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Environmental pressures and rural-urban migration: The case of Bangladesh

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By Michael Herrmann and David Svarin

Abstract

Bangladesh, like other least developed countries (LDC), has a large rural population and agricultural labor force. At the turn of the Millennium 75 percent of the LDCs' population still lived in rural areas and 71 percent of the LDCs' labor force was involved in agriculture. Yet, even the least developed countries are affected by rapidly accelerating rural-to-urban migration. This decade, 2001-2010, is the first ever in which the urban population grows faster than the rural population in the LDCs. And this change is also associated with a historic employment transition, where the agricultural sector gradually loses importance.

Both the population and the employment transition that can be observed for the group of least developed countries, are largely attributable to LDC's in Asia, and in particular Bangladesh. The very large rural-urban migration in Bangladesh, in comparison with other least developed countries, is attributable to relatively strong push factors on the one hand, and strong pull factors on the other. The principle factor that encourages people to leave their homes in the country side is the frequent recurrence of natural disasters, which undermine agricultural development and cause food crisis. By contrast, the principle factor that attracts people to urban centers is the expansion of the non-agricultural sectors, industry and services, which promises jobs and higher household incomes.

Key Words: Bangladesh, climate change, rural-urban migration, agricultural development, urban planning, dual-dual model, employment, poverty

JEL Classification: I32, J21, J31, J61, O18, Q54, R0

A. Introduction

Climate change is one of the major global threats of this millennium. A large number of countries, particularly developing countries, are facing serious challenges for their humanitarian and economic development.

Bangladesh is among the countries most affected by the prospects of climate change and by environmental pressures. Furthermore, Bangladesh figures in the group of the least developed countries, facing high poverty rates and low economic development. Natural hazards underpin these negative tendencies, thus increasing the already numerous challenges for the economic development and poverty reduction strategies. Over the past two decades, Bangladesh's economy successfully expanded the share of the non-agricultural sectors in total economic activity. The increase in productivity in the industry and service sectors provoked important structural changes for Bangladesh's economy. Since most of these economic activities are located in urban areas, large numbers of the economically active population, mostly living in rural areas, were encouraged to seek better employment opportunities in the non-agriculture sectors. Nevertheless, agriculture still remains the most important economic sector, providing livelihoods and employment for large parts of the population. As a result, the economic transition was accompanied by an enhanced population transition, particularly from rural to urban areas. In addition to these structural challenges, Bangladesh suffers from the negative impacts of natural disasters affecting both economic and demographic prospects. Not only do environmental hazards have negative impacts on agricultural production, but they also cause important internal migration flows, in the most cases pushing people in rural areas to move to the urban centers. Hence, rural-urban migration entails important challenges for the development of urban areas and consequently the non-agriculture sectors.

In this paper, we first examine the population and employment transition in Bangladesh in conjunction with its economic development. Thereafter we analyze the factors that push the population to migrate from rural to urban areas, such as increasing natural hazards and weak agricultural development, as well as the factors attracting people to

migrate to the urban centers, which are the improvement of the non-agricultural sectors and the hope for better employment opportunities in cities. Ultimately we discuss the impacts of rural-urban migration on urban infrastructures, as well as the economic development prospects of natural hazards abatement measures.

B. Employment and population transition

Bangladesh is witnessing a historical employment transition. The growth of the non-agricultural labor force has exceeded the growth of the agricultural labor force since the decade 1970-1980, yet the size of the non-agricultural labor force is expected to exceed the size of the agricultural labor force only during this decade, 2000-2010 (see chart 1).

In the least developed countries as a group about 75 percent of the population was living in rural areas, and about 71 percent of the labor force was involved in agriculture at the turn of the millennium. In Bangladesh, by comparison, the share of the population in rural areas was even higher, 77 percent, but the share of the labor force in agriculture was considerably lower with 56 percent. The relatively strong divergence between the rural population and agricultural labor force on the one hand, and the urban population and the non-agricultural labor force on the other in Bangladesh suggests that a relatively large share of the population which lives in rural areas is in fact employed off farms. Yet, the significant reallocation of the labor force from the agricultural to non-agricultural sector is also associated with an increase of the migration from rural to urban areas.

Between 2000 and 2030, the total population of Bangladesh is expected to grow from 129 to 206 million. Two thirds of this increase will take place among the urban population. During this decade, 2000-2010, the increase of the urban population is almost in pair with the increase of the rural population (12 and 14 million respectively), but in the decade 2020-2030 the increase of the urban population will be considerably higher than that of the rural population (22 and 2 million respectively) (see chart 2).

In short, compared with other least developed countries, Bangladesh has a relatively large labor force in the non-agricultural sector. The rapid expansion of the labor force in the non-agricultural sectors, which leads the way to an accelerated expansion of the population in the urban centers, is attributable to relatively strong push and pull factors. On the one hand, a relatively weak agricultural development, which has been attributable to the recurrence of natural disasters, enforces people to search for employment opportunities outside agriculture; on the other hand, a relatively strong development of the non-agricultural sectors, which has been due to the expansion of the textile industries, has enabled many people to find employment in the non-agricultural sector. Although many jobs in non-agricultural sectors are still located in the rural areas, an increasing number of people working in the non-agricultural sectors are reallocating to the urban centers.

C. Push factors for rural-urban migration:

Natural hazards, weak agricultural development and food insecurity

In comparison with other least developed countries, Bangladesh has a relatively modern agriculture characterized by comparatively large use of agricultural machinery, high consumption of fertilizer and widespread installations of irrigation systems. In 2000-2003, Bangladesh irrigated about 50 percent of its total agricultural land, compared with only 10 percent in LDCs as a group, and in 2000-2002 Bangladesh consumed about 165 kilograms of fertilizer per hectare, compared with only 15 kilograms per hectare in LDCs as a group (see table 1). Although Bangladesh has a more modern agricultural sector than other least developed countries, the differences between Bangladesh and other Asian LDCs are much smaller than the difference between Bangladesh and African LDCs, reflecting the fact that many Asian countries continued to promote the Green Revolution, whereas many African countries did not. Structural adjustment programmes have contributed to this situation as they encouraged many low-income countries to significantly curb public spending, with negative effects on agricultural investment, research and development, extension services, specialized banks and marketing boards.

Although agricultural labor productivity has increased in Bangladesh, it is not so much due to an increase of agricultural value added, as it is due to a decrease of the agricultural labor force, associated with accelerating rural-urban migration in the country. The development of the agricultural sector in Bangladesh is therefore more appropriately measured by yields in agricultural produce. Our data shows that despite considerable investment in agriculture, yields in important agricultural produce have fallen during the past decades. Since the early 1980s yields of groundnuts, rice and wheat fell by 1 mt/ha on average. The main reasons for the weak agricultural development are exogenous factors, notably climate-change induced natural hazards. Natural hazards destroy harvests and threaten food security, especially of poor households.

In order to measure the impact of natural hazards on Bangladesh's agriculture we analyzed the development of crop yields of the three main agricultural produce -- groundnuts, rice and wheat -- over a period of 20 years (from 1980 to 1999) in each of Bangladesh's six divisions (see table 2). A comparison of the average yields for a 5-year period ranging from 1980 to 1984 to the latest 5-year period ranging from 1995 to 1999 indicates a net regressive tendency in all but one division (Rajshahi) for each of the three produce. The three divisions accounting for the most serious cutback in yields are Sylhet, Dhaka and Barisal with losses of 0.69 mt/ha, 0.53 mt/ha and 0.41 mt/ha respectively. As for the three agricultural products, groundnuts proved to be the less vulnerable to exogenous influences accounting for increases in yield outcomes of about 0.4 mt/ha in total over the 20 years period. Severe decreases of yields occurred in the production of rice and wheat with cutbacks amounting to 0.95 mt/ha and 1.28 mt/ha respectively.

Bangladesh is continuously affected by natural disasters increasing in frequency and magnitude. These natural hazards, mainly floods, droughts and cyclones, have an impact on agricultural production. In 1998 Bangladesh suffered from one of its worst ever floods as its three main rivers spilled over at the same time. Flooding in Bangladesh is quite common during the monsoon months' of July and August, but in 1998 the flooding kept on going till the end of September, inundating up to 68 percent of the total land, affecting about one fifth of Bangladesh's population and damaging houses and large parts of the

road infrastructure (Del Ninno et al. 2001: 4/5). Over one million people have been displaced as a consequence of the flooding. This event had some strong impacts on the agricultural sector. For instance, usual flood levels of standard duration have little or almost no adverse impacts on rice production, one of Bangladesh's main produce. However, the intensity and duration of the 1998 flooding caused an overall decrease of 48 percent of agricultural production in rural households (Del Ninno et al. 2001: 54). Only massive imports and international aid donations prevented a drastic food crisis.

Our data shows similar tendencies when comparing the yields of groundnuts, rice and wheat per division in the year before the 1998 flood to the yields in the following year. The three divisions Barisal, Dhaka and Sylhet again accounted for the deepest cutbacks in yields with an overall loss of 0.35 mt/ha, 0.24 mt/ha and 0.09 mt/ha respectively. However, when looking at each of the three agricultural produce separately we find that the only one on which the 1998 flooding has had a negative impact is wheat (-0.29 mt/ha), whereas yields of groundnuts stayed stable and rice yields even increased at 0.3 mt/ha. These results are explained by the physical differences of Bangladesh's six divisions. During the 1998 flood the three divisions that experienced decreases in yields for groundnuts, rice and wheat -- Barisal, Dhaka and Sylhet -- have also suffered the most from the floods with, in average, up to 50 percent of the land inundated. The peak level of inundation for the other three divisions -- Chittagong, Khulna and Rajshahi -- amounted to an average of 30 percent of their total land. However, these numbers vary even more significantly between the different districts of each division. Some districts in flood-prone areas had up to 70 percent of their land inundated whereas others in less affected regions only around 10 percent.

The combination of weak agricultural development and adverse impacts of natural hazards has serious implications on food security in Bangladesh. During the last 11 years, Bangladesh experienced food crisis in 7 years. While some countries (especially in Africa) were affected by even more food crisis during the same period, in all of these countries, except one (Lesotho), was the food crisis also attributable to political instability and distress. The exposure of Bangladesh to serious natural hazards, which

induce food insecurity, is thus larger than in almost all other countries. In addition to outright food crisis, Bangladesh was affected by several food shortages. Over the period from 1998 to 2008 there were 14 reported food shortages in Bangladesh, and 13 of these were caused by flooding and its subsequent effects.

Due to its geography and its physical condition, Bangladesh is one of the world's countries most vulnerable to natural disasters. It is located in the delta of three of the world's largest rivers -- the Ganges, the Brahmaputra and the Meghna -- which all have their origin outside Bangladesh. This means that during the monsoon season in summer, Bangladesh has to manage not only its own monsoon runoffs, but those of its neighbor countries entering the land through the three main rivers. Furthermore, these rivers have many tributaries forming a dense network covering big parts of Bangladesh's floodplain area whose main characteristic is to be extremely flat. Over 60 percent of Bangladesh's land is six meters below sea level, facilitating the flooding of large areas (Mirza 2002: 127). In general about 20 percent of Bangladesh's land is flooded every year and the population has in some parts successfully adapted to this situation. However, over the last 25 years, Bangladesh experienced six major floods exceeding usual flood levels and causing severe humanitarian and economic damage (MoEF 2008) (see table 3). In addition, Bangladesh has a tropical monsoon climate characterized by high variations in rain fall, which means too much rain during monsoon season and too less during the dry season. Therefore, several regions are highly vulnerable to droughts and floods at the same time. Furthermore, Cyclones are a common phenomenon in the coastal area causing unusual surge heights which inundate large areas.

The increasing frequency of natural hazards, which explains the weak development of the agricultural sector and the recurrent threat to food security, is a principle reason for accelerated rural-urban migration.

Forced migration provoked by environmental changes is not a new phenomenon; it is rather a logic consequence of interaction between people and nature. Hence, climate change prospects increase the magnitude of migration caused by environmental

influences. Despite that, it has not entirely gained recognition by the wider public. For instance the term of 'environmental refugee' or 'environmental migrant' has no legal connotation and therefore offers no protection to people actually suffering from the displacement caused by climate change (Boano et al. 2007).

Bangladesh is particularly vulnerable to the impacts of climate change and is one of the rare countries in which natural hazards are the main cause of migration (Piguet 2008: 6). Bangladesh's vulnerability is mainly due to the mix of high population density and low-lying land. Some estimates predict that by 2050 Bangladesh will have about 15 million environmental refugees (Myers 1993: 754). Furthermore, Bangladesh's demographic prospects increase the magnitude of the problem. The World Urbanization Prospects of the United Nations Population Division estimates that by 2050 Bangladesh's population will be of about 254 million people -- 1.6 times more than today. Some estimated 57 percent will be living in urban areas. Taking into consideration that land losses, caused by massive inundations and riverbank erosion, are a most probable consequence of climate change in Bangladesh, the problem of a steadily growing population is even more accentuated when adding the prospects of a shrinking land to it.

One of the major global impacts of climate change will be sea-level rise, which is consistent with the warming of the world and the melting of glaciers and arctic ice sheets. However, sea-level rise is a slow but steady and irreversible process which makes it particularly hard to adapt to. Hence, migration seems to be the only adequate response for large numbers of the population (Piguet 2008: 7). The principal consequences of sea-level rise are massive inundations and subsequent land loss, which are reported to have serious impacts on Bangladesh. According to the IPCC (2001: 569), a 45 cm sea-level rise could cause a potential land loss of 10.9 percent and a one meter sea-level rise a loss of 20.7 percent. The UNDP (2007: 100) predicts that 11 percent of the population will be directly threatened by a one meter sea-level rise. Furthermore, as the land regresses and the sea advances, cyclone storm surges will reach further inland, causing even more damage to agriculture, ecosystems, fresh water availability and soil salinity (Black et al. 2008: 33/34).

Riverbank erosion accounts for another of Bangladesh's environmental problems provoking important internal migration. According to Shamsuddoha (2007), satellite image and population studies have revealed a total loss of 0.6 percent of Bangladesh's land between 1982 and 1992, as well as about 730'000 displaced people due to riverbank erosion.¹

Internal migration is widely considered by Bangladesh's population as the only adequate reaction to increasing natural hazards. However, in most of the cases internal migration is considered a short-term solution, since people usually plan to move back after the natural disaster. Yet, long term migration inside Bangladesh exists, consisting mainly of rural-urban migration. According to Afsar (2003: 1/2), 66 percent of Bangladesh's rural migration is directed towards urban centers, whereas 10 percent account for rural-rural and 24 percent for overseas migration. Rural-urban migration -- mainly to the country's two biggest cities Dhaka and Chittagong -- accounts for around 2/3 of the total urban growth (Black et al. 2008: 28). Hence, climate change has an indirect impact on cities and urban development.

Rural-urban migration has also important impacts on Bangladesh's economic structures. Many people give up agriculture as a result of recurrent natural disasters which destroy large parts of agricultural produces. However, in most parts of Bangladesh natural hazards, such as inundations, occur on a regular basis and during certain periods. Adaptation measures therefore need to concentrate on these difficult periods. If people can stay on their land they are more than willing to do so, thus quickly providing aid and food supply to concerned regions can importantly restrain people from migrating (Black et al. 2008: 29).

The mix between negative environmental impacts and insufficient economic conditions causes large flows of internal migration, mainly from rural to urban areas. However, there

¹ The actual numbers are probably even higher given the fact that the climate situation in Bangladesh has worsened and natural disasters occur at higher frequencies and stronger intensities. Due to a lack of available and suitable data, more recent figures and numbers can unfortunately not be provided.

are a large number of other factors influencing Bangladesh's population to leave the countryside and to abandon agricultural activity in order to move to the urban centers.

D. Pull factors for rural-urban migration:

Positive development of and higher earning potentials in non-agricultural sectors

Differences in labor productivity indicate differences in earning potentials. The average labor productivity in Bangladesh is considerably lower than the average labor productivity in most other countries of the world, which helps to explain why many Bangladeshi seek more productive and lucrative employment outside their country. Yet, non-agricultural labor productivity in Bangladesh is considerably higher than the agricultural labor productivity, which helps to explain why agricultural workers seek more productive and lucrative employment in the non-agricultural sectors.

Between 1980-1983 and 2000-2003 Bangladesh has witnessed an increase of agricultural labor productivity on the one hand, and a decrease of non-agricultural labor productivity, on the other (see table 4). Yet, in the latter period the labor productivity and thus the earning potential in non-agricultural sectors was still almost four times as high as the labor productivity and earning potential in agriculture. In accordance with classical theories of the dual economy, these differences in labor productivity and earning potentials help to explain the non-agricultural bias, which is also increasingly associated with an urban bias. Although in many cases the actual wage difference between the sectors will be smaller than the productivity difference between the sectors, it is the prospect of earning a higher wage in non-agricultural sectors that encourages many workers to migrate to urban areas. A considerable share of rural-urban migration is thus adequately explained by the classical theories of dual economies (Lewis 1954; Fei and Ranis 1964; Todaro 1969; Harris and Todaro 1970), as well as more recent theories of the dual-dual economy (Khan and Thorbecke 1988; Stifel and Thorbecke 2003; Herrmann and Khan 2008).

During the past decades, Bangladesh has seen a relatively strong expansion of its non-agricultural sector (table 5). Although the services sector accounts for the largest share of total value added in almost all countries at all times, and the services sector tends to increase as countries climb the development ladder, in the case of Bangladesh, the increase of non-agricultural value added was exclusively attributable to an increase of industry value added. Between 1990-1993 and 2000-2003, non-agricultural value added increased from 71 to 76 percent, half of which was attributable to non-manufacturing industries (construction, oil, etc.), and the other half to manufacturing industries (mostly textile). The relatively strong expansion of the manufacturing sector makes Bangladesh an exception within the group of least developed countries. Between 1990-1993 and 2000-2003, the manufacturing value added of the group of LDCs increased by US\$ 7.4 billion, half of which was attributable to Bangladesh alone. Indeed, over the same period, 21 out of 36 least developed countries, for which data was available, saw a premature de-industrialization as characterized by a declining share of manufacturing value added in total value added. Although Bangladesh continues to have a relatively small industrial sector compared with more advanced countries, it has a relatively strong industrial sector compared with other least developed countries. As particularly the manufacturing industry tends to create relatively productive and lucrative employment opportunities, the strong development of manufacturing industries is a positive sign for the development of Bangladesh's economy at large.

In Bangladesh, the relatively strong expansion of the non-agricultural sectors was also associated with a shift towards more advanced manufacturing and service sector activities (see chart 3). At the turn of the millennium, basic manufacturing activities (i.e. resource-intensive and low-technology manufacturing) as a share of total manufacturing, and basic services (basic commercial services and human development services) as a share of total service value added were lower in Bangladesh than in other least developed countries (Herrmann 2006). Thus, although textile remains the most important industry in Bangladesh, other non-agricultural industries are growing in importance. A relatively large and growing number of employment opportunities in Bangladesh are therefore to be found in sectors with relatively high value added.

While some non-agricultural activities are located in rural areas, most of them are located in the urban centers. The relatively strong expansion of non-agricultural industries therefore is an important factor in explaining the rapidly increasing migration to urban areas. Dhaka, the country's capital and biggest city, is a striking example for the rapid rate of rural-urban migration. The city currently has about 13 million inhabitants, and each year about 500,000 more are being added (UN-Habitat 2008). The largest share of rural-urban migration in Bangladesh is destined for the two largest cities, Dhaka and Chittagong.

Although the development of the non-agricultural sector is reflectively strong, it does not create sufficient jobs to absorb the large and rapidly increasing number of people searching for more productive and lucrative employment in the non-agricultural sector. Many who leave the rural areas in search for a better life in the urban centers will therefore be disappointed. Rather than finding a relatively stable and well paying job in a textile enterprise, for example, they will be forced to shine shoes at a street corner. They will end up working in the informal sector of the economy to ensure their survival. It has been estimated that in 1995/96, the share of informal employment in total non-agricultural employment in Bangladesh was 68 percent (UNCTAD 2006: 184). However, many people who migrate to urban areas in search of a more productive and lucrative job in the non-agricultural sector are likely to be disappointed, as the influx of people far exceeds the rate of job creation. This is reflected in the large unemployment and underemployment in industry and services, as well as in the increase of poverty in urban areas.

Interestingly, accelerated rural-urban migration in Bangladesh has been associated with shrinking slums in its urban areas. This contradicts the experience of many other countries. In Bangladesh, over the last 18 years, the share of the urban population living in slums has decreased by 16 percent (from 87 to 71 percent). However, over the same period the proportion of urban population using improved drinking water has declined by 3 percent (from 88 to 85 percent), and the share of the population with access to

improved sanitation facilities has declined by 8 percent (from 56 to 48 percent). The declining share of the population in slums, on the one side, and the decreasing share of the urban population with access to vital infrastructure, on the other, suggests that an increasing number of people decide to settle in the centers of cities rather than in slums at their fringes. The subsequent overcrowding in city centers encourages a degradation of the available urban infrastructure, and ultimately the “slumification” of inner cities themselves.

E. The dual use of abatement infrastructure

The direct and indirect negative impacts of the environment in Bangladesh are increasing. The subsequent infrastructural challenges for Bangladesh are numerous and they require immediate action. The range of possible adaptation and abatement measures reaches from community-level based approaches to global solutions. Nevertheless, abatement measures should be adapted to the country's economic, demographic and environmental context. In the case of Bangladesh, the most urgent and probably most useful abatement measures concern a handful of different domains. These are agriculture, information practices, urban infrastructure and land management.

Well-funded and operational information practices are a first step to climate change adaptation and mitigation, because it allows the population to know about the risks they face. Widespread information dissemination and increasing information accessibility are the basis for low-scale adaptation, since it fosters awareness of and preparedness for natural disasters in concerned regions. On the one hand, such measures should include the dissemination of weather forecasts and related information, such as elaborate storm patterns and flood maps. On the other hand, the diffusion of information about the conditions of life in cities could help to change the perceptions of urban centers and ultimately prevent excessive rural-urban migration.

Adaptation concerning land management is more complex but nonetheless essential for the deployment of cost-effective and enduring solutions. For instance, not all of

Bangladesh's divisions and districts are equally affected by environmental hazards and subsequent damages. As our figures show, around 30 percent of the land is almost not threatened by natural hazards at all, whereas around another 30 percent only experiences 'normal flood levels' during the monsoon season. Abatement measure should thus take these facts into consideration. Therefore, planning of and investing in adaptation and abatement infrastructure should as well be driven by geographic and land-oriented considerations.

Furthermore, reducing deforestation and increasing afforestation is widely recognized as one of the most cost-effective abatement measures, since it prevents the spreading of storm surge flooding and helps to stabilize the land against erosion. Accordingly, the government of Bangladesh has implemented such a project in the coastal area, which stands for almost one third of the total immediate abatement costs (see table 6).

Despite significant structural economic changes, Bangladesh still has a high dependence on agriculture. Adaptation to natural hazards and diversification of agricultural production should be a main focus in action plans. The promotion of research in the field of crop mutation could provide the concerned population with new kinds of flood and salinity resistant produce. Agricultural production should concentrate on products which are either more tolerant to soil salinity or less vulnerable to massive inundations. In some areas of Bangladesh peasants already have adopted to seasonal flooding by growing modified and more resistant rice crops. For instance, according to our figures, the massive 1998 floods did not harm Bangladesh's rice production whose yields even increased in the following year.

Fisheries account for important economic activity especially in the coastal area of Bangladesh. It therefore equally needs to foster research in order to adapt fish cultures to the new circumstances. For instance, areas in which inundations have impacts on water salinity, fisheries have to diversify their fish cultures to salt tolerant species.

In order to prevent further rural-urban migration and the loss of labor force in agriculture, Bangladesh needs to increase agricultural productivity so that it can provide better employment and higher wage opportunities. However, this requests important investments, especially in new infrastructure protecting agriculture from environmental pressures. Such investments in rural areas, however, must be complemented by investments in urban areas. Large parts of the urban population still live in slums and even more only have limited access to clean drinking water and sanitation facilities. Hence, massive investments in urban infrastructure such as road systems, sanitation, water supply and especially housing need to be done. The outcome of such measures is twofold. On the one hand, it provides the poor with the essential basic needs for life; on the other, it improves the development of urban infrastructure, making it more attractive for investment. In the end, climate change abatement measures should be in direct accordance with the general economic development goals.

The implementation of abatement infrastructure requires important resources which neither Bangladesh's economic sector nor its government is able to provide. In its first National Adaptation Programme of Action (NAPA, see MoEF 2005), the government of Bangladesh has issued a non-exhaustive list of adaptation projects including cost estimates, which amount to a total of about US\$ 73 million (see table 6). The required amount for these projects makes it clear that the international community should take an active role in helping to provide the funds for these measures.

F. Conclusions

Trade-off between rural and urban poverty

In comparison with other least developed countries, particularly least developed countries in Africa, Bangladesh has been able to considerably reduce poverty during the last four decades, as indicated by national-accounts based poverty estimates, and has achieved relatively low levels of poverty today. However, an additional reduction of extreme poverty appears difficult.

The accelerated rate of migration from rural to urban areas in Bangladesh has been associated with a redistribution rather than a reduction of poverty. Household-based poverty estimates show that between 1996 and 2004, the part of the population in rural areas living below the national poverty line has decreased by 2 percent (from 55 to 53 percent), whereas in urban areas it has increased by 8 percent (from 29 to 37 percent)². There thus appears to be a trade-off between rural poverty and urban poverty, which implies that many people are caught between a rock and a hard place. People seek to escape poverty in rural areas but many times they take poverty with them to the urban centers.

The decline of rural poverty is mostly due to the fact that a large number of people have left rural areas and not because of a considerable expansion of agricultural production and employment. By contrast, the increase of urban poverty is attributable to the fact that many people were added to the urban labor force without a concomitant expansion of non-agricultural production and employment (i.e. fewer people in relation to similar output). This suggests that, if insufficient flows of people leave the rural areas it will be difficult to reduce rural poverty, yet the more people move to urban centers, the more difficult it is to reduce urban poverty, all else equal.

The large influx of people to cities seriously undermines their viability and sustainability. The lack of productive and lucrative employment opportunities in particular means that too many people are making use of the available urban infrastructure and services, but too few are contributing to their maintenance or improvement through tax payments. This challenge must be addressed through better planning and management of cities. However, it would be wrong to shift from an anti-urban bias, which has characterized development policies during the past decades, to an anti-rural bias now. At the heart, the viability of cities also always depends on a strong development of the country side. Investments in non-agricultural sectors and urban centers, in other words, must be complemented by equal investment in the agricultural sector and the rural areas. The former is necessary to

² Rahman and Islam (2003) come to the same conclusion. However, as they state, the increase in urban poverty and the decrease of rural poverty are rather a recent phenomenon and are mainly due to income inequalities in urban and rural areas.

absorb a rapidly growing urban populations in productive jobs in the non-agricultural sector, whereas the second is necessary to create productive jobs for the rural populations in agriculture and thereby to decrease the pressure on cities.

The investment in rural areas must take two principle forms. First, Bangladesh should continue to invest in the modernization of its agriculture with a view to raising agricultural productivity. Second, Bangladesh must begin to invest much more heavily in the protection of agriculture against natural hazards. In many cases, abatement infrastructure will serve both purposes. But the costs associated with such investment are significant and exceeding the financial possibilities of Bangladesh for which reason they claim openly in the NAPA for international support. It is therefore important that the necessary investment in the productive sectors and economic infrastructure, including abatement infrastructure, be financed through development assistance. This however will require a new and more balanced orientation of development assistance, focusing on the promotion of production and the creation of employment.

During the past years, the share of aid dedicated to economic development in least developed countries declined. Between 2000-2004 and 2006, aid committed by OECD/ DAC countries for the development of the social sector and governance in the LDCs increased from 34 to 42 per cent of total ODA commitments (disbursements accounted for 41 per cent in 2006), whereas aid committed by OECD/ DAC countries for the development of economic infrastructure and production in the LDCs fell from 29 to 18 per cent of total ODA commitments (disbursements accounted for only 13 per cent in 2006) (UNCTAD 2008a: 31, and 2008b). The decline of economic aid in general has been paralleled by underinvestment in the rural areas. In the period 2003-2005, OECD/ DAC countries committed only about 1 per cent of their total aid to the LDCs for the agricultural research, extension, education and training (UNCTAD 2007: 168).

Sustainable poverty reduction in least developed countries like Bangladesh requires more and more productive employment opportunities in both urban and rural areas and to this end, it is necessary that least developed countries like Bangladesh increase investment in

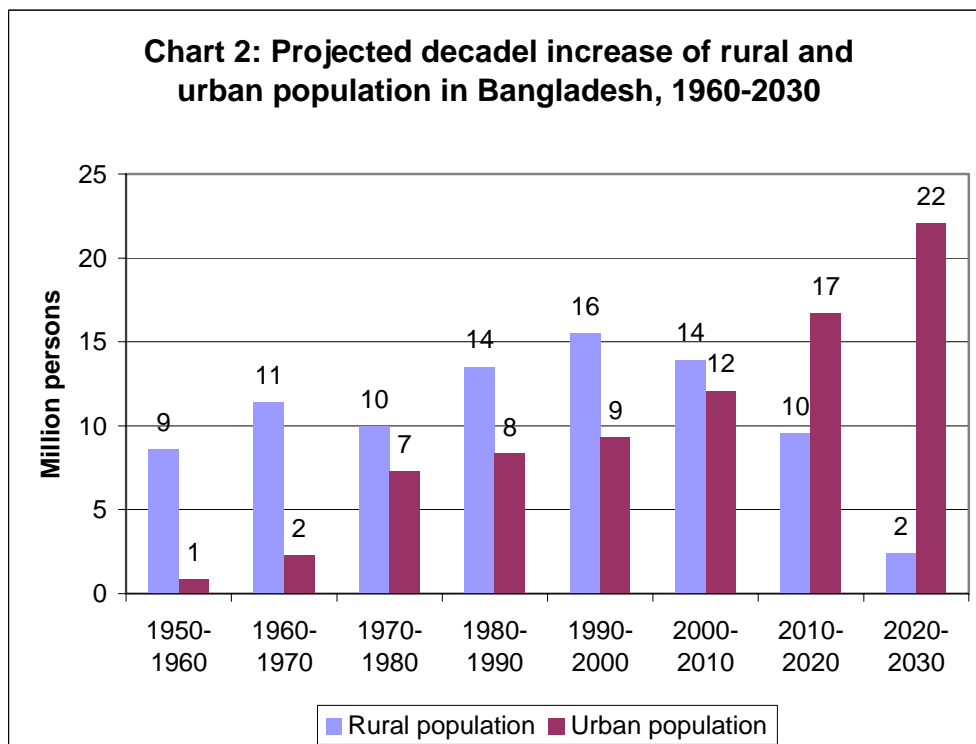
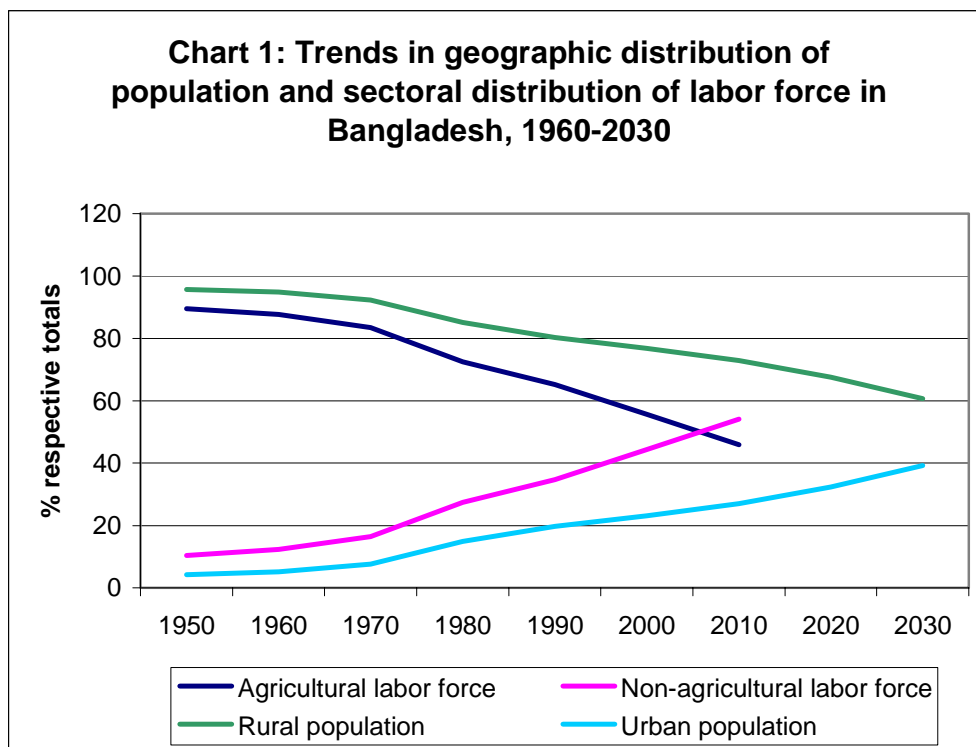
both the non-agricultural and the agricultural sectors. In particular, Bangladesh requires more public and private investment in physical infrastructure, banking systems, business support institutions, technologies, skills and knowledge-systems (Gore and Herrmann 2008a, 2008b). Without a stronger focus on the development of productive capacities, it will be difficult for Bangladesh to promote more effective poverty reduction, and to encourage a balanced development of its economy, which pays adequate attention to the rural and urban areas.

References

- Black, R., Kniveton, D., Skeldon, R., Coppard, D., Murata, A. and K. Schmidt-Verkerk (2008). *Demographics and Climate Change: Future Trends and their Policy Implications for Migration*. T-27 Working Paper, Development Research Centre. University of Sussex, Brighton.
- Boano, C., Zetter, R. and T. Morris (2007). *Environmentally Displaced People: Understanding the Linkages between Environmental Change, Livelihoods and Forced Migration*. Policy Briefing, Refugee Studies Centre. University of Oxford, Oxford.
- Del Ninno, C., Dorosh, P., Smith, L., and D. K. Roy (2001). *The 1998 floods in Bangladesh: disaster impact, household coping strategies and response*. IFPRI Research Report 122. IFPRI, Washington D.C.
- Fei, J. and G. Ranis (1964). *Development of the labor surplus economy*, Homewood, IL, Irwin.
- Gore, C.G. and M. Herrmann (2008a). "Trade and Investment in LDCs" in UNDP (ed.). *Making Globalization Work for Least Developed Countries*, New York.
- Gore, C.G. and M. Herrmann (2008b). "Technology and Innovation in LDCs" in UNDP (ed.). *Making Globalization Work for Least Developed Countries*, New York.
- Harris, J.R. and M.P. Todaro (1970). "Unemployment and Development: A Two-Sector Analysis", *The American Economic Review*, Vol. 60 (1), 126-142.
- Herrmann, M. (2006). "Structural change in labor-surplus economies: Evidence from least developed countries", Background Report to the Least Developed Countries Report 2006, UNCTAD, Geneva.
- Herrmann, M. (2007). "Agricultural support measures of advanced countries and food insecurity in developed countries: Economic linkages and policy responses", in Guha-Khasnobis, B., S.S. Acharya and B. Davis (eds.). *Food security: Indicators, measurement, and the impact of trade openness*, Oxford University Press, Oxford.
- Herrmann, M. and H.A. Khan (2008). "Rapid urbanization, employment crisis and poverty in African LDCs: A new development strategy and aid policy", Geneva, mimeo.
- IPCC (2001). *Climate Change: Impacts, Adaptation and Vulnerability*. McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J. and K.S. White (eds.). Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge.
- IPCC (2007). *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and C.E. Hanson (eds.) Cambridge University Press, Cambridge.
- IPCC (2007b). *Asia. Climate Change 2007: Impacts, Adaptation and Vulnerability*. Cruz, R.V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., Honda, Y., Jafari, M., Li, C. and N. H. Ninh. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and Hanson, C.E., (eds.), Cambridge: Cambridge University Press, 469-506.

- Lewis, W.A. (1954). "Economic development with unlimited supplies of labor", The Manchester School.
- Khan, H.A. and E. Thorbecke (1988). *Macroeconomic effects and diffusion of alternative technologies within a social accounting matrix framework: The case of Indonesia*, Gower Publication, Co., Aldershot.
- Mirza, M.M.Q. (2002). "Global Warming and Changes in the Probability of Occurrence of Floods in Bangladesh and Implications." *Global Environmental Change*, Vol. 12 (2), 127-138.
- MoEF (Ministry of Environment and Forest) (2008). *Bangladesh Climate Change Strategy and Action Plan 2008*. Ministry of Environment and Forests. Government of the People's Republic of Bangladesh, Dhaka.
- MoEF (2005). *Bangladesh National Adaptation Programme of Action (NAPA)*. Ministry of Environment and Forests. Government of the People's Republic of Bangladesh, Dhaka.
- Myers, N. (1993). "Environmental Refugees in a Globally Warmed World." *Bioscience*, Vol. 43 (11), 752-761.
- Piguet, E. (2008). *Climate change and forced migration*. Research Paper No. 153. UNHCR Evaluation and Policy Analysis Unit, Geneva.
- Rahman, A., Alam M., Alam, S.S., Uzzaman, M.R., Rashid, M. and G. Rabbani (2007). "Risks, Vulnerability and Adaptation in Bangladesh." UNDP Human Development Report 2007/2008 Background Paper. UNDP, New York.
- Rahman, R.I. and K.M.N. Islam (2003). *Employment Poverty Linkages: Bangladesh*. Issue in Employment and Poverty Discussions Paper 10. ILO, Geneva.
- Shamsuhoda, Md. (ed.) (2007). *Sea Level Rise Causes: Environmental Refugee in Bangladesh*. Campaign Brief 5. Coast Trust and Equity and Justice Working Group, Dhaka.
- Stifel, D. and E. Thorbecke (2003). "A dual-dual CGE model for a stylized Archetype African economy", *Journal of Policy Modelling*, Vol. 25 (3), 207-235.
- Todaro, M.P. (1969). "A Model of Labor Migration and Urban Unemployment in Less Developed Countries", *The American Economic Review*, Vol. 59 (1), 138-148.
- UNCTAD (2006). *The Least Developed Countries Report 2006: Developing Productive Capacities*, New York and Geneva.
- UNCTAD (2007). *The Least Developed Countries Reports 2007: Knowledge, Technological Learning and Innovation for Development*, New York and Geneva.
- UNCTAD (2008a). *The Least Developed Countries Report 2008: Growth, Poverty and the Terms of Development Partnership*, New York and Geneva.
- UNCTAD (2008b). *The Trade and Development Reports 2008: Commodity Prices, Capital Flows and the Financing of Investment*, New York and Geneva.
- UNDP (2007). *Human Development Report 2007/2008. Fighting Climate Change: Human Solidarity in a Divided World*. UNDP, New York.
- UN-Habitat (2008). *State of the World's Cities 2008/2009. Case Study: Dhaka's extreme vulnerability to climate change*. UN-Habitat Feature. United Nations Human Settlement Programme, Nairobi.

Annexes: Tables and Charts



Source: Authors' calculations, based on FAO, FAOSTAT online.

Table 1: Agricultural land and investment in Bangladesh and selected country groups

	Land/ person ratio		Irrigated land % total agricultural land		Total fertilizers consumption	
	<i>(Annual and permanent crops land in 1000 Ha/ economically active population in agriculture in 1000)</i>		<i>(Agricultural Area in 1000 Ha)</i>		<i>(Kg/ hectare)</i>	
	1980-1983	2000-2003	1980-1983	2000-2003	1980-1983	2000-2002
Bangladesh	0.3	0.2	..	49.5	49.8	165.1
Least developed countries	0.8	0.7	8.2	10.7	9.8	15.2
Developing countries	0.8	0.7	20.1	23.1	60.5	98.1
Developed countries	9.3	14.0	9.1	10.8	118.6	78.4

Source: Authors' calculations, based on FAO, FAOSTAT online.

Note: (a) The group of African and Asian LDCs does not include small island LDCs. (b) Values on irrigated land and fertilizer consumption for country groups are based on the 1980s, rather than the early 1980s only.

Table 2: Yield changes in selected agricultural produce and regions

Long-term trend 1980 to 1999					Changes before and after 1998 floods					
Division	Product	1980-1984	1995-1999	Difference	Division	Product	1997	1998	1999	Difference
Barisal	Groundnut:	1.05	0.95	-0.1	Barisal	Groundnut:	0.94	1.05	1.12	-0.18
	Rice	1.84	1.18	-0.66		Rice	1.26	1.03	1.24	0.02
	Wheat	1.29	1.64	0.35		Wheat	1.6	1.8	1.79	-0.19
Chittagoni	Groundnut:	0.96	1.14	0.18	Chittagoni	Groundnut:	1.16	1.15	1.13	0.03
	Rice	2.39	1.95	-0.44		Rice	2.1	1.89	1.92	0.18
	Wheat	2.1	2.01	-0.09		Wheat	2.08	2.22	2.17	-0.09
Dhaka	Groundnut:	1.03	1.13	0.1	Dhaka	Groundnut:	1.26	1.08	1.08	0.18
	Rice	2.01	1.92	-0.09		Rice	1.85	1.82	1.84	0.01
	Wheat	2.26	1.72	-0.54		Wheat	1.47	2.09	1.9	-0.43
Khulna	Groundnut:	1.18	1.04	-0.14	Khulna	Groundnut:	1.09	1.02	0.94	0.15
	Rice	1.75	1.85	0.1		Rice	2.03	1.8	1.91	0.12
	Wheat	2.4	2.1	-0.3		Wheat	2.31	2.31	2.26	0.05
Rajshahi	Groundnut:	1.14	1.27	0.13	Rajshahi	Groundnut:	1.25	1.26	1.25	0
	Rice	1.95	2.02	0.07		Rice	2.12	2.08	2.04	0.08
	Wheat	2.13	2.02	-0.11		Wheat	2.22	2.3	2.05	0.17
Sylhet	Groundnut:	1.05	1.28	0.23	Sylhet	Groundnut:	1.3	1.3	1.48	-0.18
	Rice	1.98	1.65	-0.33		Rice	1.62	1.74	1.73	-0.11
	Wheat	2.21	1.62	-0.59		Wheat	1.78	1.76	1.58	0.2

Source: authors' calculations based on FAO, Agromaps

Table 3: Major floods and their impacts

Year	Land inundation (% total land)	Estimated damage (million US\$)	People affected (million)	Deaths (numbers)	Houses damage (million)
1984	36	378
1987	34	1000	..	2055	..
1988	61	1200	45	2000–6500	..
1998	68	2800	30	1000	..
2004	38	6600	4	700	..
2007	22	over 1000	..	649	over 1

Source: Authors' calculations based on MoEF 2005, MoEF 2008, Del Ninno et al. 2001.

Table 4: Agricultural and non-agricultural labor productivity in Bangladesh and selected country groups, 1980-1983, 1990-1993 and 2000-2003

	1980-1983	1990-1993	2000-2003
Bangladesh			
Agricultural labor productivity (USD)	223	248	307
Non-agricultural labor productivity (USD)	1149	1081	1125
Non-agricultural/ urban biase	5.1	4.4	3.7
<i>Memo: Agricultural labor force (million)</i>	30.8	35.4	39.0
<i>Memo: Agricultural labor force (% total)</i>	71.4	63.8	54.2
Least developed countries			
Agricultural labor productivity (USD)	239	242	273
Non-agricultural labor productivity (USD)	1319	1213	1204
Non-agricultural/ urban biase	5.5	5.0	4.4
<i>Memo: Agricultural labor force (million)</i>	139.6	173.7	226.4
<i>Memo: Agricultural labor force (% total)</i>	77.9	74.3	69.8
Other developing countries			
Agricultural labor productivity (USD)	408	493	599
Non-agricultural labor productivity (USD)	4248	4406	5145
Non-agricultural/ urban biase	10.4	8.9	8.6
<i>Memo: Agricultural labor force (million)</i>	853.5	981.4	1049.9
<i>Memo: Agricultural labor force (% total)</i>	64.0	58.6	52.3
Developed countries			
Agricultural labor productivity (USD)	11608	17729	28013
Non-agricultural labor productivity (USD)	38766	45591	52887
Non-agricultural/ urban biase	3.3	2.6	1.9
<i>Memo: Agricultural labor force (million)</i>	26.4	19.9	14.1
<i>Memo: Agricultural labor force (% total)</i>	7.4	5.0	3.3

Source: Authors' calculations based on World Bank, WDI 2005 CD-Rom (value added data), and FAO, FAOSTAT online, December 2005 (economically active population).

Note: Agricultural labor productivity is agricultural value added/ economically active population in agriculture; non-agricultural labor productivity is non-agricultural value added/ economically active population outside agriculture; non-agricultural or urban biase is non-agricultural labor productivity/ agricultural labor productivity.

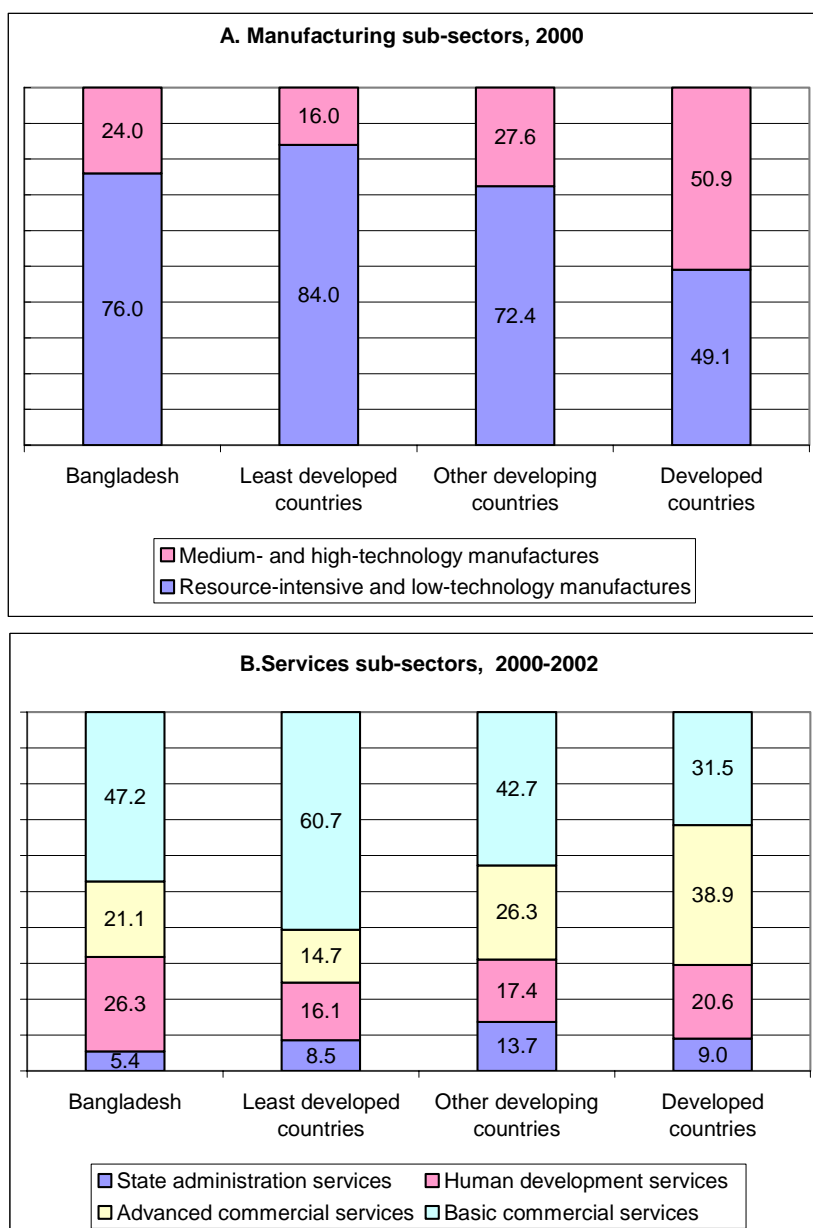
Table 5: Value added by principle economic sectors in Bangladesh and selected country groups, 1980-1983, 1990-1993 and 2000-2003

	1980-1983	1990-1993	2000-2003
Bangladesh			
Agriculture	33	29	24
Non-agriculture	67	71	76
Industry	17	21	26
Manufacturing	11	13	16
Non-manufacturing	6	8	11
Services, etc.	50	50	50
Least developed countries			
Agriculture	37	35	33
Non-agriculture	63	65	67
Industry	23	22	26
Manufacturing	9	10	11
Non-manufacturing	14	13	15
Services, etc.	39	43	42
Other developing countries			
Agriculture	15	14	11
Non-agriculture	85	86	89
Industry	33	34	37
Manufacturing	17	19	23
Non-manufacturing	16	15	14
Services, etc.	52	52	52
Developed countries			
Agriculture	2	2	2
Non-agriculture	98	98	98
Industry	31	30	27
Manufacturing	8	18	17
Non-manufacturing	22	12	10
Services, etc.	67	68	71

Source: Authors' calculations based on World Bank, WDI 2005 CD-Rom

Note: sample size: other developing countries 67; developed countries 22.

Chart 3: Value added created in sub-sectors of manufacturing and services



Source: Authors' estimates, based on UNIDO (distribution of manufactures value added), and UN Statistical Division (distribution of services value added).

Note: (a) Where manufacturing value added is concerned, data were available only for incomplete country groups: 27 least developed countries, 72 other developing countries, and 33 developed countries. (b) State administration services include public administration, defence, and compulsory social security; human development services include education, health, social work, as well as other community, social and personal services; advanced commercial services include financial intermediation, as well as real estate and renting, and other business activities; basic commercial services include transport, storage, communication, wholesale, retail, gastronomy, and personal household services.

Table 6: Type and costs of selected adaptation projects in Bangladesh

Project name	Type of project	Estimated costs (million USD)
Reduction of climate change hazards through coastal afforestation with community participation	Intervention	23.0
Providing drinking water to coastal communities to combat enhanced salinity due to sea level rise	Intervention	1.5
Capacity building for integrating climate change in planning, designing of infrastructure, conflict management and land-water zoning for water management institutions	Capacity building	2.0
Climate change and adaptation information dissemination to vulnerable community for emergency preparedness measures and awareness raising on enhanced climatic disasters	Awareness and capacity building	7.0
Construction of flood shelter, and information and assistance centre to cope with enhanced recurrent floods in major floodplains.	Intervention	5.0
Mainstreaming adaptation to climate change into policies and programmes in different sectors (focusing on disaster management, water, agriculture, health and industry)	Capacity building	1.0
Inclusion of climate change issues in curriculum at secondary and tertiary educational institution	Awareness building	0.5
Enhancing resilience of urban infrastructure and industries to impacts of climate change	Capacity building	2.0
Development of eco-specific adaptive knowledge (including indigenous knowledge) on adaptation to climate variability to enhance adaptive capacity for future climate change	Intervention	5.0
Promotion of research on drought, flood and saline tolerant varieties of crops	Research	5.0
Promoting adaptation to coastal crop agriculture to combat increased salinity	Intervention	6.5
Adaptation to agriculture systems in areas prone to enhanced flash flooding	Intervention	6.5
Adaptation to fisheries in areas prone to enhanced flooding through adaptive and diversified fish culture practices	Intervention	4.5
Promoting adaptation to coastal fisheries through culture of salt tolerant fish	Intervention	4.0
Exploring options for insurance to cope with enhanced climatic disasters	Research	0.2
Total Costs		73.7

Source: authors' computations based on MoEF 2005