

An Assessment of Climate Change on ADP of Bangladesh

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Introduction

Climate change as a concept has been added to our vocabulary only recently. It has drawn public attention only recently and in particular since the 80s after the discovery of ozone hole over the Antarctic (Farman, Gardnier, & Shouklin, 1985). About the same time, research on Carbon Dioxide concentration in the atmosphere led scientists to believe that human-induced climate change is a real phenomenon (Ramanathan & Vogelmann, 1997) but it is only recently that scientists are able to predict using large computer simulation models the consequences of CO₂ concentration on the climate with a reasonable degree of accuracy. Also it was only in 1997, the world leaders were able to sign (not implement) an international protocol (known as Kyoto Protocol) under which industrialized countries (except USA) have agreed to limit their carbon emission to the 1990 levels. Unfortunately, the protocol became effective only in 2005 when after a lot of persuasion Russia agreed to sign the protocol and the protocol fulfilled its necessary requirements to become an effective international agreement. Unfortunately again the protocol will expire by 2012 (only 3 years left now) and the world is yet to show any significant movement towards arresting carbon emission.

Predictions on Climate Change and Bangladesh

Bangladesh, is already feeling the impact. Frequency of disasters like cyclone, flood and drought has already risen above the normal level. IPCC 4th assessment report (IPCC, 2007) has already listed Bangladesh as one of the most vulnerable countries of the world. It has mentioned that climate impacts will effect Bangladesh in several ways: a) sea level rise will permanently inundate roughly 1/3rd of the country if it is not properly protected with embankments and polders; b) frequent floods will force millions to become climate refugees; c) deteriorate the poverty, health and nutrition scenario; and d) increase salinity in coastal areas (Haque, 2008). The report further went in to suggest possible mitigation options for the developed nations in energy, transportation, construction, industry, agriculture, forestry, and waste disposal mechanism to reduce or arrest the growth of carbon emission into the atmosphere. The report also mentioned with a high degree of confidence (8 in 10 chance to be correct) that climate change has resulted in a) more and larger glacier lakes; b) increasing ground instability in permafrost regions; c) increasing rock avalanches in mountain regions; d) changes in arctic and Antarctic ecosystems; e) increased run-off and earlier spring peak discharge; f) changes in algae, plankton, fish and zooplankton because of rising water temperature, changes in ice cover, salinity, oxygen levels and water circulation. The report is even more confident in saying that 'climate change is affecting terrestrial biological systems in that a) spring events such as the unfolding of leaves, laying of eggs, and migration are happening earlier, b) there are poleward and upward (to higher

altitude) shifts in ranges of plant and animal species' (Wikipedia). IPCC reports further suggested that taking either mitigation or adaptation measures will not be sufficient to tackle the problem of climate change and so countries should try adopting both of these measures to address the problem of climate change.

Economic Assessment of Climate Change

Given this background, economists were asked to 'measure' the impact of climate change on the world economy. Climate impact studies require that scientists must provide a 'reasonable' estimate of future changes (over the next 100 years), economists often find it puzzling to measure impacts that is going to come over the next 100 years. After all, economists deal with human behavior. To me this is a growing and a very challenging field of research in economics. Our problems are twofold – a) how to integrate the complex climate science in economic models and b) how to develop economic models that will predict economic conditions in 2100! You can easily imagine the insurmountable problem both in terms of behavioral theories as well as in terms of data requirement! In order to predict the next 100 years, we need economic data from the previous 1000 years or so. In absence of both 'good' economic models and 'reliable' past data, economists are definitely handicapped. Yet, we need to provide some assessment to help policy makers plan the future.

Nicholas Stern, in his report in 2006, discussed the effect of global warming on the world economy and suggested using the results from formal economic models, that if we do not act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. (Stern, 2006). This means the total loss is between 3-12 trillion dollars. For countries like Bangladesh this is about 4-14 billion US\$ a year. For a country whose annual government budget is about 16 billion US\$ (Ministry of Finance, Government of Bangladesh, 2009), it will be a nightmare for the government of Bangladesh to recover the total damage due to climate change. Government of Bangladesh spends nearly 4-5 billion dollars in development projects each year. The climate change will put these investments at risk and so the real impact on Bangladesh economy might be even larger. Against this backdrop, this paper assesses the impact of climate change on ADP of Bangladesh. The objective is to develop an understanding about 'additional' funds needed to ensure that these projects are able to sustain its intended impact on economy of Bangladesh.

Assessment of Climate Impacts on ADP of Bangladesh

Considering the 'block allocation' as a separate item, it can be shown that development projects in Bangladesh are approved by the Ministry of Planning largely under these 18 sectors. These sectors are 1) Agriculture, 2) Rural Development & Institutions, 3) Water resources, 4) Industries, 5) Power, 6) Oil, Gas and Natural Resources, 7) Transport, 8) Communication, 9) Physical Planning, Water Supply and Housing, 10) Education and Religious Affairs, 11) Sports and Culture, 12) Health, Population and Family Welfare, 13) Mass Media, 14) Social Welfare, Women Affairs & Youth Dev, 15) Public Administration, 16) Science and Technology Research, 17) Labor and Employment, and 18) Block Allocation. There are nearly 900-1000 different projects financed by the government in each year under ADP.

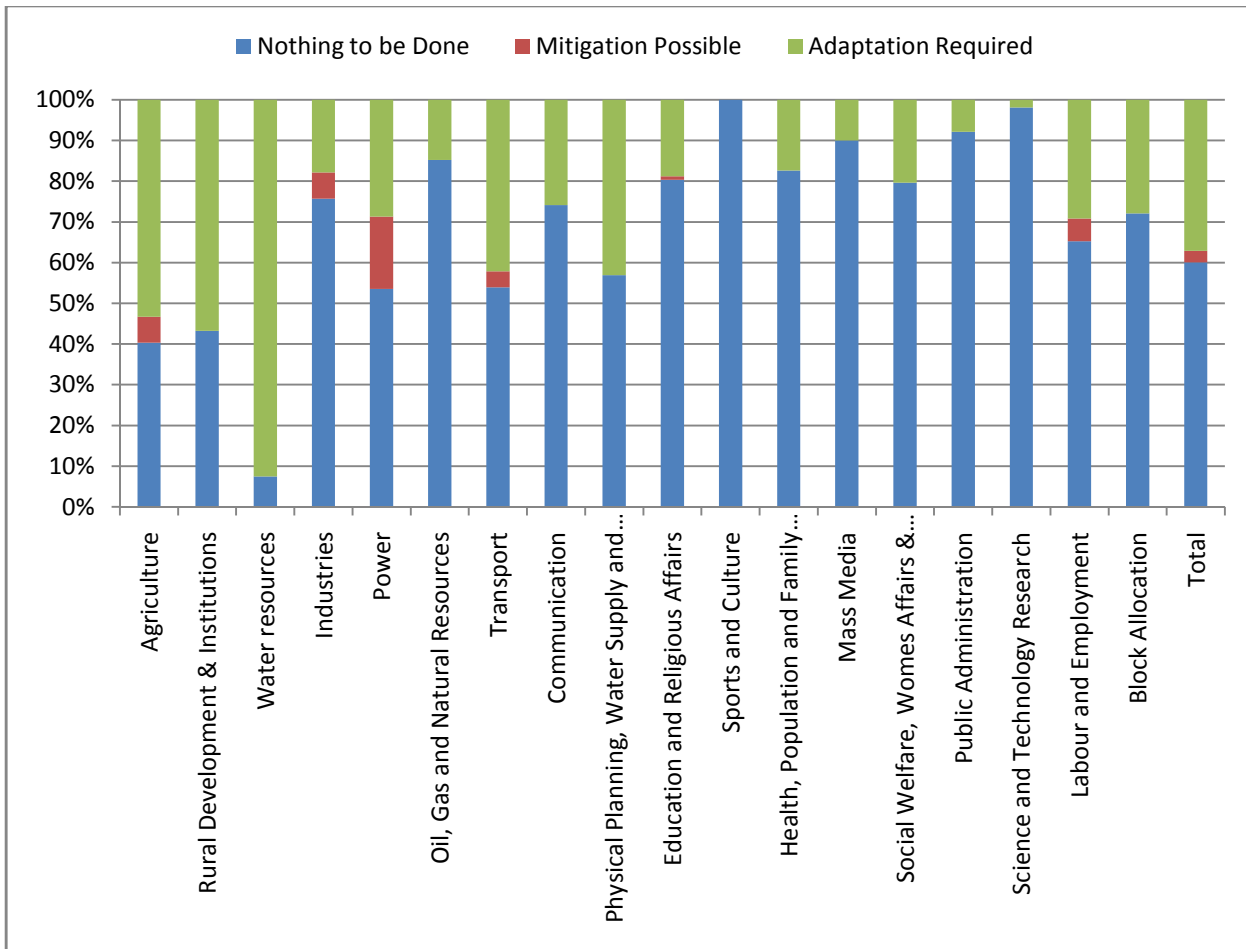
Global warming or climate change is likely to affect the effectiveness of many of these projects. For example, a project like building embankment requires adaptation to ensure that a bigger and a stronger cyclone that might be coming to Bangladesh in future (due to climate change) cannot reduce its effectiveness in terms of protection life and assets of the people living in the floodplains of Bangladesh. Similarly, a project like hospital is also able to serve adequately the population when in future the incidence of certain diseases rise or also poverty reduction or employment generation projects need to be adjusted to accommodate larger number of people as the incidence of poverty will be on the rise in many communities due to climate change and the collapse of cropping system. This means that these types of projects will require adaptations to ensure that the welfare objectives of the projects are realized at the end. On the other hand, given the rise in level of carbon concentration in the atmosphere, it is possible that Bangladesh can also take measures to reduce its carbon emission by adopting a better technology or changing human behavior. For example, dairy farms could be designed to trap methane gas and reduce GHG emission. Similarly, energy projects could be redesigned to ensure co-generation using heat-trapping. These are examples of mitigation measures that can be adopted in some of the ADP projects.

It is, therefore, expected that many projects need to be amended for mitigation and adaptation purposes without which the project themselves may not become economically viable. The question is how many of the ADP projects are susceptible to such modifications. In order to develop a general understanding on this, a review of development projects of 2004-5 and 2008-9 were studied. Projects in two consecutive fiscal years are often similar due to time overlap during implementation and so projects from two fiscal years with gaps in years in between were taken for this analysis. A total of 1901 projects were scrutinized by the author to understand **if the projects are designed today** what type of measures should be adopted to salvage its welfare impacts. Figure 1 summarizes the result by sectors.

Projects Need Modification due to Climate Change

Figure 1 shows that projects in all sectors except in the sector of sports and culture require adaptation measures without which the projects will become ineffective or may even be infeasible. Overall, nearly 40% of the projects need to be modified for possible mitigation or adaptation options. This means that the capacity of the officials of the government of Bangladesh needs to be improved dramatically to design projects with possible adaptation and mitigation measures.

Figure 1: Percent of ADP Projects Needs Climate Adjustment

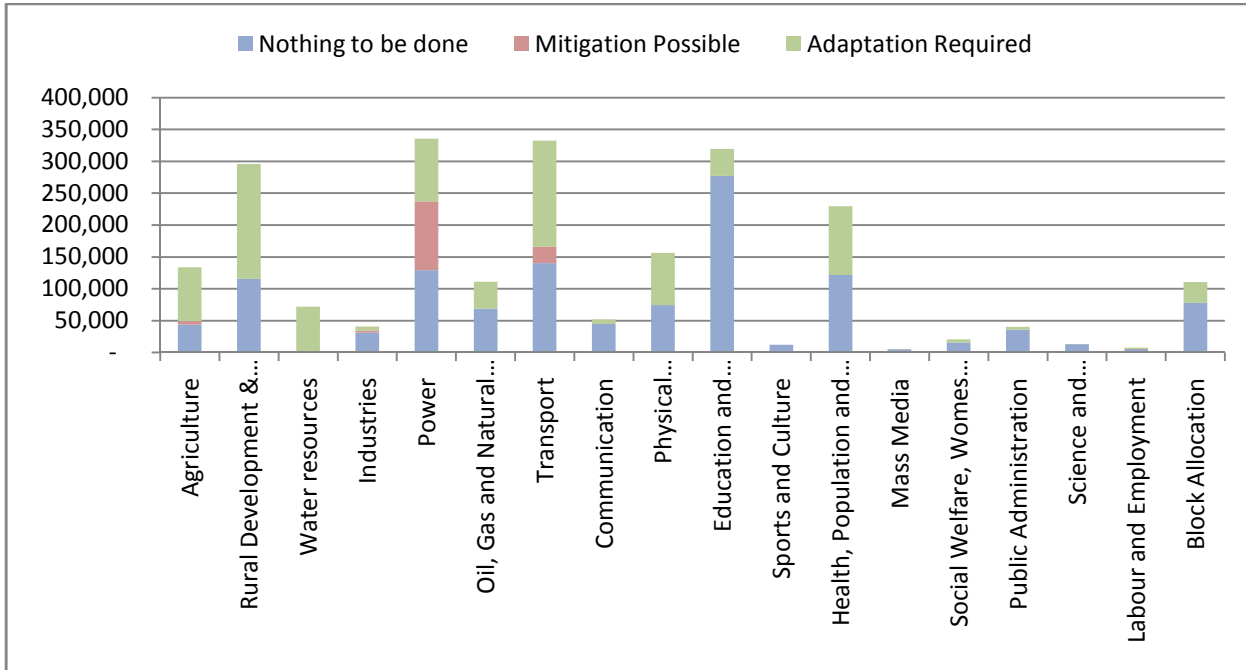


Cost of Projects at Risk due to Climate Change

In terms of the total investment funds which are at risk, Figure 2 shows the total cost of ADP projects which are subjected to mitigation and adaptation measures. For example, in the agricultural sector, out of allocation of 200 million BDT projects with a total of less than 50 million BDT can be retained 'as is' while the rest needs to be modified. On the other hand, out of 700 million (BDT approx) project costs nearly all projects need to be modified to accommodate adaptation and mitigation options otherwise these projects that are designed to generate employment in rural areas will not be able to generate the number of

employment. The changes are due to predicted climate change and their impact on the rural economy and production.

Figure 2: Cost of Projects Need to be modified



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Figure 3: Percent of ADP expenses under risk without modification

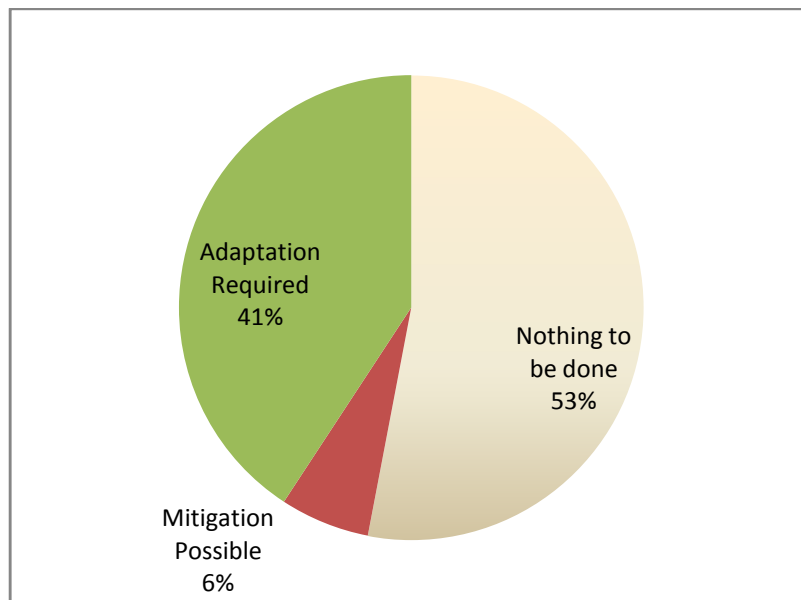


Figure 3 shows that nearly 59% of all ADP expenses are at risk if government of Bangladesh does not modify the project design with adaptation measures. It also shows that nearly 7% of the ADP expenses needs to be adjusted in order to accommodate measures to reduce emission and this too require additional fund.

Overall, effectiveness of development projects goes down to between 34-41% without adequate changes in the project design.

Conclusion

In a typical year, Bangladesh spends nearly 4.7 billion dollars in development projects in its 18 sectors (including block allocation for local governments). Of them, about 2.7 billion dollars of investment is now at risk due to climate change. While a detailed estimate on the cost of adaptation and mitigation has not been studied in this paper, a rough estimate suggests that additional 10-30% fund might be needed to retain the current level of benefits of the projects. This exercise shows that not only our investment in all the sectors are at risk, proper evaluation of climate impacts on projects will also affect the choice of projects as it would change the benefit-cost ratio of projects. As a consequence, investments made in various sectors of Bangladesh economy under ADP are in big disarray.

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Appendix Tables

Appendix Table 1: ADP projects need to be modified due to climate change

Sector	2008-09				2004-05				Both Years			
	No	Percent			No	Percent			No	Percent		
		NTD	MP	AR		NTD	MP	AR		NTD	MP	AR
Agriculture	174	35.06	6.32	58.62	127	45.7	6.3	48.0	151	40.4	6.3	53.3
Rural Development & Institutions	68	38.24	0.00	61.76	58	48.3	0.0	51.7	63	43.3	0.0	56.7
Water resources	52	9.62	0.00	90.38	56	5.4	0.0	94.6	54	7.5	0.0	92.5
Industries	34	79.41	8.82	11.76	25	72.0	4.0	24.0	30	75.7	6.4	17.9
Power	47	40.43	34.04	25.53	66	66.7	1.5	31.8	57	53.5	17.8	28.7
Oil, Gas and Natural Resources	27	70.37	0.00	29.63	20	100.0	0.0	0.0	24	85.2	0.0	14.8
Transport	167	42.77	7.83	49.40	169	65.1	0.0	34.9	168	53.9	3.9	42.2
Communication	18	72.22	0.00	27.78	25	76.0	0.0	24.0	22	74.1	0.0	25.9
Physical Planning, Water Supply and Housing	112	53.57	0.00	46.43	103	60.2	0.0	39.8	108	56.9	0.0	43.1
Education and Religious Affairs	78	82.05	0.00	17.95	61	78.7	1.6	19.7	70	80.4	0.8	18.8
Sports and Culture	15	100.00	0.00	0.00	33	100.0	0.0	0.0	24	100.0	0.0	0.0
Health, Population and Family Welfare	67	89.55	0.00	10.45	33	75.8	0.0	24.2	50	82.7	0.0	17.3
Mass Media	8	100.00	0.00	0.00	5	80.0	0.0	20.0	7	90.0	0.0	10.0
Social Welfare, Womes Affairs & Youth Dev	36	63.89	0.00	36.11	43	95.3	0.0	4.7	40	79.6	0.0	20.4
Public Administration	49	93.88	0.00	6.12	31	90.3	0.0	9.7	40	92.1	0.0	7.9
Science and Technology Research	26	100.00	0.00	0.00	26	96.2	0.0	3.8	26	98.1	0.0	1.9
Labour and Employment	8	75.00	0.00	25.00	9	55.6	11.1	33.3	9	65.3	5.6	29.2
Block Allocation	11	72.73	0.00	27.27	14	71.4	0.0	28.6	13	72.1	0.0	27.9
Total	997	55.92	4.32	39.76	904	64.3	1.3	34.4	951	60.1	2.8	37.1

NOTE: NTD – nothing to be done, MN – mitigation possible, AR – adaptation required. Source: (IMED, selected years)

Appendix Table 2: Cost of ADP at risk due to Climate Change

	2008-09			2004-05			Average of both years		
	Nothing to be done	Mitigation Possible	Adaptation Required	Nothing to be done	Mitigation Possible	Adaptation Required	Nothing to be done	Mitigation Possible	Adaptation Required
Agriculture	55266	9317	105721	31791	2458	62547	43,529	5,888	84,134
Rural Development & Institutions	109468		239951	121853		120437	115,661		180,194
Water resources	1006		70475	842		71276	924		70,876
Industries	30741	5800	7365	31760	403	4996	31,251	3,102	6,181
Power	80702	163335	103694	177754	52399	93819	129,228	107,867	98,757
Oil, Gas and Natural Resources	36893		42204	100766			68,830		42,204
Transport	109026	25636	191305	171850.7		141646.3	140,438	25,636	166,476
Communication	25784		4898	63710.1		9346	44,747		7,122
Physical Planning, Water Supply and Housing	102544		117605	46459		45472	74,502		81,539
Education and Religious Affairs	293207		42378	261187	120	42680	277,197	120	42,529
Sports and Culture	12990			11369			12,180		
Health, Population and Family Welfare	224370		31785	19208		183920	121,789		107,853
Mass Media	6228			4081		485	5,155		485
Social Welfare, Women's Affairs & Youth Dev	9499		9690	21520		448	15,510		5,069

Public Administration	62737		7496	8446		1395	35,592		4,446
Science and Technology Research	14885			10952		312	12,919		312
Labour and Employment	7299		1833	3796	144	1800	5,548	144	1,817
Block Allocation	65394		27000	90000		38700	77,697		32,850
Total	1248039	204088	1003400	1177344.8	55524	819279.3	1,212,692	142,756	932,840
Additional Costs 10%		20408.8	100340		5,552	81,928		14,276	93,284
Additional Costs 30%		61226.4	301020		16,657	245,784		42,827	279,852

Diagram 1: Percent of ADP Projects Affected by Climate Change

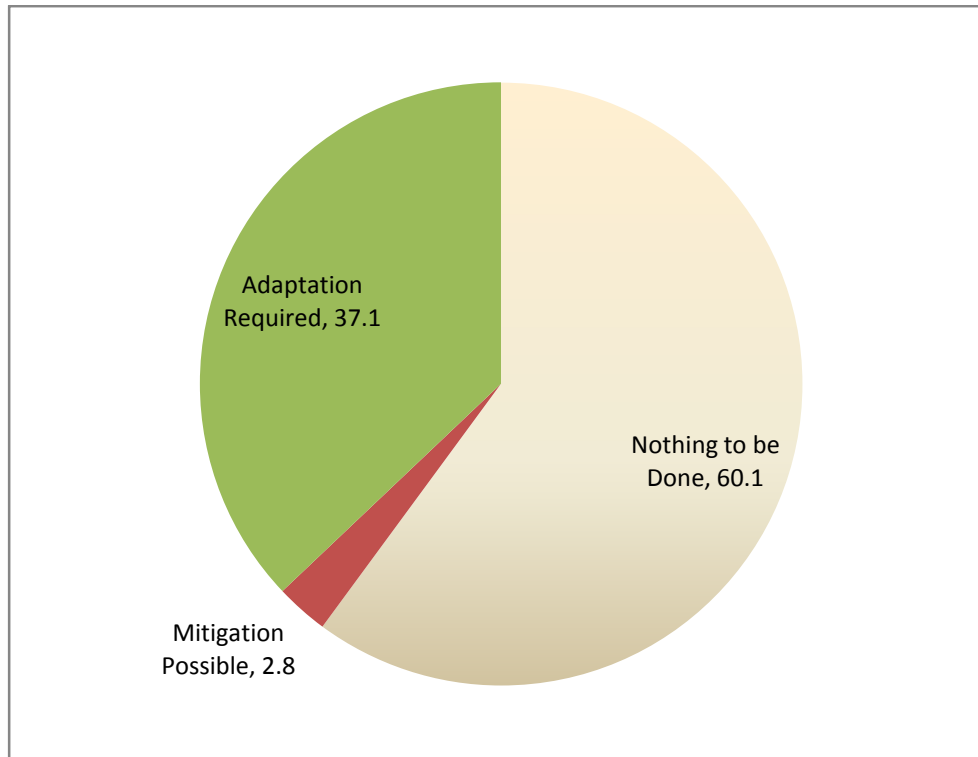


Diagram 2: Percent of ADP Expenditure at Risk due to Climate Change

