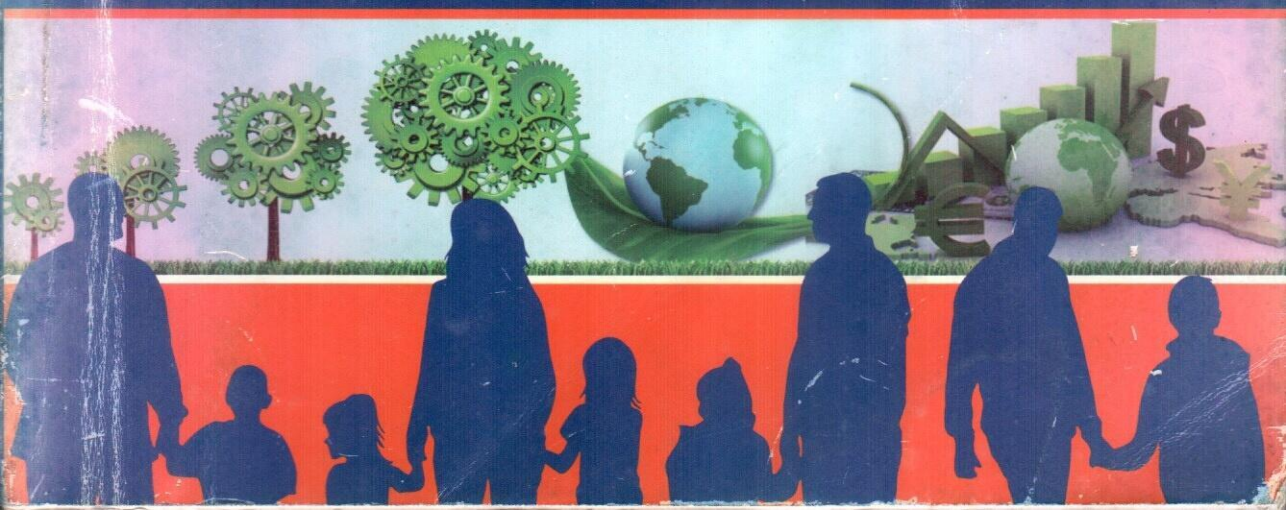
MOHAMMED A. MABUD

BANGLADESH: Population Environment and Economy



Bangladesh's Population Environment & Economy

Edited by

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ACRONYMS

ADB	Asian Development Bank
ADP	Annual Development Program
BDHS	Bangladesh Demographic Health Survey
BADC	Bangladesh Agricultural Development Corporation
BBS	Bangladesh Bureau of Statistics
BUET	Bangladesh University of Engineering & Technology
BWDB	Bangladesh Water Development Board
CAI	Clear Air Initiative
CBR	Crude Birth Rate
CDR	Crude Death Rate
CER	Certified Emission Reduction
CHT	Chittagong Hill Tracks
CPR	Contraceptive Prevalence Rate
CPS	Contraceptive Prevalence Survey
DND	Dhaka- Naryangonj- Demra
DOE	Department of Environment
EU	European Union
FAP	Flood Action Plan
FDI	Foreign Direct Investment
FWA	Family Welfare Assistant
GCF	Green Climate Fund
GDP	Gross Domestic Product
GOB	Government of Bangladesh
GBM	Ganga-Barahmaputra-Megna
HRM	Human Resource Management
HRD	Human Resource Development
IMF	International Monetary Fund
IMR	Infant Mortality Rate
IPCC	Intergovernmental Panel on Climate Change
LDC	Less Developed Countries
MOHFW	Ministry of Health and Family Welfare
MDG	Millennium Development Goal
MMR	Maternal Mortality Rate / Ratio
MNC	Multinational Corporations
MT	Metric Ton
NAPA	National Adaptation Program of Action

NAP	National Action Plan
NPR	Net Reproduction Rate
NSU	North South University
NWP	National Water Plan
NWMP	National Water Management Policy
NWRD	National Water Resource Database
OPPA	Organization for population and Poverty Alleviation
SAARC	South Asian Association for Regional Cooperation
SAIAS	South Asian Institute for Advanced Studies
SAP	Structural Adjustment Program
SB	Social Business
SCCP	Social Climate Change Fund
TFR	Total Fertility Rate
TND	Transnational Organization for Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
WARPO	Water Resource Planning Organization
WB	World Bank

EDITOR'S NOTE

This book is divided into three sections, namely, population, environment and economy and consists of 15 articles on diverse topics of current interest, great academic value and future direction. The contributors are doyens in their respective field. They have significantly contributed to our knowledge and understanding of their subjects of study.

In the section on population, there are four articles on population, of which three are contributed by **Mohammed A. Mabud** on three different, but inter- related topics. The first one is "Bangladesh Population in Regional Context" in which he has presented a demographic scenario of Bangladesh and other SAARC countries based on some important parameters, such as population size, density, sex ratio, life expectancy at birth, TFR, IMR, MMR, age structure and some social characteristics like religion and literacy rate. In this article, readers can see overall population trend in Bangladesh vis-a-vis countries of the South Asian Region in comparative framework. The next article is on "How to Manage Bangladesh's Huge Population?" in which author has shown the projected population up to 2051 and 2101 and the trend in population growth momentum having significant demographic and non-demographic implications. He has also indicated the probable timing for population stabilization and stationary population or zero population growth in Bangladesh. He foresees a great social and economic problems in the days ahead owing to rapid rise in population and indicates some pragmatic policy measures to obviate the difficulties which Bangladesh is most likely to confront in the days ahead. In the list of policy measures, enhancing people's mobility through their capacity development figures prominently. His third article is on 'Transforming Bangladesh's Population into Human Resources" in which he has emphatically suggested that government should establish a **National Human Resources Commission** to give an undivided attention to HR-issues. The tasks of this Commission are (i) to set up training centers of different skill-mix at 64 districts of Bangladesh and make such training accessible to school-drop- outs and also, those young men and women below the age of 30 years, (ii) co-ordinate with HR-production institutions like Universities, Polytechnics etc. (iii) set yearly production targets on different skill-mix, oversee the manpower production institutions as far as skill training is concerned, set common standard of similar skill training among the wide array of institutions and ensure quality, and (iv) explore overseas markets for deployments of the trained products of all HR- institutions. His HR-Health-Population interaction model is a critical input for the policy

planners on health and other organizations which generally require incremental workforce. **Obaidur Rob**, in his article on "Policy Issues in Bangladesh Population Planning Programs" has mentioned some population and development challenges, such as, (i) increase in size of reproductive women (15-49 yrs), (ii) large size of young population (iii) rapid increase in urban population (iv) increase in ageing population and access to services in low performing and hard-to-reach areas (v) increasing access to maternal health care and reducing adolescent fertility, (vi) reducing unwanted and unintended pregnancies etc. Rob calls for very careful policy planning and programmatic actions to minimize the adverse effect of above problems and thereby improving the present population program in Bangladesh.

The section on environment consists of six articles from water experts, climatologists and public health specialists .The article by **Umme Kulsum Novera** gives a clear scenario of water sources in Bangladesh which includes mighty river system consisting of Ganges, Brahmaputra and Megna and their tributaries as well as other rivers in the southern region like the Karnafully, Sangu,Mathamuhuri in Chittagong and the Nuf river near Tecnaf and the Feni river. She also mentions vast array of surface water in ponds, tanks, haors and jheels all over Bangladesh. This surface water is essential for the survival of living creatures including aquatic flora and fona as well as navigation, irrigation and fisheries. Most of the rivers are originated from India and Nepal and then, pass through Bangladesh to fall into Bay of Bengal. The article shows how Bangladesh, once known for water abundance has now turned into a water scarce-country. The other closely related article by **Md. Sirajul Islam** on population, water and flood policy reveals that water in Bangladesh and elsewhere in the world is going to be scarce resource and that it will be difficult to cope with the demand of the growing population. He emphasizes that some thorny issues like trans-boundary water sharing and climate change should be addressed by the Governments concerned. In his views, regional co-operation is urgently needed to address water problems. **Nazmul A. khan and Nepal C. Dey** in their paper on" Environmental Assessment of Drought in Northwest region of Bangladesh" reveal that the 1994 –drought brought terrible economic hardship, health hazards and water scarcity for the people of affected areas. **Shafi M. Tarek** in his paper on "Environmental Pollution in Bangladesh" provides an excellent overview of major types of environmental pollution in Bangladesh. In his views, environmental pollutions are found all over---water, air, soil surface and ground water and causing considerable health hazards. He has suggested some measures that require concerted efforts to solve the pollution related problems. **Khondker Galib B. Mohiuddin** and **Md. Khasro Meah** in their article

on" Climate Change in Bangladesh: Is Social Marketing Relevant?" claim that climate change in Bangladesh is occurring rapidly due to human actions, rural-urban migration and international inactions. In their views, social marketing of climate change-related education is needed most for creation of awareness, preparedness, and action programs in Bangladesh. The last article in this section by **Minhaz Farid Ahmed and Hassan Mahmud** on 'Public Health Effect of Fragrance and Perfumed Cosmetics" is illuminating having significant educational value. Cosmetic commonly used for ardor and fragrance is found to be harmful as these contain chemicals that result in various types of skin diseases. The people use cosmetics without knowing the adverse effect. This article is evidenced-based and informative. The authors call for awareness creation on massive scale regarding adverse effect of ardor and fragrance.

The third section on 'Economy" consists of five articles including the one from our **Noble Laureate Professor Muhammad Yunus on Social Business which is now a most widely accepted concept for social** change, a strategy for poverty eradication, and a tool for bringing new social order and economic justice in this world that is fraught with an outmoded complex system in which the poor are in the poverty trap for no fault of their own. Based on his Grameen Bank experience, he advocated social business with investment for profit for others, but not for self. An Investor may withdraw his investment if he so desires, but not his profit. Professor Yunus' social business concept is not merely a theoretical construct, but a practical reality. He demonstrated social business in co-operation with **DANONE** to produce yogurt, **Veolia** to produce water and **Adidas** to produce shoes for the poor at a cheap price. In fact, social business concept is currently gaining ground all over the world at remarkable speed.

The next article by professor **Ataur Rahman** on ' Income inequality and female labour force participation: Evidence from Bangladesh' argues that female labour force participation is some what 'Fancy' or somewhat reserve labour and that it comes out when situation is pressing.

Rifat Akhter in her article on 'Globalization, Women's Employment and Empowerment' shows how world economy has marginalized women's position and sustained unequal power relations between men and women. Her findings indicate that women are heavily feminized and that their inclusion in the labour market which has been created under neo-liberal economy has taken away their options to choose their own occupations. Women are heavily. Their inclusion in labour force should not be perceived as women's empowerment, if they do not have better working environment, if they cannot bargain their wages, and if other options are

taken away from them. According to her, women's works are simply stimulating country's economic growth without empowering them. In fact, Rifat's views on women's empowerment challenges the contemporary notions on empowerment. **Gour Gobinda Goswami** and **Nazrin Khanom** in their article on "Does Higher Education Raise Inequality?"Using panel data of 155countries over a period of 1963-1999 and fixed effect estimation method, they came out with a conclusion that pre-primary and primary level education makes the income distribution less unequal but the higher spread of tertiary education makes income disparity. They also tested Kuznet's hypothesis regarding curvilinear relationship between development and inequality and found no evidence to support the hypothesis. Included in this section an article on "New Paradigm of Human Resource Management (HRM) Practices in South Asia" by **Md. Khasro Miah** and **Muhammed Siddique Hossain**. Authors have exhaustively reviewed the HRM practices in India, Pakistan, Sri Lanka, Bangladesh, Afghanistan, Nepal and Maldives vis-a-vis , HRM practices of countries of stronger economies like USA, China and Japan. According to them, in South Asian countries, state-managed HRM is common and people-managed HRM is rare. Besides, their current HRM practices are not free from foreign influences. In fact, people managed HRM will be evolved when state power will be delegated to the lower tiers of administration and the people will have the scope to participate in development activities.

In fact, a book like this is an important tool of the trade of the professionals, academicians and also, those who pursue advanced studies at the university. Wealth of information provided by the contributors is our great source of knowledge. Professor Muhammad Yunus' social business concept which has already received global acceptance by the men of affairs, government leaders and academic community is a rich contribution to this volume. The other articles are also adequately informative, analytical and of great educational value. I commend highly the efforts of the contributors and recommend the book for our graduate students of the Universities in Bangladesh and elsewhere.

Mohammed A Mabud

Editor

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PART I : POPULATION

1. Bangladesh's Population in Regional Context
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3. Transforming Population into Human Resources
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Chapter 1: Bangladesh's Population in Regional Context

Mohammed A. Mabud

***Abstract**: The purpose of this article is to bring into public focus the trend in Bangladesh's population growth both retrospectively and prospectively and its status vis-a-vis other countries in the SAARC region inrespect of some selective demographic and social indicators, such as, population size, age structure, rate of population growth, total fertility rate, infant and under five mortality rate, literacy rate , religion etc. Such a comparative study will give us a better view of Bangladesh's progress in respect of those indicators. Bangladesh has now estimated 158 million people with an annual growth rate of 1.35 percent. If Bangladesh succeeds to achieve NRR equal 1 by 2016 and sustains it over time, this population will continue to grow up to 172 million in 2021 and 220 million in 2051. Such a phenomenal growth in human number has obvious implications which need to be reckoned by policy planners and development partners of Bangladesh and calls for some necessary measures to manage its upcoming huge population.*

1.1 Context: Bangladesh has a large population relative to its land space-almost 158 million people (mabud-2009) presently squeezed in an area of 147570 sq km. Population is growing too large. About 2.2 million people are being added per year to the existing population aggravating further land-man ratio and strained labor market. Area now comprising Bangladesh had its first census in 1872 that reported population of 28 million. This population grew upto 28.93 million in 1901; and in the following hundred years, one hundred million more people were added to make the country's total of 130.2 million in 2001. In 2011, this population grew upto 150.1 million. Population growth rate was too low until 1961 and inter censal growth rate was then reported to be 2.23 percent. In 1974, Bangladesh had its first census which reported the inter censal growth rate of 2.5 percent, followed by gradual decline to the level of 1.54 percent between 1991-2001and 1.37 percent between 2001-2011. Data in table1 provide a scenario of population and inter censal growth rate from 1901-2011.

1.2 Population Growth:

Table 1: Trend in Population Increase and Inter Censal Growth Rate, 1901-2011.

Year	Population (In Million)	Inter Censal Growth Rate
1901	28.92	-
1911	31.55	0.87
1921	33.24	0.52
1931	35.60	0.68
1941	42.00	1.65
1951	54.16	0.50
1961	55.22	2.23
1974	76.40	2.80
1981	89.91	2.33
1991	111.45	2.15
2001	130.03	1.54
2011	150.00	1.34

Source: Population Census, 2001 (National Report); Census Report of 2011, Bangladesh Bureau of Statistics, Dhaka.

During the first half of this century, population shall keep on growing , but at a decreasing rate. Total fertility rate is expected to decline to a level of 2.1 any time between 2015-2021. Life expectancy at birth will gradually increase as a result of decline in infant and under 5- mortality rate. But due to large base of young age population below 15 years and large number of females 15-49 years, there shall be tremendous increase in population in the next several decades. In view of the demographic momentum and trend, it is important to ascertain how many people is Bangladesh likely to have by the middle and end of this century? And when is it going to have stable and stationary population, if it achieves two-child policy goal anytime between 2015 – 2021 and sustains it overtime? To answer these critical demographic questions, this investigator has made three population projections upto 2051 based on the assumptions of achieving NRR=1 by 2015, 2018 and 2021, holding mortality assumptions i.e. life expectancy at birth more or less equal for three projections. Three population scenarios generated from the projections are presented in Table-2.

Table 2: Projected Population up to 2051 based on the Assumptions of Achieving 2-child Family goal in 2015, 2018 or 2021.

Year	Base Year	Projected Population (in million)		
Projection Assumptions	2001	2011	2021	2051
Bang-1 (NRR=1 in 2021)	130.3	161.97	175.57	226.60
Bang-2 (NRR=1 in 2018)	130.3	160.76	173.63	222.25
Bang-3 (NRR=1 in 2015)	130.3	159.26	171.68	220.98

Three population projections based on the assumption of achieving 2-child family goal in 2015, 2018 or 2021 and mortality assumption of life expectancy at birth ($^{o}e_{o}$) from 65 years in 2001 and 68 years in 2011, followed by linear increase in $^{o}e_{o}$ upto 77 years in 2051, we have got three different population sizes in 2051 but with trivial differences . Utilizing the results of variant I (i.e. Bang I) that shows 226.61 million population as of 2051, we ran another projection up to 2101 assuming fertility assumption of 2-child family as constant and further linear increase in life expectancy at birth ($^{o}e_{o}$) upto 78 years by the end of this century. The results of this long term projection (2001-2101) by some selected parameters are shown in Table 3 below.

Table 3: Projected Population of Bangladesh and Changes in Selected Parameters, 2001-2101 Under Bangla Assumption of NRR=1 by 2021

Changes in Population Parameters	Year						
	2001	2011	2051	2061	2071	2081	2101
Population (in million)	130.3	152.76	226.61	236.36	241.04	240.91	238.05
% Population 0-4	13.05	10.86	6.9	6.50	6.42	6.19	6.01
Population growth rate (%)	1.7	1.47	0.57	0.31	0.10	-.07	-.09
% Population below 15 years	39.35	31.56	20.82	18.61	18.14	18.14	18.08
% Working age population (15-64)	62.15	64.59	67.53	64.41	62.96	62.61	62.61
% Old age population (65+)	3.86	4.0	11.64	15.98	17.89	18.46	19.28

1.3 Population Density

One of the obvious implications of population growth is the increase in population density since 1901. Population density in the area now comprising Bangladesh was 196 persons per sq. kilometer in 1901 which was almost the same as what was estimated for the district of Khagrasari in Chittagong Hill Tracts Region in 2011. Population density steadily increased up to 881 per sq. kilometer in 2001 and 1050 in 2011. Data in table 4 provide population density scenario since 1901.

Table 4: Density of Population per sq. kilometer. in Bangladesh 1901-2011.

Census Year	Density
1901	196
1911	214
1921	225
1931	241
1941	285
1951	299
1961	374
1974	518
1981	609
1991	755
2001	881
2011	1050

Source: Bangladesh Population Census, 2001; National Report, page 26, BBS, 2003 and 2011 Census Population.

With the increase in population even at a decreasing rate, it will keep on growing as large as 242 million people anytime between 2075-2080 under the assumption of achieving NRR=1 by 2021. This means that there shall be an increase of more than 100 million people within three quarters of this century. This will have obvious adverse implications for population density per square kilometer. Data in table 5 reveal the most likely scenario in population density in Bangladesh from 2001-2101.

Table 5: Projected Increase in Population Density per sq. kilometer, 2001-2101.

Census Year	Population (Million)	Density
2001	130.03	881
2011	152.76	1035
2021	173.21	1187
2031	195.62	1325
2041	212.6	1440
2051	226.6	1536
2061	236.31	1602
2071	241.04	1634
2081	241.24	1636
2091	239.87	1626
2101	238.05	1613

Population density shall reach its climax, according to our projection anytime between 2075-2081. In 2081, maximum population density shall be 1636 persons per sq. kilometer, followed by gradual decline in population density owing to decline in population size as a result of zero population growth rate in Late sixties of this century.Around mid-seventies, Bangladesh will experience minus growth rate and thereafter, population density will start falling gradually to a level of 1613 persons per square kilometer in 2101; whereas comparable figures were 1050 in 2011 and 1536 in 2051. Man-land ratio will decrease to the level of 1:8 decimals in 2051 and 1:5 decimals in 2101 as against 1:15 decimals at present.

1.4 Most Densely Populated Districts:

Out of 64 districts in Bangladesh, populations in ten districts were found to be most densely populated (BBS, 2001). These districts are ranked according to population density per square Kilometer and shown in table 6. As population shall grow, the ten districts will have larger and larger population with obvious implications for land, water, education, health, environment etc. Readers may imagine Dhaka City when it's population shall be double in next 14 years, Chittagong in 18 years and Khulna in 21 years. These are alarming demographic facts that give grim scenario of the future. Unless measures are taken to attract rural migrants to other urban areas and enhance people's mobility through capacity development, and thus, enabling them to move out of the country employment, business etc. future urban-Bangladesh shall be chaotic and not livable. (for details, see chapter 2 of this books).

Table 6: Ten Most Densely Populated Districts of Bangladesh, 2001.

No.	Districts	Population Density Per Sq. Kilometer
1	Dhaka	5887
2	Narayangonj	3097
3	Narsindi	1667
4	Comilla	1488
5	Munshigonj	1350
6	Chandpur	1315
7	Feni	1300
8	Chittagong	1239
9	Bharamanbaria	1234
10	Gazipur	1124

Source: Bangladesh Population Census, 2001; National Report, Page 26, BBS, 2003.

Bangladesh in Regional Context

An analysis of Bangladesh's status by selected demographic and socioeconomic indicators appear to be in order as it will provide some insights and an outlook in comparative framework among the countries of the south Asian region which consists of seven nations, namely, Afghanistan, Bhutan, Bangladesh, India, Nepal, Pakistan and Sri Lanka. Each country is unique in its culture, history, socio-economic and demographic characteristics. It has land locked countries like Afghanistan and Nepal; large countries like India with its 1.21 billion people and also, small country like Bhutan with 0.72 million people as well as island country like Sri Lanka with 20.26 million people. Bangladesh and Pakistan respectively located on the east and west of India are also unique in their demographic and socio-economic characteristics. The discussion that follows will show Bangladesh's position vis-à-vis other countries of the region by some selected characteristics as mentioned in the Table 7 below:

1.5 Comparative Scenario of South Asian Countries by Some Selected Demographic and Socio-economic Indicators

Table 7: Comparative Scenario of South Asian Countries by Some Selected Demographic and Socio-economic Indicators, 2012.

Sl no.	Countries Demographic and social indicators	Afghanistan	Bhutan	Bangladesh	India	Nepal	Pakistan	Sri Lanka
1	Population (in millions)	31.10	.742	152.4	1210.1	29.89	187.3	20.2
2	Area (in Sq. Km)	6,47,500	38,394	1,47,560	32,87,590		8039,400	62,7
3	Population Density	48	19.3	1051	368		233	323

	per sq km							
4	Growth rate(%)	2.22	1.15	1.4	1.3	1.59	1.6	.91
5	CBR/1000popn	39.3	20	21.0	20.22	22.17	31.0	17.04
6	CDR/1000Popn	14.59	8.5	7.0	7.4	6.81	8.0	5.96
7	Total Fertility Rate(TFR)	5.64	2.13	2.35	2.35	2.5	2.6	3.58
8	Life Expectancy at birth(in yrs)	64	67.1	68	68.69	66.5	65	75.94
9	Sex ratio at birth	1.05	1.05	1.04	1.04	1.05	1.05	1.04
10	Infant mortality rate(IMR)	121.63	42.17	49.0	46	44.4	61.27	9.4
11	Maternal mortality rate (MMR)	4.6	1.8	1.9	2.0	1.7	2.6	.35
12	Age structure 0-14 15-64 65+	 42.3 55.3 2.4	 28.4 65.8 5.8	 34.6 61.4 4.0	 31.1 63.6 5.3	 34.6 61.6 4.4	 36.7 59.1 4.2	 24.9 67.0 8.1
13	Percentage urban(%)	24	38.0	27	27.8	40.3	36.0	14.1
14	Urban Growth Rate(%)	5.4	3.7	3.5	3.2	4.7	3.5	1.1
15	Main religion(%)	99.0 Muslim	70.0 Buddhist	90 Muslims	80.56 Hindus	80.2 Hindus	95.0 Muslims	75 Buddhist
16	Literacy rate --Male(%) --Female(%)	31.0	47	58.2	78.6	79	2	90.2 91.6 90.0
17	%under poverty line	534	-	33.0	-	-	-	-
18	Per capita GNP in$	-	1321	850	-	-	-	-

Source: Wikipedia Demographics, 2012.

a. Population: Most distinguishing feature among south Asian countries is the size of their respective population. Here located world's second largest country, India with 1.21 billion people, sixth largest country Pakistan with 187.3 million people and eighth largest country Bangladesh with 152.2 million people as of 2012. The population of these three countries taken together exceed the world's largest country China, which has uptil now estimated 1.4 billion people. The other countries of south Asia are Afghanistan, Nepal, Sri Lanka, and Bhutan which have respectively 31.3, 29.89, 20.26, and .742 million people. All the seven countries taken together have estimated 1.634 billion people as of 2012 and constitute an association called SAARC for regional development and connectivity.

b. Population density: These countries have striking differences not only in population size but also in their respective areas and population density. The table

below provides the scenario of Population density per square kilometer vis-à-vis Bangladesh.

Table 8: Population Density of Countries of South Asia Region, 2012

Countries	Area (sq.km.)	Population Density per sq.km.
Afghanistan	6,47,500	48
Bhutan	38,394	19.3
Bangladesh	1,47,560	1051
India	32,87,590	368
Nepal	-	--
Pakistan	-	--
Sri Lanka	62,724	323

Source: Wikipedia, Demographics, 2012.

In respect to population density, Bangladesh is a worst case scenario with 1052 persons per sq km. Most thinly populated are Afghanistan and Bhutan with 48 and 19.3 persons per sq.km respectively. India and Pakistan are much better off than Bangladesh as they can still absorb the increasing population. Some obvious implications of high population density are increase of price of land and commodities and depletion of arable land which may affect agricultural growth and flux of rural people to urban area.

a. Growth rate: Review of the data on population growth rate of the SAARC countries reveals that there has been tremendous progress in the rate of reduction of growth rate in last decade owing to efforts and investment in health sector of the countries together with socio- economic development. Three decades ago, almost all countries except Bhutan and Sri Lanka had population growth rate within the range of 2.0 to 2.8 percent per annum. Now except Afghanistan (2.2%),all countries growth rates are well below 1.6% per annum with Sri Lanka (0.9%) and Bhutan (1.1%) being the lowest of all. Population growth rate in Bangladesh, India, Nepal and Pakistan are respectively 1.34, 1.37, 1.59 and 1.6%. If current investment trend and efforts in fertility and mortality reduction continue, there shall be further reduction in population growth rate in the next decade to a level of 1 or 1.2% in the countries of the region. The most crucial demographic factors that influence the population growth rate are crude birth rate and crude death rate. The table 7 shows that CBR in Afghanistan is the highest among the countries of SAARC region (39.3per 1000 population). The comparable figures for Bhutan, India, Bangladesh and Nepal fall within the range of 20 to 22 per 1000 population; while Sri Lanka's CBR is 17.04per 1000 population, the lowest in the region as also the case of its mortality level (CDR

5.91 per 1000 population). CDR of Bhutan, India, Bangladesh and Nepal is also considerably low ranging from 6.81 to 8.5 per 1000 population. (see table 7)

b. Life Expectancy at Birth: it is measure of mortality and development. If we look back to 3 to 4 decades, all countries of SAARC region have progressed considerably in respect of their life expectancy at birth which was in the range of 45 to 55 years in those days. But now in all these countries life expectancies at birth are in the range of 64 to 75.94 years with Sri Lanka being the highest and Afghanistan being the lowest in the rank order. Bangladesh has improved quite a lot. Its life expectancy at birth rate was 48 years in 1950's which has increased up to 68 years at present. As infant and maternal mortality rates are declining, life expectancy will improve further. Life expectancy at birth in both Bangladesh and India are very close which are 68 and 68.89 years respectively.

c. Sex ratio at birth: sex ratio at birth is defined as number of males per 100 females. Sex ratio of the countries in the region is hovering around 1.04 and 1.05 except in India where it is estimated to be 1.08 (census 2011).

d. Total fertility rate: it is a refined measure of estimating birth rate per woman of reproductive age (15-49 years). The SAARC region as a whole made considerable headway in respect of this demographic indicator. Sri Lanka and Bhutan already reached two child family goal i.e. replacement fertility of 2.1 children per woman. Bangladesh, India and Nepal have long been aspiring after achieving this goal. They are now close to achieving it anytime between 2016-2020. Total fertility rates of these countries were estimated to be 2.35, 2.5 and 2.6 respectively as of 2011. Comparable figures of Afghanistan and Pakistan are respectively 5.64 and 3.58. If current trend continues, human fertility will be well under control. (see table 7).

e. Infant mortality rate: Countries of the SAARC region have history of high infant mortality rate partly due to inadequate investment in health and population sector, but trend has changed a lot due to increasing programmatic efforts in maternal health, child health and reproductive health activities . Mother and child care including child immunization programs have created tremendous awareness on child care which is why IMR has reduced almost 50% since 1999. However, still worst scenario prevails in Afghanistan with infant deaths of 121.63 per 1000 live births. Comparable figures of Bhutan, Bangladesh, India and Nepal are 42.17, 49.0 46, 44.5 respectively. In Pakistan IMR is still as high as 61.27. Most spectacular development is in Sri Lanka with IMR as low as 9.4 per 1000 live births (see Table 7).

f. Maternal Mortality Ratio (MMR): it is the number of mothers dying due to pregnancy related causes per 1000 live births. Our review of data concerning this demographic parameter shows that most of the countries in the region have

considerable progress in MMR. Worst case scenario of MMR is in Afghanistan where it is as high as 4.6 per 1000 live births; whereas the best case is in Srilanka with MMR as low as 0.35 per 1000 live births. Moderate progress has been observed in MMR with respect of five countries namely Bhutan, Bangladesh, India, Nepal and Pakistan with MMR of 1.8, 2.4 2.0, 1.7 and 2.6 respectively. If current efforts continue it is expected that there will be further reduction in MMR.

i. Age Structure: one of the striking features of population of the countries of the SAARC region is shifting in age structure as life expectancy at birth is gaining; this shift is in favor of elderly population of 65 years and above. Unlike the developed countries the shift is still modest. The population below 15 years of age represents 42.3% in Afghanistan-- the highest in the region implying that demographic transition is yet to begin; whereas comparable figures for Bhutan, Bangladesh, India, Nepal and Pakistan are 28.4, 34.6, 31.1, 34.6 and 36.7% respectively indicatcip almust 20 to 25% reduction since one decade ago. In Sri Lanka, population 0 to 14 years represents only 24.9% of the total. The population 15-64 years in Afghanistan and Pakistan represent 55.3 and 59.1% respectively; whereas comparable figures in Bhutan, Bangladesh, India and Nepal are 65.8%, 61.21%, 63.6% and 61.1% respectively implying that there are huge economically active people in these countries. In Sri Lanka, 67% people belong to the age group 15- 64. Only 2.4% people of Afghanistan are elderly. (see table 7).

j. Religion: One of the dominant features of culture is religion that shapes the behavior pattern of the people and guides them and sets their moral code of conduct. It is interesting to observe that each country is distinct from other from the point of view of their religious affiliations. The population of Afghanistan, Pakistan and Bangladesh are predominantly Muslims consisting of 99, 95 and 90 percent people respectively. Dominant religion of India and Nepal is Hinduism with 80% of their population; whereas, Bhutan and Sri Lanka have 70 and 75 percent of their population Buddhist. Though there are differences, there is appreciable harmony and coexistence among the people of these three religions. Except Afghanistan and Pakistan, other countries have sizable minority too. For example, India has 15 percent Muslim population; and Bangladesh has almost 8 percent Hindu population. In Sri Lanka, 10-12 percent are Tamils. The Christian population is too small to compare with the other religions. Overall scenario is that the region as a whole is an abode of the people of major religions of the world. (see table 7).

k. Literacy rate: In social development index, literacy rate is an important measurement of individual country's development. Higher the literacy rate, a country is most likely to achieve progress in other areas of development. Sri Lanka is the only country in the region that looks promising with 90.2 percent literacy rate. Difference in male-female literacy rate is very trivial which is

respectively 91.6 and 90.0. The lowest literacy rate has been observed in Afghanistan which is only 31.0 percent. Comparable figures in Bhutan, Bangladesh, India, Nepal and Pakistan are respectively 47.0, 58.2., 78.6, and 79.3 percent. The government of these countries have given due priority to education. It is expected that their literacy rate shall improve soon by religiously pursuing pro-people education policy. (see table 7).

1.5 Conclusion

South Asian countries are currently passing through great demographic and socio-economic transitrion. If their current efforts continue uninterruptedly, there shall be further decline in birth and death rate with obvious implications for growth rate and age-structure along with socio economic development, particularly in education, health, women's empowerment and employments. Again, if current trend continues, Bangladesh and India are likely to achieve two-child family goal within this decade; while Pakistan and Nepal are expected to achieve this goal in the next decade.

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Chapter 2: How To Manage Bangladesh's Huge Population?

Mohammed A. Mabud

Abstract: *Bangladesh's population both in regional and global context is too large to be accommodated in a land space of 57000 square miles that roughly represents three thousandth part of the world's land space. About 2.2 million people are being added per year to the existing population. This population, according to one projection (Mabud, 2009) shall grow upto 172 million in 2021 and 220 million in 2051, even if Bangladesh achieves NRR of 1 (at least TFR of 2.1) by 2016. If two child family goal, that is NRR =1 continues for a longer period, the maximum people, which Bangladesh is likely to have 242-246 million around 2060's and stationary population around 2070-72, followed by minus growth rate thereafter. At any rate population size relative to land space shall be staggering in the days to come. The purpose of this article is to highlight some policy strategies to manage Bangladesh's upcoming huge population. These Policy strategies are i) enhancing people's mobility, ii) balanced distribution of rural- urban population iii) urban center economic growth, iv) relocation of industries from cities to peripheral towns, v) meeting the unmet need; and vi) delaying age at marriage and age at first birth through community mobilization and multi -sector involvement. It is expected that if this policy strategies are pursued vigorously, number of people shall be less than what is projected and thus Bangladesh can somehow manage its population within its limited land space.*

2.1 Context: In global and regional context, Bangladesh population has drawn considerable attention of the social scientists, policy planners and international organizations. In global context, Bangladesh is now world's eighth populous country having 156.6 million people, but occupying only 3000th part of the world's land space. Such a huge concentration of population in small land space cannot but draw one's attention. About 2.2 million people per year are currently being added to its existing population; and such pace will continue in the next one decade and a half, even if Bangladesh achieves 2- child family goal (i.e. TFR of 2.1 or NRR=1) in any time between 2015-2018. In regional context, South Asian countries including Bangladesh comprise world's one-fourth population and contribute 24% to its annual increase of 80 million people. Therefore, focus on population increase lies in south Asia in which Bangladesh portion appears to be most volatile because of high population density, poor land-man ratio, moderate economic growth, massive unemployment, huge working age population relative to the size of job market etc. The population problem arises out of past population

growth which was regarded once as **Number one national problem,** but it has lost its focus now owing to other overriding problems, such as, corruption, deteriorating law and order and political instability. Meanwhile, it has taken a new dimension that has to be recognized; and necessary civilized measures need to be taken to offset the ill -effects of phenomenal growth in human number. In fact, keeping in view this demographic development, this paper has been written. The central purpose of this paper is to discuss Bangladesh population and its prospects of achieving 2-child family goal (NRR=1 or TFR of 2.1) by anytime before 2018 and suggest some policy strategies to sustain it so as to stabilize its population in the soonest possible time. Keeping this broad purpose in view, the paper is structured into four (4) sections. Section 1 deals with current population scenario –its age structure, trends and urban-rural distribution; section 2 deals with the demographic prospects, momentum and stabilization; while in section 3, we discuss various implications of upcoming huge population. In section 4, some policy strategies are suggested for maintaining its huge population.

2.2 Current population Scenario:

2.2.1 Age Distribution and Growth Trend:

As already stated, Bangladesh population is currently estimated to be 156.6 million. Such a huge population are squeezed in an area of 1, 47,000 s^2 km which gives the population density of 1075 persons per s^2 km. Population is characterized by a high proportion of young age population of below 15 years (38%) and reproductive women, 15-49 years (37% of all women). Both indicate the substantial growth potential of future population. Unlike developed countries, our population is slowly aging. Population of 60 years and above represents about 7.0 percent of the total. As life expectancy is gaining, the size of the elderly population will increase and thereby, increasing the dependency burden. In recent years, there has been tremendous improvement in some demographic parameters. For example, infant mortality rate (IMR) was reduced to 43/1000 live births in 2011 from 52/1000 live births in 2007. Under-5 mortality rate declined up to 53 from 65/1000 children under-5 during the same period. Total fertility rate (TFR) had declined to 2.3 in 2011 from 2.7 in 2007. Urban- rural difference in fertility is quite substantial. As expected, TFR for rural woman is 2.5 and that of urban woman is 2.2. TFR was plateaued i.e. 3.4-3.3 during 1991-2000, followed by sharp decline by 1.0 during 2000-2011. It varied widely by administrative Divisions. Khulna reached replacement level of fertility (1.9), followed by Rajshahi (2.1), Dhaka (2.2), Barisal (2.3), Chittagong (2.8) and Sylhet (3.1) (BDHS, 2011). In view of the current declining fertility trend, it is expected that Bangladesh is most likely to achieve its policy goal of replacement level fertility (TFR of 2.1) around 2016.

2.2.2 Contraceptive Prevalence Rate (CPR):

Closely related to the decline in TFR is the increase in CPR .In 1975, TFR was 6.3, and CPR was 7.7(BFS, 1975) Since then, CPR has steadily increased up to 56% in 2007 followed by further increase upto 61 percent 2011,(NDHS, 2011). The percentage of modern method users continues upward trend. Sylhet and Chittagong were found to be relatively low performing areas, having considerable scope for improvement.

2.2.3 Population Distribution:

The 2011 Population Census revealed rural-urban population distribution was 73:27. In recent years, rural-urban migration has increased steadily. Expert opinion is that current rural– urban population distribution is 70:30. Almost 85% of the rural migrants are absorbed in four main cities, namely, Dhaka, Chittagong, Khulna and Rajshahi and thus overcrowding these cities, threatening the ecology and complicating the task of managing the urban life. If the current rural-urban migration trend continues, it is expected that population distribution between rural and urban area shall be 50:50 by the middle of this century.

2.2.4 Plateauing of Population Growth Rate:

Bangladesh population growth rate passed through a period of stagnation during the period 1992-2000, owing to slow pace of decline in fertility and mortality. In my view, population growth rate was hovering around 1.7% to 1.6% during this period. The estimated crude birth rate was 26/1000 population (BDHS, 2007) and crude death rate (CDR) was 10/1000 population. The resultant growth rate was 1.6%. Since then, population growth rate has declined considerately. In 2011 census, population growth rate was estimated to be (1.37%). If this rate continues Bangladesh population will double itself in 52 years.

2.3 Demographic Prospects, momentum and Stabilization:

2.3.1 Prospects:

Death matters no less than birth – indeed more, to demographers. As public health measures are likely to further improve, deaths decline particularly among the infants and thus, more babies will live to grow up. So a country's population becomes more youthful as in the case now in Bangladesh. More young adults mean more births. Birth rate may decline further through family planning program efforts reinforced by non-family planning measures like female education, skill training, use of media etc. All these measures will eventually help create a conducive environment to reduce birth and death rates leading to population stabilization. But when? In seeking answer to this question, this analyst offers a range of projections, hereinafter, called variants. Variant 1 assumes replacement level fertility (i.e. just 2 children) in 2016. Variant 3 and variant 3 assume the same fertility level (i.e. NRR=1) in 2018 and 2021

respectively. Discussion that follows will mainly concentrate on variant -1 to illustrate the future population stabilization and a change in various demographic parameters in the next four decades.

A country's growth potential is built in the age structure of its population. Currently our age structure is heavily pyramidal with a large base of young age population. Notwithstanding an elaborate and modestly persuasive family planning program, fertility reduction to replacement level seemingly difficult, but achievable by 2016, if more vigorous efforts are made at the grass root level by the health and family planning workforce. Assuming that public and private sectors efforts in this respect shall continue and that public health measures will augment considerably to thwart the menace of deadly diseases, Bangladesh is quite likely to achieve its demographic goal of NRR=1 by 2016. If the current pace of progress continues, life expectancy at birth is likely to increase anywhere between 70-71 years by then. At present, life expectancy at birth is estimated to be 69 years.

2.3.2 Implications:

The variant 3 projection that assumes NRR=1 and life expectancy at birth of 70 years by 2016, shows that Bangladesh's population will increase up to 172.0 million in 2021 and 221 million in 2051 which means addition of 68 million more people to the present population in a span of 36 years. Population growth rate will be reduced from current level of 1.35 percent to 0.56 percent in 2051.The implications of this projection are that there shall be a considerable shift in the age-structure of population. For example, the size of the population below 15 years shall be 49 million in 2051 against 52.4 in 2011.

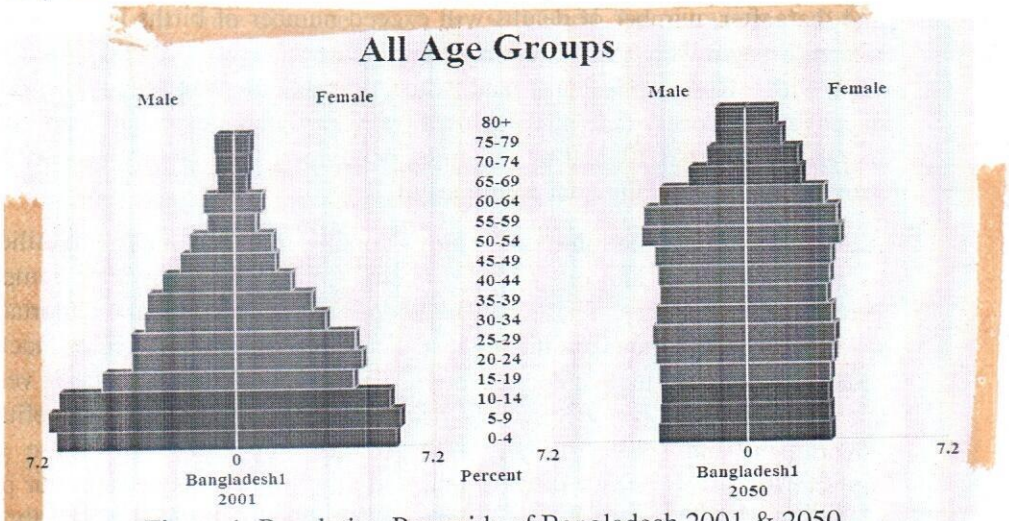

Figure 1: Population Pyramids of Bangladesh 2001 & 2050

The size of the school age population in absolute number shall decrease to 32.4 million against 34.2 in 2001; while the working age population (15-64) wil increase up to 155 million (as against 85 million now), aggravating further th strained labour market; and number of elderly population (i.e. 65 year+) shall b 29.8 million as against 6.0 million requiring old age supports and medical care The other obvious implications include: population density of 4157 persons pe square mile as against the present density of 2591 persons. The existing man-lan ratio of 1:14 decimals shall be reduced to a half. Because per capita availability o arable land will be reduced; and per person food production is likely to b reduced too. Too many people in too little space will create enormous demand for public services which any sitting Government may not afford and thereby, i may destabilize the Government. Thus, one may go on relating this growin population to other social and economic objects, but that will make one instantl feel bad about having too many people in too little space.

2.3.3 Population Momentum and Stabilization:

Population growth momentum has already started; and various pressures hav already been generated. The people have started feeling the pinch of it. So population will keep on growing even if Bangladesh achieves the replacemen level fertility. The timing of population stabilization depends on the time whe replacement level fertility will be achieved. In our present case, if Bangladesh ca achieve NRR=1 by 2016, population will stabilise by 2060 at around 23 millions, followed by a stationary population in next 10-12 years, (i.e. numbe of births will be equal to number of deaths and resultant growth rate is zero). Tha is, stationary population in Bangladesh is likely to be achieved around 2070-7 and thereafter, number of deaths will exceed number of births i.e. minus growt rate will begin which will eventually decelerate the country's population as is th case with Russia, Germany and some of the European countries now. Th deceleration process (i.e. minus-growth rate) in Bangladesh shall start accordin to variant-I after 2070, and by this time, population shall grow up to 240 millio provided 2-child family goal continues till then.

A great deal of population momentum is coming from low income families, suc as poor, ultra poor and other lower income groups who together comprise 5 percent of the society. These are the people among whom infant mortality an maternal mortality rates are the highest. Total fertility rate is twice as much of th upper, middle and high income groups. They are the ones who have very littl access to education beyond primary, health care services and other benefits whic government and society usually offer to the individuals. So if the goal o replacement level fertility is to be achieved any time in this decade, our policie programmes and resources should be directed towards the welfare of those wh

The size of the school age population in absolute number shall decrease to 32.4 million against 34.2 in 2001; while the working age population (15-64) will increase up to 155 million (as against 85 million now), aggravating further the strained labour market; and number of elderly population (i.e. 65 year+) shall be 29.8 million as against 6.0 million requiring old age supports and medical care. The other obvious implications include: population density of 4157 persons per square mile as against the present density of 2591 persons. The existing man-land ratio of 1:14 decimals shall be reduced to a half. Because per capita availability of arable land will be reduced; and per person food production is likely to be reduced too. Too many people in too little space will create enormous demands for public services which any sitting Government may not afford and thereby, it may destabilize the Government. Thus, one may go on relating this growing population to other social and economic objects, but that will make one instantly feel bad about having too many people in too little space.

2.3.3 Population Momentum and Stabilization:

Population growth momentum has already started; and various pressures have already been generated. The people have started feeling the pinch of it. So, population will keep on growing even if Bangladesh achieves the replacement level fertility. The timing of population stabilization depends on the time when replacement level fertility will be achieved. In our present case, if Bangladesh can achieve NRR=1 by 2016, population will stabilise by 2060 at around 230 millions, followed by a stationary population in next 10-12 years, (i.e. number of births will be equal to number of deaths and resultant growth rate is zero). That is, stationary population in Bangladesh is likely to be achieved around 2070-72 and thereafter, number of deaths will exceed number of births i.e. minus growth rate will begin which will eventually decelerate the country's population as is the case with Russia, Germany and some of the European countries now. The deceleration process (i.e. minus-growth rate) in Bangladesh shall start according to variant-I after 2070, and by this time, population shall grow up to 240 million, provided 2-child family goal continues till then.

A great deal of population momentum is coming from low income families, such as poor, ultra poor and other lower income groups who together comprise 50 percent of the society. These are the people among whom infant mortality and maternal mortality rates are the highest. Total fertility rate is twice as much of the upper, middle and high income groups. They are the ones who have very little access to education beyond primary, health care services and other benefits which government and society usually offer to the individuals. So if the goal of replacement level fertility is to be achieved any time in this decade, our policies, programmes and resources should be directed towards the welfare of those who

are currently in disadvantageous position and whose fertility transition is relatively slow.

There are, however, some grounds for optimism. A large number of women want children fewer than ever and the younger the women, the fewer they want. The recent surveys (BDHS 2011) of married women reveal that there is a considerable unmet demand (13%). Meeting this demand is not restricted to modern methods of contraception; even traditional methods help plan family size as in some countries. But for this to happen, education, use of media, arousing people's consciousness and democratising social and political institutions at all levels of society to allow the hitherto neglected people to participate and involve themselves in all kinds of state sponsored development works are essential. If we can create an enabling environment through such processes and other civilized means, demographic momentum effect can be significantly reduced and the timing for population stabilisation may be advanced even before 2060's.

2.4 Policy Strategies to Manage Huge Population

Bangladesh has now come to a stage of achieving two-child family goal (NNR-1) anytime around 2016 and thereafter, it is on road to achieve its policy vision of population stabilization. One may note that declining fertility and mortality will not stop population from growing, even if Bangladesh achieves 2-child family goal around 2016. If Bangladesh sustains this two-child family goal (i.e. NNR=1) for a longer time, there shall be considerable changes in the age-composition of the people which is, in fact, a long drawn process. Hence, population stabilization shall occur 3-4 decades after achieving NRR of 1.

However, this time-distance may be shortened by pursuing certain policy strategies. This calls for managing upcoming huge population rather than mere controlling population. The policy

choices outlined below will have beneficial impact not only upon population growth, but also on demo-economic development. The policy choices are:

(i) Enhancing people's mobility;
(ii) Balance distribution of rural-urban migration;
(iii) Relocation of Industries for the cities;
(iv) Multi-sectoral involvement;
(v) Meeting unmet needs; and
(vi) Delaying age at marriage and age at first birth.

2.4.1 Enhancing People's Mobility

Enhancing people's mobility beyond the national boundary through their **capacity development** could be a worthwhile strategic option for population

management and demo-economic development. Bangladesh has not yet fully explored this possibility. For sheer necessity and craving for better living, about 5-6 million people of different skill-mix are currently working overseas, and remitting substantial part of their income to their families and thus, augmenting the country's foreign exchange reserve. But Bangladesh's contribution of workforce is still disproportionate to its population size and demand of the international market. In order to avail the opportunities which now exit, Bangladesh should have a planned action for increasing its production capacity in internationally marketable skill-mix, such as doctors, nurses, dental surgeons, various health technologies, engineers, architects as well as technicians of different varieties. Fortunately, it has now considerable educational and training institutions; and many of the institutions, particularly those in the private sector needs significant improvement in terms of faculty development, physical space, equipment etc. Government should encourage the Banking Sector to come forward to invest significantly in human resources production sector at a nominal rate of interest. In fact, this strategic approach calls for serious rethinking of the Government, Management of all HRD institutions and the Bankers' community.

At present, sector ministries like Health and Education are producing different kind of workforce primarily to meet their respective requirements regardless of population consideration. HRD production of health sector, for instance, which totally interacts with population, is not in accord with population growth. Its production of doctors, nurses and different technologists are far below the international threshold level. One exercise carried out by this analyst (Mabud, 2006 and 2012) reveals that if the current rate of production of 3000 doctors per annum continues, Bangladesh shall have to wait another 30 years to reach a threshold level of 1:2000 people from the current level of 1:3700. A somewhat dismal scenario prevails in our production of engineers, architects and different technicians. In order to meet the domestic requirements generated by growing population and also, the international market demand, we need to produce more. For this purpose our admission policies need upward revision. All HRD institutions need to be strengthened; and private-public-development partners' collaboration for enhanced investment need to be ensured. For this, a high priority should be given to human resources development (HRD). At present, Health sector's annual production of doctors is about 3200 compared to 6000 in Pakistan. India produces more skilled persons than its domestic requirements and affords to supply to meet the international market demand. Thus, they enhance their people's mobility through capacity building. This is what Bangladesh should do now.

Of the factors of population growth - birth, death and migration, Bangladesh has quite a number of programs to reduce birth and death rates, but nothing to influence migration, i.e. third factor of population growth. Enhancing people's

mobility through their capacity development could be a potential factor for population mobility within and beyond the national boundary. If the people can go abroad for employment, international trade and education and stay there for several years, many of them will tend to stay there eventually. If not all, at least, some of them and their children may not return to their place of origin. Thus, in one generation or a little later, "enhancing mobility through capacity development" will have beneficial impact on the size of country's population. If this policy is pursued by the Government of Bangladesh, my projected population size of 220 million in Bangladesh in 2051 can be reduced to 200 million, and projected stable population size of 240 "million to 210 million around 2070. In order to achieve Bangladesh demographic goal and manage its upcoming huge population, it should urgently prepare a National Master Plan for capacity development" for the next 15 years. Since Sector Ministries operate from their narrow perspective, and hardly realize the national perspective, Bangladesh Planning Commission may be entrusted to prepare National Plan for human resources development. Preparation of five year plan, annual plan, Poverty Reduction Strategy plan, Perspective Plans etc are included in its terms of reference. Preparing Master Plan for National capacity development in cooperation with relevant Ministries may as well be taken as another important undertaking of the Planning Commission.

2.4.2 Balanced distribution of rural-urban migrants

Managing urban population in four big cities, namely, Dhaka, Chittagong, Khulna and Rajshahi shall be one of the major tasks of the Government in Bangladesh. At present, urban-rural population distribution, as noted elsewhere in this paper is 30:70. Among the rural migrants, about 80.0 percent are absorbed in these four cities and the rest in the remaining 60 district towns of the country. Imagine a demographic catastrophe when the population of these four cities shall be doubled in the next 14-23 years which will almost paralyze the city life. More schools, more spacious roads and public transportation facilities, more supply of gas, electricity, pure water etc are to be afforded for the city dwellers. All these shall require 15-17 times larger investments than the Government's current spending. Besides, law and order situation will deteriorate to such an extent that it may frequently pose threat to the stability the Government.

Table 1: Projected population of four major cities of Bangladesh, 2008 and years of doubling the population.

Cities	Population in 2001 (in million)	Estimated present population (in million)	Estimated present Growth rate (%)	Doubling of the population (in millions) and years
Dhaka	8.6	11.0	5.0	22.0(14 yrs)*
Chittagong	3.4	5.0	4.5	10.0 (15.5)
Khulna	1.3	2.0	4.0	4.2 (17.5)
Rajshahi	0.7	1.0	3.0	2.0 (23.3)
Total	14.0	19.0	-	-

** Figures in parenthesis represent number of years of doubling the population.*

As a part of Government's population management strategy in urban area, Government may attempt to reverse the current trend through planned infrastructural development in remaining district Headquarters and selected Upazilas so as to upgrade them as the second tier modern cities and towns in a period of ten years. These emerging cities and towns should have proper connectivity with big cities along with all modern facilities so that rural migrants become attracted to go there for employment, business and education and eventually for settlement. The emerging cities and towns should have education, business, industries, spacious roads, public transportation facilities etc. This kind of urban center economic growth in favor of peripheral cities and towns is desirable for balanced growth of urbanization and economic development. This scheme will create a significant employment and income opportunities for the disadvantaged people of the underdeveloped urban areas. Hence, rural migrants will be attracted to go there rather than coming to highly polluted mega city and port cities. As a result, current imbalance in rural migrants' distribution between big cities and small cities shall narrow down and may ultimately take a reverse trend in a period of ten years from hence. It is assumed that 70.0 percent rural migrants may go to newly emerging towns and the rest 30% may come to the big cities. This kind of shift may take time, but eventually it will happen, provided we pursue the above policy strategy.

2.4.3 Relocation of Industries

One of the reasons for overcrowding, congestion and pollution is the location of many industries in the heart of our big cities and their adjoining areas. As a strategy for urban population management, and minimizing the urban problems, relocation of the industries to a suitably located distant place is necessary. Countries having problems similar to ours pursued this kind of policy strategy. South Korea is a case in example. Since 1980, it has been pursuing this policy to

reduce population pressure in its capital Seoul and thus, it was able to reduce its congestion by at least, 25% percent. In order to materialize this strategic objective, Government needs to provide land at a cheaper rate and tax rebate to the affected industrialists together with other essential facilities like water, gas, and electricity, as well as connectivity with the **Capital** and **Ports.**

2.4.4 Multi Sectoral Involvement:

Since population cut across all sectors of economy, their involvement and participation in all population activities are, therefore, essential. Bangladesh Population Policy is un-equivocal on this issue and has made ample rooms for their participation. But the ground reality is that they are yet not fully involved nor the National Population Council (NPC) has been made fully functional. The Ministry of Health and Family Welfare which provides secretariat support and stewardship needs to be fully tuned with the spirit of Bangladesh population policy. The sooner NPC can be made fully functional and create enabling environment for other Ministries to play their respective role as envisaged in the national population policy, the better for the nation. Also, given the demographic development and the urgency of the situation, Bangladesh Planning Commission may wish to consider the aforesaid population management strategies, while designing the country's planning and development strategies.

2.4.5 Meeting the unmet needs:

Country's family planning and reproductive health programmes must reach those who have felt-need for services and supplies. For this, door step services must be accelerated. Where necessary, worker-population density should be improved. The family planning programme should be fully supported with due priority.

2.4.6 Age at marriage and age at first birth:

Age at which a girl is married is an important predictor of her total fertility. In Bangladesh, overwhelming number of girls are married around the age 16. About 32 percent of the girls aged 15-19 year experience their first birth (BDHS,2011). Various studies show that 40 percent of infant deaths occur among the adolescent girls. They also experience significant maternal deaths. It is, therefore, important that for the sake of avoiding life-risk and health-risk, both age at marriage and age at first birth be delayed for which all conceivable means including the multi sectoral involvement for grass root level information and education and use of mass media, electronic media, local media and community opinion makers. As a result of these strategies, societal perception and understanding may change towards delaying age at marriage and delaying age at first birth of this strategic objective can be achieved, TFR of 2.1 may be reduced to 1.5 or 1.6 per women.

This will shorten the timing of achieving the goal of stable population with resultant decline in population size.

2.5 Conclusion

Our review of Bangladesh's current and prospective demographic situation shows that it has come to a stage of achieving 2-child family goal around the year 2016 and that it is on road to reach stable population 3-4 decades from now. Such time-distance may be shortened, if total fertility rate of 2.1 further declines to the level of 1.7 or 1.8 in the long run which is possible, provided policy strategies like (i) enhancing people's mobility, (ii) balanced distribution of rural-urban population through urban economic development and (iii) promoting and the practicing the idea of delayed marriage and delayed first birth by arousing people's consciousness and changing societal perception. This requires multi-sectoral involvement for community mobilization in massive scale and use of mass media and local Governments.

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Chapter 3: Transforming Bangladesh's Population into Human Resources

Mohammad A. Mabud

Abstract: *An attempt has been made in this article to indicate how population of Bangladesh can be transformed into human capital. It is the conviction of this investigator that enhancing people's mobility by their capacity development through education and skill training can obviate the adverse effect of rapid increase in human population. The people who will have relative skills in different skill- mix will have potential demands both in domestic and international markets. In order to facilitate the people to acquire skills, a human resource commission needs to be formed and entrusted with a task of preparing a 15-year master plan for human resources production and also, to coordinate with other manpower production institutions of the ministries of education, health, labor and manpower, public works, civil aviation and tourism, agriculture and industries etc. It is important that all HRD institutions need to revise syllabi and their admission policies upward to accommodate new vision of HR-productions targets. They should design customized training on different skill- mix on the basis of market demands of HR products of both at home and abroad. Such a policy strategy, if pursued vigorously, projected population of Bangladesh will be slightly reduced as fraction of them shall move out of the country for jobs, education, and business. This will hasten the process of population stabilization earlier than expected time. It will also help Bangladesh thrned into a country of skill-manpower.*

3.1 Context:

With 156.6 million people, Bangladesh ranks now as the Asia's 5th and world's eighth populous country, but occupying only 3000th part of the world's land space. With 1.35 percent growth rate, it is adding 2.2 million people per annum to its existing stock of population. This trend will continue in next decade or so even if Bangladesh achieves 2-child family norm any time between 2015-2021, its population shall keep on growing, though at decreasing rate. The population size will be so staggering that it will be difficult to contain in small land space. According to one recent projection, Bangladesh population will grow upto 173 million in 2021, and 226 million in 2051, even if it achieves 2-child family goal anytime before 2021 (Mabud, 2009). As a result, there shall be tremendous shortage of food, electricity, water, and other essentials of life to meet the need of growing population. Unemployment problem shall be acute; per capita arable land shall dwindle to 1:8 decimal from the present level of 1:15 decimals.

Working age population (15-64 yrs) shall be double the present size of 80 million, aggravating further the strained labour market. The school age population will increase, but facilities needed to improve quality of education is unlikely to increase owing to resource constraints. Law and order situation may deteriorate to such an extent that the Government shall be pre-occupied with this problem. Thus, in the days ahead, one cannot see much prospects. In this backdrop, the idea of transforming large population into human resources has emerged as a strategy for population management. Now, both the Government and intellectual community in Bangladesh are openly seeking solution of population problem through transforming them into human resources. The underlying philosophy is that, if population can be transformed into skilled workforce and equipped with the know-how in many nationally and internationally marketable skill- mix, a significant fraction of them may find their place in wide variety of occupations both at home and abroad. The empirical evidence is: when such people stay abroad for long time, they tend to stay there and do not feel like coming to their place of origin. If at all they come home, at least, their children will prefer to staying abroad for education, employment and business. When this process will continue, Bangladesh is unlikely to have the number of people as projected. In one generation time, at least, 25-30 million people may settle abroad. Thus, in stead of having 226 million people by 2051, Bangladesh is most likely to have 190-200 million by then. This demographic bonus is quite possible, provided country succeeds in producing skill manpower in different skill-mix on large scale. Apart from this advantage, the large number of skilled manpower will be the major source of GDP growth and economic development. Many employment and self-employment opportunities shall be created. Skilled manpower who will be engaged in large number are expected to remit fraction of their income which will boost Government's Foreign exchange reserve. Thus, Bangladesh's vision to reach the status of a middle income country in 2021 is expected to be materialized. The merits of the proposal for transforming huge population into human resources are enormous but the central question is: how can this task be accomplished? In seeking answer to this question, this investigator has put forward the following strategic proposals that need to be pursued to achieve the objective.

3.2 Establishing HRD-Commission:

In order to transforming populations into human resources, the first and foremost task of the Government is to establish a high powered institution capable of coordination with all human resources production authorities like Universities, Medical Colleges, Technical and Vocational Institutes etc. and the relevant Ministries, such as Ministries of Education, Health, Agriculture, Civil Aviation and Tourism, Textiles, Urban Development, Fisheries and live stock, Labour and Manpower etc. Apart from coordination, it shall have to be entrusted to produce

HR-Master Plan for 15-years---a plan which will show number of people required to be trained for meeting domestic and international market demands of the workforce in different skill-mix. It will have responsibility for data gathering directly at home and indirectly through Bangladesh Missions abroad regarding marketable skill-mix, extent of demand for specific skill (e.g. Nurse, Engineer, or Technicians). It will set standard of training in different skill-mix comparable to international standard so that our trained person should get equal pay like those of India or other countries on the same type of jobs. It will have power to recommend measures to improve quality of training to different institutions on marketable skill-mix. This National HRD-Commission will prepare long term HRD Policy and produce HRD-Master Plan for 15 years within the policy framework for 20 years. The HR-Commission should be headed by a Technically qualified eminent person with the status of State Minister who will be aided by 3 Members of similar background with status of the full Secretary to the Government. Since this institution is to produce a National HRD-Policy and a Master Plan within of 2- years of its establishment, it may need more than 100 consultants on different skill-mix on a long and short term basis to propos commission materplan years. With all these arrangements, the proposed National HRD Commission should be established without further delay.

Though enhancing people's mobility for population management by transforming population into human resources is deemed to be relevant and necessary in Bangladesh context on which there is hardly any disagreement, there is, however, no practical measures taken by the Government uptill now. The whole subject, as it stands today, seems to be a area. This is precisely the reason, why a strong and viable institution with clearly defined tasks should be established to scientifically address the HRD issues. Since Sector Ministries operate from their narrow perspective and hardly realize the national and international perspective, Bangladesh Planning Commission may be another alternative institution to prepare National Plan for human resources development. Preparation of Five Years Plan, poverty reduction strategy plan, perspective plan etc. is included in its terms of reference. Preparing a Master Plan for national capacity development in cooperation with relevant Ministries may as well be taken as another important undertaking of the Planning Commission.

3.3 Capacity Development in Population Perspective:

All capacity development efforts now underway are regardless of population consideration which is why Bangladesh producing manpower disproportionate to its population size. Therefore, population consideration should be built-in the HR-production targets and actual outputs in different skill-mix. In order to achieve this strategic objective, the most important undertaking of the proposed HRD-Commission is to undertake massive HR-related data collection on:

i) Number of Institutions by Sectors and by Skill-Mix.
ii) Number of Instructors/Teachers by Institutions and by Skill-Mix.
iii) Availability of standard physical space, equipment, library etc.
iv) Current and projected population of Bangladesh upto 2051.
v) Manpower projection by activities/sectors, if any.
vi) Study on International Market demand for various Skill-Mix.
vii) Wage rate for Labour/Employment of various Skill-Mix.
viii) Survey on Admission Policies of Institutions of different Skill-Mix and their International Compatibility;
ix) Duration of Schooling/Training by Skill-Mix and their International Compatibility; and
x) Preparing a list of marketable Skill-Mix to concentrate its works on preparing the 10 years Master Plan for HRD and monitoring the training of those Skill-Mix according to its recommendations.

The above list of data gathering for HRD policy and Plan preparation is, by no means, exhaustive. There may be a few more important areas of data requirement which may be relevant for the proposed HRD plan preparation and policy functions.

3.4 Demographic Approach to HRD-Target Setting:

In order to transform population into productive workforce on large number, production targets by Skill-Mix is necessary so that it does not become disproportionate to year wise population increase and market demand both at home and abroad. This task is difficult but it can be done, if the HRD-Commission constantly remains vigilant and make trend analysis of domestic and international market demand through its intelligence functions using all modern means of communications and thus, it can guide the production units/institutions of different Skill-Mix.

An important factor to be considered for setting production target is the age-distribution of population by sex. Neither the people of all ages nor the entire working age population (15-64 yrs) will be considered for production target. HR-Production target will include some fraction of the population as follows:

HR production Target = P_1 (Pop^n 11-15-school years) + P_2 (Pop^n 16-29). So, hypothetically, our HR Production Target for the year 2010 should be:
Production Target 2010 = P_1 (Pop^n 11-15-school years) + P_2 (Pop^n 16-29)
Where P_1 is the proportion to be assumed on the basis of specific requirement of a Skill-Mix.
P_2 is the proportion to be decided upon on the basis of requirement of a particular Skill for age group 16-29.

Please note that anyone exceeding age 30 will not be considered for human resources investment and hence, they will be excluded from the Demo-HRD projection model.

The following Table is an illustrative example.

Table 1: Estimated Number of Persons Eligible for Training in Different Skill Mix, 2008-2015. (in million)

Year	(a) Population (11-15 yrs)	(b) * Projected increase C.S.% School goers	(c) Leftout Eligible Number	(d) ** Selected @ 10%	(e) Population 16-29	(f) Estimated Eligible Number @ 10%	(d+f) Total Number for HRD-Training
2008 (Base yrs)	17.53	6.20	11.33	1.30	39.08	3.90	5.20
2009	17.52	6.51	11.01	1.21	40.21	4.00	5.21
2010	17.42	6.83	10.60	1.27	41.35	4.13	5.40
2011	17.16	7.17	9.99	1.29	42.45	4.24	5.53
2012	16.64	7.52	9.12	1.28	43.62	4.36	5.64
2013	16.25	7.90	8.35	1.25	44.73	4.47	5.72
2014	15.93	8.30	7.63	1.22	46.50	4.65	5.87
2015	15.68	8.70	6.98	1.11	46.94	4.70	5.81

It may be added that all production institutions, Colleges and Universities, Vocational Training Centers, Technical Training Centers etc. will keep on producing their outputs. The National HRD Commission/Planning Commission shall only oversee whether their productions are enough to meet the target number. If not, commission shall have the right to recommend upward revision of their admission policy, strengthen their faculties, increase their physical space and equipment. The concerned Ministries responsible for HR-production in their respective sphere may incorporate these measures in their respective HRD-Project for approval of the competent authority.

*Notes: *(i) Number of students aged 11-15 enrolled in 2008; Table 2.3 page-64, National Statistical Report, BANBEIS, Dhaka, 2009, and the figures at columns (a) and (e) are projected population estimates from medium variant population projection 2001-2051 by Mohammed A.Mabud, Dhaka, 2009.*

**(ii) This percentage can be changed subject to need assessment of particular skills. First Base year @ 60% and subsequent year progressively 1% incremental rate.*

(iii) It is assumed that those who shall be out of schools at secondary level are eligible candidates for training in various skill-mixes. 20% of them will be selected for training for the age group 16-29.

3.5 Establishing Production Centers:

Number of skills which have domestic requirement and international demand could be many, but proposed HR-Commission/Planning Commission should, at least, prepare a list of 75 skills of which some skills may not have any formal training centers. The HR-Commission should set up at all district 64Headquaters Technical Training Centers consisting of, at least, 10-15 skills or more for proper training in those skills e.g. Interior design, computer skill, technician, plumber, driving, painting, house keeping etc. For proper supervision, resource allocation and overall management, these should be put directly under the HR-Commission and will be regarded as Model Training Centers. The training may range from 3-12 months. The graduates from these centers will be the potential products for international markets. In Bangkok, there is a National Vocational Center for providing training on as many as seventy skills of different duration. It is located about 30 kilometers away from the capital city. The proposed sixty four "Model Vocational Centers" shall be similar to this, but they will be spread over all the districts to facilitate the disadvantaged peoples' access to these training facilities.

3.6 Role of Some Key Ministries in HR-Production:

In respect of human resources production and utilization, there are two sets of Ministries. The Ministries of Education, Health, Agriculture, Fisheries and Live Stock are producers and users of their human resources; whereas Ministries of Industries, flood control and water resources, Ports and Shipping etc. belong to the second set of Ministries i.e. user-Ministries. Ministry of Health produces all health manpower of 18 different Skill-Mix (see Table 4) and they largely utilise their products and supply to the international markets to some extent.

3.6.1 The Ministry of Education produce vast array of manpower ranging from general, technical, vocational and professionals. Table-2 provides a broad scenario of this wide range of institutions.

Table 2: Number of Different Categories of Institutions Producing Human Resources under Education Ministry, and other Ministries, 2008-09

	Types of Institutions	Number
1.	Universities including 51 Private Universities	82
2.	Polytechnique Institutes including Private 108	154
3.	Technical School & Colleges including Private 16	80
4.	Commercial College including Private 7	23
5.	Glass and Ceramic Institutes with no Private	1
6.	Graphic Arts Institutes with no Private	1
7.	Survey Institutes with no Private	2
8.	Technical Training Centre including Private 4	35
9.	Textile Institutes including Private 23	29

10.	Textile Vocational including Private 10	50
11.	Agriculture Training Institute including Private 91	104
12.	Marine Technology with Private institute	1
13.	S.S.C Vocational (independent & attached) including Private 1384	1441
14.	H.S.C Vocational (independent & attached) including Private 1138	1195
	Total: Including Private Institutions of 2781	3116

(Source: National Education Survey, 2008-Statistical Report, M. Edu., 2009)

In all, 11,492,270 students including 56,96,226 females were enrolled in all these institutions in 2008 (NES report, BANBEIS, 2009, P.15). At the University level, 387,433 students were enrolled; In 9284 Madrashas, 1.9 million students were enrolled. These students are not exposed to any technical education including computer, or vocational training. In order to make the Madrasha education more productive, some formal training on marketable skills or vocations should be given. Many of the institutions including Universities need strengthening in respect of faculty, equipment and physical space, particularly those in the private sector. Any careful examination of the wide range of existing educational institutions will reveal some scope for capacity development for meaningful human resources development. In fact, the Ministry of Education is significantly important production setting for huge human resources to meet both domestic and international market demand.

3.6.2 Ministry of Agriculture, Live Stock and Fisheries:

These Ministries produce professional manpower through their respective institutions and utilize those manpower in large number in their respective settings. Scientists produced in these fields may have demand outside Bangladesh. But that has to be explored. In fact, all international agencies like the World Bank, FAO, UN, IFAD, ADB etc. look for specialists in these fields.

3.6.3 Ministries of Industries and Energies :

Steady energy supply and industrial growth are intimately related. Both the sectors have the scope for considerable improvement and expansion. These two sectors require hard-core technical personnel like Civil Engineers, Chemical Engineers, Electric Engineers and Technicians of different varieties. Since both the sectors need some time for recovery from its present sick stage, it is difficult to predict the future requirement of technical staff. In view of the scope for expansion what can be said is that three times larger than the currently available Technical staff of the both sectors will be needed within a span of 5-10 years. Technical manpower, to that extent, need to be produced for our domestic requirement. Since there is always demand for qualified engineers (Civil, Electric,

Mechanical and other varieties) in the international market, our Universities including BUET and Polytechnic Institutes and Technical Centers should be encouraged to produce more engineers and technicians to meet the domestic and International market demand. In each case, quality of our products must not be sacrificed for the sake of quantity. In order to ensure quality and comparability with other countries, production institutions may need strengthening in terms of staffing, equipping, furnishing and physical space which need to be provided by the sponsoring authority, may that be Government or Private.

3.6.4 Human Resources for Urban Economic Growth:

In search of jobs, higher education, and business, safety and security, rural people in large number are flocking to urban areas, particularly capital city of Dhaka and port cities of Chittagong and Khulna. These overcrowded cities are no good for comportable Urban life. Now, a trend has emerged where other urban areas like the Divisional and District Headquaters are going to be developed into second tier modern cities and towns which will need a large number of Engineers and Technicians as well as semi-skilled and unskilled people. Added to this, an important contribution is going to be made in this regard by the Real Estate sub-sector. There are more than 2000 Companies currently working in construction of apartment complexes. As the year passes by, number of Real Estate Companies shall increase for which more civil and electrical engineers, architects and a large number of plumbers, electricians and artisans of different varieties will be needed for construction of buildings and roads as well as repair and maintenance of existing structures and super structures. Any HRD-Master Plan shall have to keep these requirements of huge technical manpower in view. If base-data of these workforce is available, some projections could be made regarding the requerment of professionals, technical and semitechnal persons who are likely to be needed for urban center economic growth.

3.7 Health Work Force

Health is one of the most labour intensive sectors of the economy. More than two and a half lakh people are currently engaged in Health Sector including those in the Private Sector. In spite of this large workforce, doctor-population density (1:3600) and doctor-nurse density (1:0.6) are case exemples the worst among the developing countries, not to speak of other categories of providers of health services. In fact, it is a sector which totally interacts with population. Hence, before engaging a 'x' number of workforce in health, 'y' number of population has to be kept in view. Health Sector produces workforce of different varieties, ranging from doctors, dental surgeons and nurses to skilled birth attendants (SBA). Table 3 below gives a vivid scenario of the institutions which produce the health man-power.

Table 3: Health-Sector Institutions Producing Health Man Power.

	Institutions	Number
1.	Medical University	1
2.	Medical Colleges - Government - Private	18 43
3.	Number of Dental College/Units in Medical Colleges	3
4.	Number of Dental College/Units in Medical Colleges	11
5.	Number of Nursing Institutions including one in Armed Forces	51
6.	Number of Nursing Schools/Colleges in Private Sector	33
7.	Number of Medical Technologies (including 2 or the Government)	51
8.	National Institute of Population Research and Training (NIPORT)	1
9.	National Institute of Preventive Health and Social Medicine (NIPSOM)	1
10.	Post Graduate Institutes	33
11.	Institute of Cardiovascular Disease	1
12.	Institute of Chest Disease Control	1
13.	Institute of Public Health	1
14.	Institute of Health Economics at Dhaka University	1
15.	Population Services Department at Dhaka University	1
16.	Institute of Ophthalmology	1
17.	Institute of Nutrition and Food Sciences at Dhaka University	1
18.	Institute of Public Health Nutrition	1
19.	Regional Training Centers (under NIPORT)	20
20.	Family Welfare Visitors' Training Institutes (under NIPORT)	13
21.	Medical Assistants' Training Institutes (Government + Private)	18

Source: HRD-Data Sheet, Ministry of Health and Family Welfare, 2010.

The number of specialized Institutes is fewer than needed; while number of Medical Colleges is quite staggering in the Private sector. Most of these colleges do not have minimum physical space, necessary equipment and furnishing as well as teaching staff. Same is true of other Institutes as well. In order to ensure quality, this situation must improve so as to augment their intake capacity and quality of training and education. All basic institutions should make serious efforts to recruit qualified teachers with experiences in Medical and Dental Colleges and specialized institutes in order to produce internationally comparable products.

3.7.2 "Health" has long been known as a under-staffed sector of the economy. There is always a need for more staff. But how many? In order to answer this question and improve the providers-population density, one needs to know the existing number available for services. Table 5 below provides a scenario of number of health workforce, as of 2010.

Table 4: Health-Human Resources in Bangladesh, 2010.

1.	Number of Registered Doctors	52453
2.	Total Number of Doctors Available in the Country	43537
3.	% Doctors working for the Government	38.0
4.	% Doctors working for Private Sector	58.0
5.	Total Number of working in F.P. Directorate	540
6.	Total Number of Registered Nurses	25732
7.	Number of Nurses currently Available for services	15023
8.	Number of Dental Surgeons	4011
9.	Number of Family Planning Officers	546
10.	Total Number of Asstt. F.P. Officers	1440
11.	Medical Technologists	
	(a) Sanitary Inspectors	1886
	(b) Dental Assistants	1886
	(c) Pharmacists	2220
	(d) Radiographers	7662
	(e) Physical Therapists	1456
12.	Number of Medical Assistants	7365
13.	Number of Health Assistants (Sanctioned)	21016
14.	Number of Health Inspectors (Sanctioned)	4202
15.	Number of Family Welfare Visitors (Sanctioned)	5705
16.	Number of Health Inspectors	1401
17.	Number of Family Planning Inspector (Sanctioned)	4500
18.	Number of Family Welfare Assistants (Sanctioned)	23500

Source: HRD-Data Sheet, Ministry of Health and Family Welfare, 2010.

3.7.3 All eighteen categories of functionaries are together providing health services in Bangladesh. All are professionals, barring a few who work in the field as health information, education and communication to the people. If one has the data on existing stock of Doctors, Dental Surgeons, Nurses, Medical Technologists etc., and also, information about projected population, one can estimate these providers-population density and number of them required to be produced and available for services by utilizing Mabud's Health-Population Interaction model as discussed in section 3.4. The model requires data on the following basic parameters for Health HR Projection.

a. Number of providers in base year;
b. Survival ratio at the beginning of the year;
c. Annual production in absolute number;
d. Projected population estimate up to the defined year; and
e. Net availability at the end of the year.

Survival ratio at the beginning of the year is estimated by the factor of $(1-D_1/P_1)$ where 'D_1' is the number of dropouts of all categories of skill 'X' up to the end of the year and 'P_1' is the total number of workforce at the beginning of the year to net availability is estimated by the factor: $[(1-D_1/P_1) * Po] + Pn$, Where Po is the previous year survivors and Pn is the new production of the year. Fortunately, we have data on items (i) and (iii). Survival ratio is to be estimated on the basis of expert opinion about the annual dropout from existing stock of workforce after adjusting it for death, disability due to old age and migration or deputation for employments/study abroad. First, we are considering the projection of doctors, as they are by far the most crucial factor for providing health services. The number of doctors and coverage of population are important. Any projection has to be based on certain assumptions. In this paper, we are presenting three projected estimates of doctors up to 2020 based on three different sets of assumptions, which are called 'Variants'-Variant 1 (high), Variant-2 (medium) and Variant-3 (low).

3.7.4 Projection Assumptions: In each variant, both production and survival assumptions are built-in. For example:

(i) Production-assumption will show the progression in production of doctors gradually up to the year 2020;

(ii) While survival assumption of workforce is held constant all through the projection period.

Implicit in these assumptions is that out of 100 surviving doctors, three are most likely to be dropped out by the end of the year from the surviving doctors due to retirement from active life, death, migration, deputation from jobs, and long study leaves plus the foreign born-trained medical graduates going out of the country after completion of their education in Bangladesh.

3.7.5 Population-Health HRD Interaction Model:

Before we proceed to discuss the extent of interaction between Population and human resources in health (HRH), some discussion on the following Population-Health HR Interaction Model (Mabud; CHPD, IUB, 2004) seems to be in order.

$Pt/[1-di/Pi)*Pi + Pni]$

Where,

Pt = $(1 + r)$ Pop $t - 1$

r = annual rate of growth in Population

$Pt - 1$ = Population of the year "t" i.e. at the beginning of the year.

D_1 = dropout rate due to death, migration, study abroad etc. of the 'i th' group of workforce,

Pi = number of workforce at the end of the year of the "i th" group of

workforce

Pn_1 = new workforce available at the end of the year of the "i th" group from the HRD institutions.

Po = net available workforce i.e. (1-di/Pi) Pi + Pni

Above Population – HR interaction model is quite practical and user friendly and provide a reasonable basis for estimating the extent of interaction. In this paper, this model has been extensively used to estimate different population-health providers density as one may see in the discussion that follows.

3.7.6 Doctor-Population Density:

Due to enhanced investment in health by public and private sectors, there shall be gradual progression in the net availability of doctors in the country for which doctor-population ratio will improve, but at different level under different production – assumptions. Three projections of doctors made by this investigator under three different production assumptions, namely (i) optimistic (variant-1); (ii) medium (variant-2) and (iii) constant (variant-3) yield three different scenarios of net availability of doctors in 2020 which may be seen from Table 5 below. In variant-3, it is assumed that production of 2000 doctors (i.e. 1200 From Government + 800 from Private Medical College), which refers to the figure in 2002, will continue up to 2020, and that there may not be any change in the admission policy of the Government and Private Colleges. Though it may be unlikely, it is, however, important to see what may be the prospects of net availability of doctors by the year 2020 under some circumstances. The details of the three projections may be seen in annexures -1 and 2 and production-assumptions are built-in column 2 of the tables.

Table 5: Prospects of Net Availability of Doctors under three Variants of Production.- Assumption Projection

Year	Variant-1	Variant-2	Variant-3
2002	28537	28537	28537
2005	31965	31866	31866
2010	39889	37724	36782
2015	49528	45109	41004
2020	60896	51450	44629

Under three variants of production, Bangladesh may have three sets of additional number of doctors on top of 28537 doctors in 2002. Under Variant-1, 32359 additional doctors will be needed by the year 2020; while under Variant-2 and 3, additional 22913 and 16092 doctors respectively will be needed.

Table 6: Doctor-Population Density in 2020 under three Variants of Production-Assumptions.

Variants	Doctor-Population Density
Variant-1	1:2840
Variant-2	1:3362
Variant-3	1:3840

Provider-Population density is estimated on the basis of projected population estimate of 173.0 million in 2021 based on the assumption of NRR=1 by 2015 and life expectancy at birth the base year 2002 in 62 years. Table 6 reveals that under Variant-1, 2 and 3, doctor-population density shall be 1:2840, 1:3362 and 1:3840 respectively. This shows that there will be some improvement over the current doctor-population ratio of 1:4645 in 2002, but still Bangladesh will not reach the internationally accepted threshold level of 1:2500 population in 2020. Due to current admission policy and weak intake capacity, particularly in the private medical colleges, it will not reach the desired level.

3.7.7 Doctor-Nurse Ratio:

Nurses are important human resources for providing health services. They have an extended role ranging form hospitals services to the community. Their utilization largely depends upon the state policy on the design and structure of the health services and the manner in which Government would like to utilize the services of the nurses. In 2002, there were 17056 nurses in the country and doctor-nurse ratio was 1:0.6. Again, annual turnout of nurses from the existing 44 nursing institutions is, on average, 800-900 per year. Given the current situation, two questions may be raised.

(a) First, keeping in view the medium variant projection of the doctors, how many nurses are necessary under the assumptions of :

i. maintaining current status(i.e. 1:0.6); and

ii. achieving the target of doctor-nurse raio 1:1

(b) Secondly, how many nurses can really be produced in view of the current limitations?

In the discussion that follows, each of these questions has been examined to provide some answers.

Table 7: Number of Nurses Necessary to Improve Doctor-Nurse Ratio under Different Assumptions.

Assumption 1: Constant Doctor-Nurse Ratio (1:0.6).

Year	Estimated number of Doctors of Medium Variant Production	Estimated number of Nurses	Increase in absolute number	% Increase
2002	28537	17514	--	--
2005	31866	18514	1000	12.09
2010	37724	21001	3487	32.70
2015	45109	24558	7044	58.68
2020	51450	28152	10638	79.21

Assumption 2: Doctor-Nurse Ratio of (1:1).

Year	Estimated number of Doctors of Medium Variant Production	Estimated number of Nurses	Increase in absolute number	% Increase
2002	28537	17056	--	--
2005	31866	31866	14810	86.8
2010	37324	37324	20268	118.8
2015	45109	45109	28053	164.5
2020	51450	51450	34394	201.6

From the data in table 7, it is clear that in order to keep up existing doctor-nurse ratio of 1:0.6, Bangladesh has to increase production of nurses by 12.09% in 2005 and 79.21% in 2020 under assumption (i.e. doctor-nurse of 1:0.6); While under the assumption of doctor-nurse ratio of 1:1, comparable figures will be 86.8% and 201.6% in 2005 and 2020 respectively over the base-figure of 17056. Given the realities, it is meaningless at this stage to assume the production of nurses to achieve the doctor-nurse ratio of 1:2 and 1:3 in some distant future from the mere base-figure of 17056 nurses in 2002. However, the issue of doctor-nurse ratio in Bangladesh context requires some comments. According one estimate based on the data of the BNC (MOHFW: HRD-data sheet 2002), doctor-nurse ration was found to be 1:1.5. This ratio was estimated keeping in view the figures on doctors and nurses who were working under the Ministry of Health. This ratio will gradually improve further, if the projection exercise is confined to those who are working under the Ministry of Health, and also, those working in the hospital and clinics alone. But if we take the total number of doctors and total number of nurses in the country as a whole, then we find a different scenario. Again, if we relate the number of nurses and number of doctors working in the hospitals, we find that doctor-nurse ratio is already 1:2 and may improve up to 1:3 in 2020. Therefore, a lot of factors need to be taken into consideration, while making projected estimates of doctor-nurse ratios. Let us now turn to the question in

which we ask ourselves about the prospects of availability of nurses in 2020 under the assumption of gradual increase in annual production rate as assumed in the following Table.

Table 8: Net Available Nurses Under Different Production-Assumptions in 2020.

Year	Production Per Year	Survivors	Net Available Nurse
2002	800	16714.88	17514.88
2003	800	16989.43	17789.43
2004	800	17255.75	18055.75
2005	1000	17514.07	18514.07
2006	1000	17958.65	18958.65
2007	1000	18389.89	19389.89
2008	1000	18808.20	19808.20
2009	1200	19213.95	20413.95
2010	1200	19801.53	21001.53
2011	1200	20371.48	21571.48
2012	1200	20924.34	22124.34
2013	1500	21460.61	22960.61
2014	1500	22271.79	23771.79
2015	1500	23058.63	24558.63
2016	1500	23821.87	25321.87
2017	1500	24562.22	26062.22
2018	1500	25280.35	26780.35
2019	1500	25976.94	27476.94
2020	1500	26652.63	28152.63

Estimates presented in Table 8 show that there will be 32080 nurses in 2020. This is exactly what we need even to maintain the current doctor-nurse ratio of 1:0.6. Thus there will be no improvement at all even we increase the production level up to 1500 from 2013 onward.

3.7.8 Dental Education:

Worse than anything else in Health-HRD is the neglect in dental education. At present, there is one Dental College and three dental units attached three Medical Colleges of the Government in addition to 11 dental colleges/institutes. There is one Dental Department for postgraduate teaching at the Bangabandhu Sheik Mujib Medical University in Dhaka. All these institutions produce about 400 dental graduates a year. As of 2009, there were reportedly 4011 dental surgeons in the country and 40% of them are working in the public sector. One may note that drop out rate among the dental graduates is much higher than the doctors. It

is estimated that 5 out 100 go out of the country every year. At present, there is Dental Surgeon-Population ratio is 1:37,397. With the current rate of production in our dental institutions and surviving ratio of 0.95, this dental surgeon-population ratio will not improve, rather it may deteriorate further as population is growing. One may note that the minimum threshold level is one dental surgeon per 8,000 population. In order to achieve this goal in the next ten years, annual production target without sacrificing the quality of production has to be increased significantly.

3.7.9 Female Worker-Population Density:

Female workers play an important role in Health and Family Welfare activities. At present, there are 23500 Family Welfare Assistants (FWA). Assuming that this number shall remain constant, the FWA-population density is likely to be as follows under the medium variant population projection as noted earlier.

Table 9: FWA-Population Densities under the Medium Variant Population Projection.

Year	Population (in million)	FWA-Pop. Density
2010	150.9	1:6421
2015	161.8	1:6885
2020	173.0	1:7361

Data show that one FWA of 2010, if she would remain alive up to 2020, shall have to serve 1000 more people. This means that FWA-population density will deteriorate. If Government wants to maintain the current worker-population density, it shall have to employ additional 12000 FWAs in 2020.

3.8. Prospects for Overseas Employments:

3. 8.1 There is always demand for employments in the International Organizations like the World Bank, Asian Development Bank, UN agencies, international NGOs, multi-national corporations etc. for persons of specialised categories. Also, there is a great need of these professional categories within the country to meet the needs of our Universities, Colleges and specialised Institutes. Some investment has to be made for the production of this category of professionals. For this, state should provide fellowships to the bright and deserving candidates to pursue higher education abroad. This number is a small fraction of the total HR, but they are apex and deserve importance and priority of their training and educational requirement in their own right. While preparing the HRD-Master Plan, this aspect has to be kept in view.

3.8.2 Supply of Technical and Non-Professional Categories:

Under some demographic compulsions, the countries which are passing through transition of rapid decline in fertility and mortality, and have achieved NRR=1 already or stabilizing their population, they will be terribly in short of working age population. These countries urgently need young age people to run their establishments, Mills and factories etc. and thereby to sustain their economic growth. Countries like China, Singapore, Taiwan, Japan, Thailand and South Korea fall into this category in Asia; while most countries in Europe are already in short of workforce of semi-skilled and unskilled labour. The other category of countries, particularly those in the middle east which are expanding their economy require manpower of all categories like the Professionals, technical, semi-technical and unskilled workforce. Thus, there is tremendous scope for employment of Bangladeshi workforce in all these countries. Due to individual efforts or through recruiting agents, Bangladesh has occupied employment markets in quite a number of countries. Such as Soudi Arabia, UAE, Kuwait, Oman, Baharain, Lebanon, Jordon, Libiya, Sudan, Malasia, Singapore, South Korea, UK, Italy, Japan, Egypt, Brunai etc. According to Bangladesh source, about 7,033,091 people have gone abroad during 1976-2010 and remitted Tk. 448,610.91 crores. The highest amount remitted was Tk. 73,981.46 crores in 2009. It may be noted that number of persons going abroad has dwindled. In 2008, more than 9.0 lakh people went abroad. This number was reduced to a half in 2009.

This problem has to be solved; and our Missions abroad has to be pro-active and skillful in establishing contact with overseas employers and explore all sorts of employment opportunities so that our trained and skilled workforce as well as large number of semi-skilled and unskilled workforce can be employed in larger and larger number. The more and more, we can develop the capacity of our workforce, the better the prospects of employment abroad.

3.9 Some Policy Considerations:

Two important considerations, namely (a) HR in gender and (b) HR in regional perspectives need to be kept in view ,while formulating HR Policy and Master Plan. The HR production institutes across all sectors of the economy must ensure gender balance in admission and training of the participants in various programmes. In gender scale, women in Bangladesh are still much behind men in many areas of development. Hence, some deliberate efforts have to be made to make up the gap in respect of HR development between men and women. In recent years, school enrollments in primary and secondary level have been increased considerably. But such trend is yet to emerge in agriculture, fisheries, livestock, polytechnic, heath technologists and other skill-mix. Besides, HRD

Policy and Master Plan must also ensure regional balance in HR-production so that no region or area lag far behind the other.

3.10 Conclusion:

Until now, the issue of transforming our population into human resources remains as a mere slogan. No concrete step has yet been taken by the Government. If the Government is really serious about it, its first and foremost task is to establish an institution under the ubric of National HR-Commission adequately staffed with eminent technical persons to prepare the National HRD Policy and National HRD-Master Plan for 15 years. Such task must have built-in demographic consideration, while fixing HR-Targets of various Skill-Mix. All districts should have model Technical Training Centers directly under the proposed National HRD-Commission to facilitate the access of disadvantaged local people to the Training facilities. Only fraction of those who are drop-outs in secondary schools (11-15) and those belong to the age group 16-29 years shall merit consideration of HR-investment. While producing skilled and semi-skilled persons, emerging requirements of urban economic growth and also, overseas requirements shall have to be kept in view. In order to remove HR-imbalance between men and women, the proposed capacity development Policy and Master Plan should be designed keeping in view both gender and regional perspectives.

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Chapter 4: Issues of Population Planning Program in Bangladesh

Obaidur Rob

Abstract: *The main objective of this paper is to appraise the needs for reviewing the existing Bangladesh's population planning program and policies by taking into account several population and development challenges. The challenges are: increasing number of reproductive women and young age population, population ageing, increasing urban population, growing needs for mother and child health care, more and more attention for underserved areas, reducing unintended and unwanted pregnancies, delaying age at marriage, to cite a few. Bangladesh has made considereable progress in reducing birth and death rates as well as increasing contraceptive prevalence rate, but there is still a great scope for imrovement of population planning program by addressing these challenges.*

4.1 Introduction: Policies are the framework upon which all elements of service programs are developed. It is on the basis of policy formulation that public services are organized and provided to people. At each developmental stage an individual's health can be affected by a policy that he or she rarely controls. Policies can have a devastating or a constructive effect. Sometimes it is the absence of policy that causes negative results, other times it is the continuation of restrictive policies that directly influences health outcomes. Progressive national policies, like those that delay age at first marriage, can save young girl from death in early childbirth. National policies that ensure family planning programs are voluntary and safe can greatly enhance an individual's ability to control fertility. Conversely, policies that limit safe termination of unwanted pregnancy consign women to unnecessary mortality and morbidity as they either bear children they cannot care for or resort to unhealthy practices of illegal pregnancy terminations.

Too often policy makers, particularly at national levels, after concentrating their energies on changing policies, believe their work is done and that lives will change simply because of progressive policy work. Unfortunately, changing policy is only the first critical step. Once adopted these require dissemination, education, vigilance and enforcement before becoming part of the culture. At the service delivery point, many policies effect the provision of services. Positive policies, like serving clients when they come, without prior appointment and without charge, have a positive effect. Policies that put limitations on services cause

negative effects. When policies regarding program and service delivery constrict, the availability of services and women's access to services become limited and thes and the individual woman's health is directly affected. It is essential to review policy at all levels to ensure that positive national policies are applied at the service delivery level. Only in this way, one can be assured of the timely and appropriate services that their national programs promulgate.

The national population policies of Bangladesh provide a strong framework for programs in population planning and reproductive health (Rob and Talukder, 2007). Many of these were introduced immediately after the liberation war and others have evolved as the demographic situations changed. However, there has never been a time in Bangladesh when population policies have not had a positive influence on the provision of family planning services, maternal and child health, particularly for reproductive health services. The government's policy of providing health services is based on the principles of universal coverage and accessibility, optimum utilization and development of human resources, gender equity, appropriate use of technology and promoting health as an integral part of overall socioeconomic development. The decade of the nineties has seen the greatest changes since the inception of the Bangladesh population program. In the development plans, the government promoted and supported the implementation of a comprehensive health and family planning service delivery system to provide comprehensive reproductive health services to the poor and rural people. The recently approved population policy also aims at improving standard of living of people through improved reproductive health status and contributing to a more desirable balance between population and development (MOHFW 2012)

The International Conference on Population and Development (ICPD) held in Cairo has a profound influence on Bangladesh population policy (Piet-Pelon et. al., 1999). The Programme of Action of ICPD sets goals for sustainable development and, within that framework, goals for greatly improved reproductive health of women and their partners (UNFPA, 1995). The adoption of this program on a country level requires a paradigm shift from vertical programs that **provide family planning and MCH services to the delivery of reproductive health services through providing an essential services package (ESP) at integrated health and family planning centers. It also calls for a holistic approach to women's development issues. Thus, it requires programs that emphasize education, employment, legal status of women and gender equity in all spheres of life.** Since ICPD, Bangladesh has been engaged in stimulating debate on policy issues and re-designed its health and population strategy to accommodate many elements of the Programme of Action. Policy makers have proactively involved a broad spectrum of civil society in policy formulation.

4.2 Demographic scenario

Bangladesh is the eighth most populous country in the world with approximately 156.6 million in population. Rural population comprises about 70 percent It is overburdened with about two million new faces every year creating extra pressure on food, shelter, education, health, employment, etc., and thus making the anticipated economic growth difficult.

It has made significant progress in reducing fertility, infant and child mortality. Bangladesh has emerged as a low fertility country within reducing total fertility rate (TFR) from 6.3 to 2.3 in one generation time. The TFR and contraceptive prevalence rate is 2.3 and 61 percent respectively in 2011. Infant and neonatal mortality rates are 43/1000 and 32/1000 live births respectively. The less than five mortality rate is 53 deaths/1000 live births. Eighty six percent of Bangladeshi children aged 12-23 months are fully immunized. The Maternal Mortality Ratio (MMR) is 194 per 100,000 live births (NIPORT, MEASURE Evaluation and ICDDR,B, 2012). Currently, the antenatal care coverage with a skilled provider is 55 percent. Nationally, 71 percent of births occur at home, and 29 percent occur in a health facility. Only 31.7 percent of babies were delivered by medically trained providers. One in four women (27 percent) with a live birth received postnatal care from a medically trained provider (NIPORT, Mitra and Associates, 2013).

4.3 Population and Development Challenges

4.3.1 Women in reproductive age: Within the next 30 years, the number of women in reproductive ages will increase at a fast pace. The estimated number of women in reproductive ages is 35 million in 2013 and the number will increase to 50 million in 2051. The number of women in the reproductive ages will continue to increase and as a result the number of births will be higher than expected. The increase in the number of women in the reproductive ages will pose the most formidable challenge to future population programs and plans. The extent of increase in the number of women in reproductive ages will occur so rapidly that the strategies, in terms of allocations, targets, supplies, logistics, providers, number of one-stop and satellite centers, will need to be updated at regular intervals.

4.3.2 Young population: Approximately 30 million adolescents and youth age 10 to 24 are living in Bangladesh. The size of this age group will continue to grow in the years ahead. A major concern is that half of the women become mothers by age 19, which heightens the risk of maternal morbidity and mortality. The national program has overlooked this large population group. The health and livelihood needs of young people living in rural areas and urban slums have not been effectively addressed in existing policies and programs. In parallel, the

working age population of Bangladesh will increase rapidly in the next three decades. Without an appropriate and timely policy for this potential workforce, the country will not be able to utilize this opportunity to transform the demographic transition into an economic transition. On the other hand, policymakers must plan for the healthcare and quality education of the children as an investment and future health care and pension income needs of this baby boom generation when it ages as a security.

4.3.3 Urban population: According to 2011 population census, the urban population makes up 33 percent of the total population. Between 1990 and 2011, the urban population in Bangladesh experienced an annual growth rate of 6 percent, which is one of the highest among South Asian countries. By the year 2040, half of the country's population is expected to live in urban areas. In 2050, approximately 60 percent of the population in Bangladesh will live in urban areas, if the urban population follows the previous increasing rate. This shift from rural to urban areas will have significant impact on food production, resource allocation, existing social services and infrastructure. The increase in the urban population will pose a formidable challenge to the policy makers if necessary measure to improve the infrastructure is not considered with top priority (Islam, 2000).

4.3.4 Ageing: Aging will have increasingly important role during the next decades. The number of elderly people is estimated as 10 million in 2013, which will increase to 15 million in 2021 and 45 million in 2051 (Kabir and Siddiqua, 2003). If the issue of ageing is not addressed properly and if adequate planning process is not initiated with special emphasis, there will be increased social, economic and health problems in the country that will be beyond the control of any makeshift kind of solution. Without a very specific set of policy strategies concerning socio-economic and health services for such an increased number of elderly people, there will be serious imbalances in the society. The problems will be more intense because a much larger number of families live under the poverty line or do not have adequate housing and healthcare, and majority of the elderly population are in the rural areas where poverty is a serious problem. Adjustments in policies will be required in order to take account of the change in age structure.

4.4 Issues and Priorities in the Population and Health Sector

It is critical to fuel the continuing policy debate in Bangladesh, particularly on the issues which are most influential in the shift from family planning programs to reproductive health services offered in an environment of sustainable development. However, in spite of the policy work that has been done in the past several years, many of the issues remain un-addressed. Of particular concern are the issues of quality of services. No matter which service is considered, the service delivery system is too often of questionable quality. This is particularly

true for the existing reproductive tract infection (RTI) services for all clients in family planning clinics, menstrual regulation (MR) services and the reproductive health services for special groups of clients – men and adolescents. There is a dynamic effort to improve reproductive health services while serving an increasing numbers of clients. Program critics and managers alike have raised concerns about quality of routine services. Though contraceptive use rate continues to rise, there are warning signs that quality is not optimal. Of particular concern are the high discontinuation rate for all contraceptive methods and the method mix with a preponderance of oral pill acceptors even among older women who have completed their family size. The discontinuation rates may reflect a lack of information or appropriate counseling to the clients at the time of method acceptance while the significant use of oral pills over other methods suggests that women may not have access to a full range of contraceptive choices.

Another crosscutting issue is the paucity of information on certain topics. The Bangladesh program is rich in data. However, it is often of the same type or quite general. For example, there has been a husbands' questionnaire in the Demographic and Health Surveys since 1983. Over the years very similar data emanate from the standard questions asked. But, the in-depth or

"why" questions are not asked. For example, program managers know that men are aware of family planning methods and sources of supply and have positive attitudes about using family planning to control fertility. What program managers and service providers do not know is why men do not use family planning methods more frequently. Nor do program managers fully understand what role men play in determining a method choice or side effect management for their partners. Consequently, policy makers are unable to develop effective programs for men because they do not know why men act differently than they profess to think. The following discussion will highlight major issues and priorities for the future plans and programs.

4.4.1 Increasing access to family planning services in low performing and hard-to-reach areas: Although Bangladesh has established a comprehensive physical infrastructure to deliver health and family planning services with a vast network of primary health care facilities in rural areas, the impact of extensive health service network has been much less than expected because these services do not reach all regions effectively. Two divisions, Sylhet and Chittagong, remain the most disadvantaged both in terms of health and population outcomes and access to services, compounded by the poor utilization of facilities. Less accessibility to health facilities and quality reproductive health care services in low performing and hard-to-reach areas still remains to be a major challenge.

4.4.2 Increasing access to maternal health care services: Maternal mortality still remains high, despite sincere intention of the government. Utilization of maternity care provided by trained professionals is alarmingly low in Bangladesh. Despite an impressive health infrastructure, approximately 70 percent of births continue to occur in the home managed by unqualified persons. Pregnant women who arrive at facilities often experience catastrophic costs, having to pay out-of-pocket, informally, for drugs, materials, services and referral transport. Increasing access to comprehensive and affordable maternal health care services for rural and urban slum population is an important challenge for the health system in Bangladesh. The government has well-established service delivery network, but yet to have a universal safety net mechanism to provide financial support to the poor for maternal health services.

4.4.3 Increasing the use of longer acting contraceptive methods: The family planning program experienced a low level of performance in long-term contraceptive services. At present the proportion of married women using longer acting contraceptive methods is about seven percent and each year it is declining, which is becoming a major challenge for achieving the goals of the national family planning program. It is to be noted that the family planning program has not been successful in motivating the high parity couples intended not to have additional children to accept long term or permanent family planning methods. Moreover, there is no clear cut strategy to target high parity couples to fulfill their family planning needs.

4.4.4 Reducing unwanted and unintended pregnancy: Approximately one-third of the total pregnancies in Bangladesh are unplanned and unwanted. Many of these unplanned and unwanted pregnancies that result in MR and abortions could be avoided. Many poorly trained personnel are providing MR services in unhygienic condition increasing the risk of reproductive morbidity and mortality. Unwanted pregnancy occurs either because irregular use of family planning methods or method failure.

4.4.5 Reducing adolescent fertility: It is estimated that adolescent fertility contributes to one-fourth of the total fertility rate. The size of this age group will continue to grow in the years ahead due to the population momentum. Adolescent fertility is also a major health concern. There is a strong correlation between the age of mother and maternal mortality and morbidity. Evidence suggest that girls aged 15-19 are twice as likely to die from childbirth as women in their twenties; those under age 15 are five times as likely. On the other hand, the current program is not using outreach service to the full to address the family planning needs of the newlyweds or younger women. Younger mothers are less likely to be visited by the field workers than women in their 20s and 30s. Married young

women are a priority segment of the population that must be reached and addressed through effective programs immediately.

4.4.6 Delaying the age at marriage of women: Early marriage always leads to early pregnancy and childbirth in Bangladesh because of social pressure for young married girls to prove their fertility and fulfill gender expectations. In Bangladesh, mean age at marriage for females continues to be far below the legal age of marriage (18 years) and more than two-thirds of women are married before their eighteenth birthday. The population pyramid of Bangladesh shows that the adolescent population is growing both in number, and as a proportion of the total population. As the number of adolescent girls will continue to increase, the need to delay the age at marriage of women reach is paramount to reduce the fertility effect of early marriage.

4.4.7 Urban health: The urban population makes up one-third of the total population. This will have significant impact on existing social services and infrastructure. A large proportion of urban population will be exposed to poor housing, very high population density and room crowding and very poor environmental services. Lack of access to health care facilities will be a serious problem for slum dwellers, as this population has limited access to primary health care services provided by NGO clinics.

4.4.8 Addressing the deficiency in service delivery system: Probelms of human resources and infrastructure: In the health sector, the key human resources problem is the inadequate number of service providers and field workers. Large number of vacant posts in rural areas has been identified as the major weakness in the service delivery (Rob and Talukder, 2008). There is also the problem of absenteeism, and poor accountability of service providers. Even the available human resources are not distributed equally across regions. The government's inability to retain trained providers in the designated position is also apparent. Regarding infrastructure in service delivery, there are limited health facilities in remote, hard-to-reach areas. Physical infrastructure in many areas is not in a good condition. Some facilities are found in run down condition, which require renovation. Some are abandoned which need to be made functional. There exists chronic shortage of drugs, contraceptives and equipment. Other problems are: supply of uniform pre-packed kits of drugs irrespective of the differences in geography, health outcomes and disease patterns; problem of worn out and insufficient furniture and equipment; and difficulty in recovering fund for health and family planning activities from Upazilla Parishad. Supply procedure is very lengthy and carrying cost provided is not sufficient.

4.5 Conclusion

It is important for policy makers, service providers, researchers and program managers to review critical policy issues and then develop policies, strategies and programs to address the outstanding issues. Many of these can be addressed through service providers training programs. Others will require a new formulation of policy strategies.

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PART: II

ENVIRONMENT

5. Water as a Resource in Bangladesh
6. Environmental Pollution in Bangladesh
7. Population, Water and Flood Policy: Bangladesh Perspective
8. Climate Change in Bangladesh: Is Social Marketing relevant?
9. Environmental Assessment of Drought In The Northwest Region Of Bangladesh.
10. Public Health Effects of Fragrances and Perfumed Cosmetics

Chapter 5: Water as A Resource In Bangladesh

Umme Kulsum Novera

Abstract: *Bangladesh is a small country but very rich in diversity and complexity specially in water sector. The water sector is one of the most challenging sectors in Bangladesh as the country mainly relies on agriculture sector where more than 85% of the population live directly on agriculture. Floodplains occupy 79% of the country's land area. The mighty river system (G-B-M) brings in three times extra water from their catchments beyond this country and they fall in the Bay of Bengal through this country. The watershed basins of these rivers are adjacent to each other, covering the centre, north and northeastern part of South Asia and the Great Himalayan Range. Thus, water resources generated in Bangladesh is very much inter-dependent with other neighboring countries. The characteristics of these basins with the flood plains evolve the water resources throughout the year in different seasons in Bangladesh. The surface water resource of this country is very much essential for its human and animal living, aquatic flora and fauna, navigation, agriculture, fisheries, forestry etc. It is also necessary for keeping alive the distributaries in the delta, and to maintain the brackish water eco-system along the sea, on an annual cycle. Ground water is conventionally available in aquifers spread all over the country, from a depth of few meters to about 20 meters below the surface but with over exploitation of groundwater, it is under threat now. In this paper, the major elements of disaster related to water in Bangladesh are discussed in brief. The planning and management of water resources depends on this disaster as well. Water in its all forms serves its people since the historical time. It is the backbone of this densely populated country. Water can be an economic good but not at the cost of human life and natural system of the environment.*

5.1 Introduction

Bangladesh, is a small country but very rich in diversity and complexity specially in water sector. The flood plain in Bangladesh is not flat. There are a lot of changes inside the country for vegetation, forestation, agricultural field with different types of paddy and irrigation practice. The water sector is one of the most challenging sectors in Bangladesh as the country mainly relies on agriculture sector. More than 85% of the population lives directly on agriculture. Bangladesh lies in the Indian subcontinent between $20^0$25' and $38^0$40' N latitudes and $88^0$01' and $92^0$40'E longitudes. The area of the country is 143999km^2 (BBS, 2007). The major rivers which flow through Bangladesh and which predominately causes the flood lie outside of Bangladesh. The sediments which underlie Bangladesh's floodplains mainly came from geological formation

outside the country as well (Brammer, 2012). Therefore the geology and climate of the catchment area of this country's three major rivers, the Ganges-Brahmaputra-Meghna (G-B-M) play the dominating role.

5.2 Physiographic Condition of Bangladesh

Bangladesh slopes gently south-eastward from near the foot of the Himalayas in the north-west towards the Meghna estuary in the south-centre. Floodplains occupy 79% of the country's land area, uplifted blocks 9% and hills 12%. These changes are significant for land use pattern and development pattern for this country. Bangladesh can be divided into 18 physiographic regions (Brammer, 2012) which is important to understand the hydrology, soil and land use. The history of the Ganges-Brahmaputra-Meghna delta is very important to know and understand for groundwater hydrology in the flood plain area, the river network system, the behavior of the river system during monsoon and dry season, the cropping pattern of the GBM basin revealed the complex history of sedimentation process during the late Pleistocene and Holocene periods (BADC, 1992). There are five major factors which provide the sediment and sedimentation rates the areas in Bangladesh. They are: (i) during the late Pleistocene sea level gradually fell to about 130cm below its present level about 18000 years ago, (ii) then, sea level rose to its present level during the Holocene period, (iii) during this time, the centre of the Sylhet basin axis subsided at 2 – 4 mm per year, (iv) the climate was wetter than at present during the early Holocene so that rivers probably brought down more sediment (mainly sandy sediments) at that time than they did later, and (v) The Brahmaputra-Ganges rivers changed their courses several times during the Holocene period.

The rates of sediment accretion varied across the delta because of continuous tectonic subsidence of the Bengal Basin (Alam et al., 2003). The present multi-accurate coastline of the Ganges Tidal Floodplain and the Young Meghna Estuarine floodplain and the different angles at which the distributary rivers flow to the coast behind each avc suggest successive eastward shifts of main Ganges channel and its associated delta (Allison, 1998).

Four main types of flood plain are recognized in Bangladesh, (i) river, (ii) piedmont, (iii) tidal and (iv) estuarine. Each of the main floodplain types has characteristic relief, hydrological and sedimentation pattern. They also influence human settlement patterns, natural vegetation, land use and exposure to natural hazards.

Bangladesh receives an average 2300mm rainfall annually. The mighty river system (G-B-M) brings in three times extra water from their catchments beyond this country i.e. from India, Nepal, Bhutan and China. This extra water occurs mostly in the monsoon time and floods, which carries fertile silt to this land. In

contrast to this, the low flow in the winter time in these rivers is critical for aquatic flora and fauna, human living, irrigation and navigation. The river system based on the GBM basin is considered as the lifeline of Bangladesh. The combined river system of Ganges-Brahmaputra-Meghna forms the biggest delta in the world and forms the largest mangrove forest at the mouth.

Table 1: Area and Proportions of the Physiographic Regions of Bangladesh (Brammer, 2012)

Physiographic origin	Land area (km^2)	River area (km^2)	Total area (km^2)	Proportion of the total area (%)
Floodplain				
A. Old Himalayan	3931	-	3931	2.9
B. Teesta Alluvial Fan	12963	244	13207	9.8
C. Brahmaputra-	15472	964	16436	12.2
D. Ganges River	23069	893	23962	17.7
E. Ganges Tidal	15073	1337	16410	12.1
F. Old Floodplain	3472	2	3474	2.6
G. Surma-Kusiyara	8779	134	8913	6.6
H. Middle Meghna	1296	313	1609	1.2
I. Lower Meghna	912	-	912	0.7
J. Meghna Estuarine	12944	176	13120	9.7
K. Northern and	547	16	563	0.4
L. Chittagong Coastal	3592	98	3690	2.7
M. St. Martins Island	8	-	8	Nil
Total Floodplain	***102058***	***4177***	***106235***	***78.6***
Uplifted Blocks				
N. Madhupur Tract	4146	14	4160	3.1
O. Barind tract	7687	-	7687	5.7
P. Akhaura Terrace	171	-	171	0.1
Q. Lalmai Hills	38	-	38	Nil
Total Uplifted blocks	***12042***	***14***	***12056***	***8.9***
Hills				
R. Northern and	16274	502	16776	12.4
Total Hills	***16274***	***502***	***16776***	***12.4***
Dhaka city + Chaittagong	126		126	0.1
Total Bangladesh	**130500**	**4693**	**135193**	**100.0**

Bangladesh has a surface water reservoir built on the river Karnafuli at Kaptai for producing hydroelectricity. It has the large natural lakes to the northeast called the 'haors'. These lakes are gradually shortening in size because of filling by silt deposits. To the southwest, the country has 'baors' which are abandoned courses of big rivers. The low lying marshes all over the country are called the 'beels'. These are increasingly being dried up for agriculture. The groundwater resource depletes heavily from December to May due to over abstraction. But this resource becomes rich again by periodical replenishment in monsoon. A vast area of the country gets flooded and remains under water from June to October.

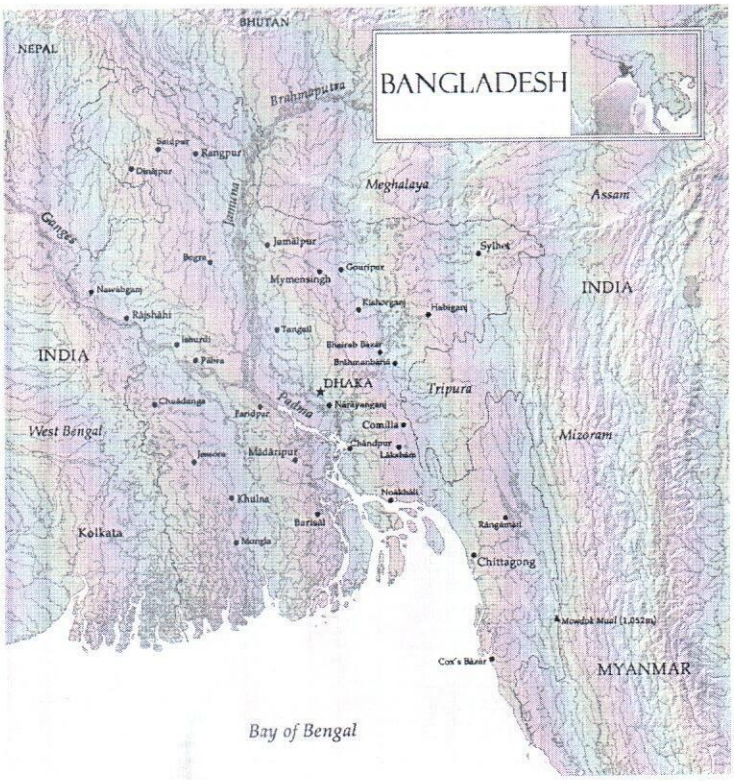

Figure 1: River system in Bangladesh

5.3 Water as a resource

Bangladesh lay on the confluence of the three major rivers of Asia, named as the Ganges, the Brahmaputra and the Meghna. These rivers fall in the Bay of Bengal through this country. The watershed basins of these rivers are adjacent to each other, covering the centre, north and northeastern part of South Asia and the Great Himalayan Range. These basins are altogether is around 665000 square miles in area. The Ganges River originates from the southern slopes of the Himalayas, but

its tributaries originate from both the Himalayas and the central highlands of India. The Brahmaputra River originates from the northern slopes of the Himalayas, in Tibet of China. Its tributaries originate from the Kailash Range, Tibetian Plateau, the Himalayan range, the Lushai Hills and the Garo and Jaintia Hills. The Meghna River originates from the Lushai Hills. Its tributaries originate from the Lushai Hills and the Garo and Jainta Hills. The Bengal Basin has some independent rivers to the west originating from the Chhotonagpur Highlands and to east originating from the Lushai Hills.

Most of the rivers in Bangladesh are either tributaries or distributaries of the Ganges, or the Brahmaputra or the Meghna River. An imaginary line from the Chhotonagpur Highlands to the Garo Hills, through the north Bengal, separates the entire Bengal-Plain into two, the upper and the lower one. The upper one to the northwest and north has all the tributaries of the Ganges and Brahmaputra Rivers. The lower one towards the south has the distributaries of the two rivers. But towards east this lower plain has the tributaries of the Meghna River.

The Bengal basin is divided mainly into two countries, India and Bangladesh, but partly to Bhutan and Nepal. These divisions did not follow any natural barrier but was made politically. Thus we can find rivers originating in Bhutan travels through India and then pass through Bangladesh (the Dharla River). The Mechi River originates in Nepal pass through India and fall into the MahanandaRiver. Some rivers originate in Bangladesh travel through India and then again enter Bangladesh (Atrai, Punarbhaba).

Thus, water resources generated in Bangladesh is very much inter-dependent between these countries. The characteristics of these basins with the flood plains evolve the water resources throughout the year in different seasons in Bangladesh.

5.4 Rivers of Bangladesh

The total catchment area of these three mighty rivers stands 1.72 million square meter covering areas of China, India, Nepal, Bhutan and Bangladesh of which only about 8% lie within Bangladesh. The country is criss-crossed with more than 425 rivers (Nod Nodi, 2012) most of which are either tributary or distributary to the major rivers. There are 57 rivers which originate outside the boundary of Bangladesh. The total length of water way of Bangladesh is approximately 24,000km and cover 9778 km^2 or 7% of the country. The annual volume of flow passed Baruria just below the confluence of Brahmaputra and Ganges is 795,000 million m^3.

The Brahmaputra-Jamuna River draining the northern and eastern slopes of the Himalaya is 2900km long and has a drainage area of 573,500km^2. In the

Bangladesh reach (length 240km) the river has several right bank tributaries: the Teesta, the Dharla, the Dudhkumar etc and two left bank distributaries – the Old Brahmaputra and the Dhaleswary Rivers. It is a wandering braided river with an average bankful width of about 11 km (Coleman, 1969). The channel has been widening, increasing from an average of 6.2 km in 1834 to 10.6 km in 1992 (FAP16, 1995). The river has an average annual discharge of 19600 m^3/sec. The river drains estimated $620x10^9$ m^3 of water annually to the Bay of Bengal. The discharge varies from a minimum of 3000 m^3/sec to a maximum of 100,000 m^3/sec. It has an average surface slope of 7cm/km (Hossain, 1997).

The Ganges River draining the south slope of Himalayas has a drainage area of 1,090,000 km^2 and a length of 2200 km. It is a wide meandering river with a bankful width about 5 km. In the Bangladesh reach (length about 220 km), a left bank tributary named the Mahananda joins the river upstream of the Hardinge Bridge and a right bank distributary the Gorai carries a part of the high stage Ganges flow to the Bay of Bengal. The average annual discharge of the river is around 11600 m^3/sec and drains $366x10^9$ m^3 of water annually to the Bay of Bengal. The discharge varies from a minimum of 1000 m^3/sec to a maximum of 70,000 m^3/sec with a dominant discharge of about 38,000 m^3/sec. The dry period discharge decreased from 2250 m^3/sec before 1975 to only 650 m^3/sec after 1975 (RSP, 1994). The water surface slope of the river is about 5cm/km. It has observed that the dry period discharge is often much lower than 650 m^3/sec (Hossain, 1992).

The Upper Meghna River originates in the Shillong Plateau and foothills. It is a canaliform type of meandering river and locally anabranched. It is relatively a small river having a bankful width of about 1km. The river has a catchment area of about 77,000 km^2 and a length of about 900 km. The river drains $151x10^9$ m^3 of water annually to the Bay of Bengal. The average annual discharge of the river is about 4800 m^3/sec and dominant discharge is about 9500 m^3/sec. The lower reach of the river becomes tidal during December-April period with negligible residual flow and reaches a maximum discharge of about 20,000 m^3/sec during monsoon.

5.5 Surface Water

The source of surface water in Bangladesh is the rainfall fallen over this country, and the stream flow coming in from outside this country. With an average rainfall of about 2300 mm it generates about 276 Million-Acre-Feet (MAF) of water (Haque, 2008). Water coming from outside by stream flow is estimated at about 818 MAF annually. Thus the total water resource generated in this country is about 1094 MAF or 1350 Billion Cubic Meter (BCM) annually. However most of this huge resource is drained down to the Bay of Bengal, and forms brackish and sweet water mixed ecosystem in the estuaries. The water brings down about 1400

million tons of silt annually to deposit over the flood plains and in the Bay of Bengal.

The surface water resource of this country is very much essential for its human and animal living, aquatic flora and fauna, navigation, agriculture, fisheries, forestry etc. It is also necessary for keeping alive the distributaries in the delta, and to maintain the brackish water eco-system along the sea, on an annual cycle. Thus the surface is essential for keeping the environmental balance of the total region, particularly in the estuaries to the south and at the mouth of the rivers. The ecosystem varies in character from west to east depending on the variability of sweet water from the upland sources.

In Bangladesh, surface water fluctuation is very common in the rivers, as they vary on seasonal precipitation and remain dependent on the inflow from the upland sources. Precipitation is significantly less during winter and high summer period. At this time, water demand for irrigation is high. So the use of groundwater at the same time with surface water is very high in Bangladesh during these times. Surface water monitoring is a necessity for water resources management and flood forecasting.

The rivers and wetlands in Bangladesh are the places of storage of its large quantity of surface water. The wetlands called the beels and haors are depressions caused by shifting of river courses, tectonic activities and land subsidence over ages. The open water bodies keep the dry season storage in winter and through their drainage outlets contribute to the base flows of the outfall rivers. Many rivers have flood plains over the countryside, those go under water during the monsoon and the floods. These water storages fluctuate on the fluctuations of their upstream water stages.

Among the closed water bodies the baors lay mostly in southwestern Bangladesh. These are horseshoe lakes formed by the dead courses of the previous rivers. But in Bangladesh, the traditional water storage for surface water is the ponds. The village people excavate these ponds to meet their everyday water demand. In saline coastal areas, embanked low lands store sweet rainwater for crops and public use.

Table 2: Water Area of Bangladesh

Open water bodies (ha)		Closed water bodies (ha)	
Rivers + Estuaries	= 10,32,000	Ponds	= 2,15,000
Beels + Haors	= 1,14,000	Baors	= 5,000
Kaptai Lake	= 68,000	Coastal lowlands	= 1,41,000
Flooded Land	= 28,33,000		
Total	= 40,47,000	Total	= 3,51,000

Total Water Area = 43,98,000 ha = 43,980 sq. km. = 30% of the total surface of Bangladesh (Source: Krishi Diary, 2013)

Change of river courses over recent years made huge surface water loss, particularly in the southwestern region of Bangladesh. The Chitra River in Chuadanga and Jhenaidah, the Kobadak and Betna rivers in Jessore, the Harihar, Bhadra and Mukteswari rivers in Khulna, and the Marichap river in Satkhira districts dried up due to the change in Bhairab River course. The bad effects of these changes were drought in the western part of Bangladesh and also intrusion of salinity in the deeper inland. Resuscitation of the nearly dead rivers and link them to perennial sources did not come out as a successful project during last century.

5.6 Ground water

Bangladesh being the flood plain of the Ganges, Brahmaputra and the Meghna Rivers and being the lower riparian country, much of its land emerged from the sea by their silt deposits. These silt deposits varies in the soil from a few hundred meters deep over the Pre-Cambrian hard rock base in northern Bangladesh to about 20 kilometers deep near the Bay of Bengal. These deposits are formed layer by layer of different qualities of clay, silt, sand and gravels in different historical periods. The ground water storages located between two impervious layers are called the aquifers. Bangladesh has three major aquifers, available at three different depths, ranging from a few meters to about 2500 meters from the ground.

Ground water is generally clear, cool and free of microorganisms, when pumped out from a reasonable depth. From very early time people of Bangladesh used ground water for drinking and household purposes. In this country, for agricultural purposes, people mainly depended on rains; groundwater use supported it on a limited scale. Ground water lifted to surface by shallow or deep tube wells are very common in Bangladesh now a days, for life support and irrigation purposes.

Ground water is conventionally available in aquifers spread all over the country, from a depth of few meters to about 20 meters below the surface. In Barind areas, it may be 35 meters to a few hundred meters deep. Ground water potentials depend on availability of water in the shallow aquifers and storage in the deep aquifers. The ground water storage is measured by taking observations of the drawdown in water table during continued abstraction by pumping.

Ground water table fluctuation occurs due to (i) vertical withdrawal from the deep storage, (ii) recharge of the deep storage by percolation of the rain water, (iii) lateral drainage due to lowering of the adjacent river stages, and (iv) inflow due to the rising of the adjacent river level stages. The hydrology department of BWDB has 1282 groundwater table observation wells, of which about 1200 are active. From these wells, the annual average groundwater fluctuations observed from the

surface are: 1m -6m in Atwari, Panakshichagarh; 2m -9m in Bagatipara, Natore; 1m – 8m in Chuadanga; 0.5m – 8m in Moammadpur, Magura; 1m – 5m in Daulatpur, Khulna; 1m -6m in Bhanga, Faridpur; 1m – 4m in Babuganj, Barisal; 1m – 5m in Bakshiganj, Jamalpur; 0.5m – 8m in Ashtagram, Kishoreganj; 0.5m – 4m in Balaganj, Sylhet; 0.5m – 6.5m in Lohajang, Munshiganj; 0.5m – 7m in Barura, Comilla; 1m – 5.5m in Lakshimpur and 0.5m – 4m in Anwara, Chittagong. Groundwater fluctuation poses a big threat to the irrigation of boro crops of Bangladesh. These crops require high irrigation depth duty, so remain dependent on high water table storage.

Ground water fluctuation now poses a big threat to the irrigation of boro crops in Bangladesh. These crops require high irrigation depth duty and when dependent on high water table storage. Large scale abstraction from the shallow depth water reserves does not get steady replenishment from the resources available in the adjacent areas. As a result, the drop in groundwater table soon becomes out of the reach of the lifting wells, resulting in damage of the crops. A large part of the northwestern Barind area and the central areas of Mymensingh and Dhaka region are suffering from this situation.

5.7 Estuarine water

The Ganges and Brahmaputra rivers of Bangladesh have hundreds distributaries towards the sea, forming series of estuaries big and small. These estuaries have varying degree of salinity in their water, depending on varying quantity of sweet water coming from the upland sources. These are open water bodies covering around 500,000 hectares of area. The water resources qualities in the estuaries changes at different time of the year because of the changes in composition of silt and concentration of salinity. During flood and monsoon, salinity remains near the sea, but the water becomes full of silt carried from the uplands. In autumn and winter, river water becomes clean of silt but because of reduction of upstream flow, salinity starts traveling inland and affects the sweet water agriculture. In Sathkhira and Khulna districts in the southwestern part of Bangladesh, no sweet water flow occurs in the dry season. The coastal water in the estuaries of Bangladesh are very rich in fish habitat in all around the year. The main estuaries are the breeding ground of the Hilsa fish. The coastal area in the southwestern part of Bangladesh has the largest brakish water mangrove forest in the world called the Sundarbans. Chittgong and Mongla are the two seaports in the estuaries of Karnafuli and Pussur rivers.

Coastal lowlands are the major source of sweet water for the people being live in those places and also their livelihood depends on this sweet water. These areas are about 1-2m above the mean sea level vulnerable to submersion by high tide and surge. The coastal embankments were constructed during the sixties along the rivers are vital to stop saline water and surge water inflow into the country side.

The embankments have flushing sluices to allow the required drainage from inside. People also dig ponds inside the polders to store rainwater for drinking and living purposes. Two separate eco systems are maintained side by side one with the brackish water outside the embankment in the rivers and the other with sweet water inside the embanked polder areas.

There are some major wetlands in the southwestern part of Bangladesh which are the vast storage of sweet waters. The draining rivers are rising up by deposition of silt as a result these wetlands cannot drain properly. So the wetlands are expanding their water areas every subsequent year. The water logged people suffer a lot due to this kind of water logging.

5.8 Bay of Bengal

The Bay of Bengal lies between 8^0 and 22^0 N latitudes and longitudes $80^0 - 95^0$ E. It occupies an area of 2,173, 010 sq. km having a wide continental shelf in the north and northeastern side and a narrow shelf in the western side. The Bay of Bengal is practically surrounded by the countries like Bangladesh, India, Myanmar and Sri Lanka and in these countries the exploration and exploitation of marine resources are still in very early stage of development. In many developed countries the marine resources have been playing a vital role in the national economy. Bangladesh including the neighboring countries is having good potentials for harnessing marine resources. The possible marine resources from the Bay of Bengal may be (i) the marine fisheries, (ii) sea water resources, (iii) minerals from beach and deep sea, (iv) energy from tides, waves and wind power, (v) fresh water from desalination process, (vi) tourism and recreation facilities, (vii) geothermal or hydrothermal power, (viii) vegetable gels, (ix) underwater habitats, (x) oil and gas exploration and (xi) sea ports.

5.9 Rain water

According to the Bengali calendar, there are six seasons in Bangladesh. The summer which starts from mid-April, is the season of heat and tornadoes, the country receives heavy precipitation in the monsoon also the flood. The flood water recedes in the autumn which leaves some shallow water storage in the low lying basins. During the winter and spring the country receives very little rainfall. Bangladesh receives sufficient rainfall annually but sometimes suffers from drought in the spring and summer.

5.10 Abstraction

Abstraction of surface water and ground water in Bangladesh are done for irrigation purposes and for the water supply to the cities (big or small). Previously animal operated water lifters were used to lift the ground water for irrigation

purposes. Manually operated indigenous water lifters called 'dons' are still being used to lift surface water for irrigation. Ground water is also lifted by manually operated hand tube wells or by buckets from dug wells for drinking and household purposes. All these are done in shallow aquifers.

Surface water abstraction in major scale started all over the country during mid seventies, when irrigation project started to spread. Low lift pumps were installed along the nearby streams to irrigate the crops especially in the winter season. After that when the streams started to dry up, shallow tube wells were installed to irrigate the high yield crops like Aus. Then came the big irrigation projects where major pumps were installed to get surface water (GK project, Teesta Irrigation project, Feni irrigation project etc.). Abstractions of groundwater from deep aquifers are generally made by 2 cusec lifting pumps for irrigation in the rural areas. Bangladesh Agricultural Development Corporation (BADC) markets the deep tube wells to the farmers. Abstraction from shallow and deep aquifers has increased significantly which results in decreasing in ground water table. Due to this an abated abstraction throughout the country the smaller streams are being dried up for reduction in ground water level around them.

5.11 Recharge of water

Bangladesh is a tropical country which is rich in annual rainfall. This rainfall supports crop production in three seasons round the year (4 crops per year, Daily Star, 08 September, 2013). It also helps the vegetation all over the country. So the evapo-transpiration rate from the surface is very high in Bangladesh. In dry seasons (November – April) the ground water abstraction is very high for irrigation and water supply purposes, it makes the ground water table to fall. At some places excessive withdrawal is letting the soil moisture loss the death of topsoil vegetation. At earlier times, abstraction from groundwater was replenished by the annual rainfall and the infiltration from the river water storage, which is not happening now a days in Bangladesh. In recent years, expanding agriculture and water supply to the cities (mainly Dhaka city) causes excessive withdrawal of ground water which results in fall in ground water table deeper and deeper. Delay in recharge also makes drying out of regenerated rivers in the southwest part of Bangladesh.

5.12 Water related disasters in Bangladesh

Bangladesh is a disaster prone country due to its physiographic, morphologic, hydrologic and other natural conditions. The major elements of disaster related to water in Bangladesh are:

i. Floods
ii. Cyclones associated with storm surges
iii. Droughts
iv. Abnormal rainfall with hailstorm
v. Nor'westers with tornadoes
vi. Erosion and landslides in rivers
vii. Saline intrusion
viii. Pollution in water body
ix. Deforestation and depletion of forest
x. Global warming which in turn gives climate change and sea level rise

The effects of these disasters may be single or multidimensional which in turn makes direct loss to life, livelihood, development and property. The consequences of these hazards pose a direct threat to economic development of a country.

5.12.1 Floods

The possible causes of floods in Bangladesh may be attributed to the following features: (i) general low topography of the country with major rivers draining through Bangladesh, (ii) rainfall in upstream countries and also in Bangladesh, (iii) slow melt from the Himalayas and glacial displacement, (iv) synchronization of major river-peaks and influences of one river on the other, (v) human interferences like deforestation and denundation in the catchment area, construction of unplanned roads, bridges, housing, flood embankment, storage reservoirs, diversion structures, drainage congestion, overgrazing etc., (vi) tidal and wind effects on slowing down the river outflow, (vii) effects of sea level rise, (viii) possible rise of sea bed and land subsidence, (ix) tectonic anomalies, and (x) possible greenhouse effect and depletion of ozone layer. Detail study and analysis is needed to overcome the threats of flooding in Bangladesh. For effective flood management some actions can be considered, (i) construction of barrages to store excess water during monsoon, (ii) construction of embankment to mitigate the effect of flood, (iii) dredging and deepening of the river depth and increase and conveyance capacity of the rivers, (iv) raising the levels of roads and highways with sufficient opening, (v) flood by pass arrangements wherever possible, (vi) new ponds in low lying areas, (vii) change in cropping pattern, (viii) massive afforestation program etc. Flood management technique is being updated and can be updated further by proper use of remote sensing technology, studies of snowmelts from satellite imagery, use of geographic information system, proper utilization of global climate model (GCM) and regional climate model (RCM), use of rainfall runoff models and so on.

5.12.2 Cyclones associated with storm surge

Every year there are some 80 tropical cyclones occurring around the globe, out of which 5% form in the Bay of Bengal (Crane, 1988). The formation, intensification and structure of tropical cyclones are related to (i) low level relative vorticity, (ii) Coriolis parameter, (iii) weak vertical shear, (iv) ocean thermal energy and sea surface temperature, (v) middle tropospheric relative humidity. Cyclones in the Bay of Bengal usually move north westerly in the beginning and then curve eastwards. But patterns are not uniformly followed. The cyclones usually decay after crossing the land causing colossal damages to life and property in the coastal region. Cyclones are accompanied by heavy rains and tidal waves called storm-surges which cause most of the damages. Storm surge height is directly related to cyclone intensity. If the strength of the wind in a cyclone increases then the surge height also increases. Astronomical tides in combination of storm surges lead to higher water levels and causes severe flooding to low lying coastal areas. Catastrophic cyclones occurred in the Bay of Bengal and hit Bangladesh area in the years: 1584, 1876, 1919, 1942, 1960, 1961, 1963, 1965, 1970, 1985, 1988, 1991, 2004 and 2007.

5.12.3 Droughts

Drought is an abnormal condition where there is a lack of sufficient water to meet various requirements and support satisfactory plant growth without enough soil moisture. The results from insufficient or no rainfall for an extended period causing a considerable hydrological imbalance and consequently water shortage, crop damage, stream flow reduction and depletion of ground water and soil moisture. In drought condition evaporation and transpiration exceeds precipitation and if it continues for long period serious hazard occurs to the affected area. The deficiency in rainfall conditions mostly occur in Bangladesh during pre-monsoon and post-monsoon periods in spatially limited area. The severe impact of drought on agricultural production and development strategies in drought prone areas of Bangladesh have been dealt in depth by Brammer, 1985 a,b. The salient features of these strategies are to consider environmental variability, climate variability, agro-ecological zones of Bangladeshand existing cropping patterns and practices.

5.12.4 Abnormal rainfall with hailstorm

The mean annual rainfall in Bangladesh varies from about 1400 mm in the western part of the country to 5000 mm in the north-eastern region. There are wide seasonal fluctuations with about 90% of the rainfall occurring in the four months period of the monsoon (June-September). Depending on the formation, structure, intensity and frequency of the monsoon depression the total rainfall during the monsoon has been decided. In spite of an overall abundance of rainfall during the monsoon, serious droughts do occur. Uncertainty in pre monsoon

showers and hailstorms, lighting etc causes tremendous impact on agricultural production. To deal with this problem studies in the field of studies on the timing of the withdrawal of the monsoon and its impact on the water system are needed. Also number of rainfall in pre monsoon period and its effect on water bodies need to be studied.

5.12.5 Nor'westers and Tornadoes

Bangladesh is a part of the humid tropics and seasons in Bangladesh may be divided into three, (i) Winter (November-February): little or no rainfall, dry, receding humidity and bright sunshine, (ii) Summer (March-May): 20% of the annual rainfall occurs during this time and frequent tornadoes and nor'westers also hit the country, low humidity and high temperature, (iii) monsoon (June-October): warm, rainy, humid and low solar radiation. The two transitional periods between south-west and north-east monsoon over the Indian subcontinent are characterized by local severe storms. Tornadoes are generally associated with severe nor'westers.

5.12.6 Erosion and landslides in rivers

The erosion caused along the rivers of Bangladesh is mainly of four types: (i) erosion by stream floware very common in our rivers in Bangladesh. The bed materials of a river are getting loose by the suction of stream flow resulting in bank fall or erosion. The erosion rate depends on the flow velocity and the bed materials diameter. The big rivers have historical limits of bank shifting in both sides. The eroding rivers normally bounce back after reaching these limits. Therefore the widths of the river between their banks of historical limits are several times larger than the actual bank width of the flowing channels. The soils are mainly composed of sand, silt and sand mixed clay. People in the eroding river bank side are severely affected by the river erosion and are always under threat. (ii) erosion by slope failure are very common in meandering rivers. These rivers are flowing in the plain lands have bank limits composed of clay soil at their meandering bends. These banks fail sometimes at sudden lowering of the river water level. (iii) erosions by land subsidence occur along the banks of the coastal rivers. The soil in the coastal riverbanks is composed of marine clay, often underlain peat deposits. Due to tidal effects the riverbank soil remains saturated round the year and cannot take the surcharge and subside by lateral shifting. (iv) erosions by wave is countrywide problem in big rivers, in haor areas, in coastal belts and along seafronts. The coastal belts and the sea fronts also face tidal and cyclonic surges. The water front with abnormal height and strength hits the bank or shore and then washes the top materials down by reverse undercurrents.

5.12.7 Salinity intrusion

Water and soil salinity has become a normal hazard in many parts of coastal area of Bangladesh. It affects different uses of water such as irrigation, drinking, household, fisheries and healthy functioning of the ecosystem. It has been seen in the south western area of Bangladesh salinity increases steadily from December through February and maximum in early April (EGIS, 2001). Salinity levels both in river and in the surrounding canals are higher that the drinking water standards as well as the standards of the irrigation water. Salinity levels of groundwater at shallow depths (60 – 70 ft) are low, whereas salinity levels at deeper depths (850-1350 ft) are sometimes very high (3000 – 4000 μS/cm). About 20% of the net cultivable land of Bangladesh is affected by different degrees of salinity (Karim et al, 1990). Salinity level which exceeds the tolerance limit can affect the human health. The health related problems identified due to salinity in the south-western region are diarrhoea, fever, high blood pressure, gastric problem, skin problem etc. To mitigate the salinity problem different management options need to be investigated. There are other ways to handle this water related crisis like application of gypsum, plantation of leguminous crops, selection of more salt tolerant crops, rainwater harvesting, suitable location of tube wells etc.

5.12.8 Pollution in water body

The concerns over water quality relate not just to the water itself, but also to the danger of diffusion of toxic substances into other ecosystems. The aquatic environment for living organisms can be affected and bioaccumulation of harmful substances in the water-dependent food chain can occur (WARPO, 2000a). A variation of inland surface water quality is noticed due to seasonal variation of river flow, operation of industrial units and use of agrochemicals. Overall, inland surface water quality in the monsoon season is within tolerable limit with respect to the standard set by the Department of Environment (DoE). However, quality degrades in the dry season. The salinity intrusion in the Southwest region and pollution problems in industrial areas are significant. In particular, water quality around Dhaka is so poor that water from the surrounding rivers can no longer be considered as a source of water supply for human consumption (BCAS, 2000). The largest use of water is made for irrigation. Besides agriculture, some other uses are for domestic and municipal water supply, industry, fishery, forestry and navigation. In addition, water is of fundamental importance for ecology and the wider environment.

The major causes of degradation of inland water quality are related to land based activities, when adequate regulatory measures are not incorporated and the stakeholders do not show proper concern. The underlying driving forces for this are poverty, an unhealthy national economy, lack of institutional strength, and lack of awareness and education. Pollutants that enter the marine and coastal

environment originate on land in the form of runoff from municipal, industrial and agricultural wastes, and from commercial seafaring activities.

The increase in the urbanization and industrialization of Bangladesh has negative implications for water quality. The pollution from industrial and urban waste effluents and from agrochemicals in some water bodies and rivers has reached alarming levels. The long-term effects of this water contamination by organic and inorganic substances, many of them toxic, are in calculable. The marine and aquatic ecosystems are affected, and the chemicals that enter the food chain have public health implications. Water quality in the coastal area of Bangladesh is degraded by the intrusion of saline water that has occurred due to lean flow in the dry season. This affects agriculture significantly, as well as other consumptive uses of the water.

5.12.9 Deforestation and depletion of forest

Bangladesh has a total forest land area of 2.5 million hectares out of that the Sundarbans and coastal forest occupy near 0.8 million hectares and the CHT has nearly 0.9 hectare. Though a large area within the Sundarbans has already become non-productive, bushy forest or vacant land, the overall situation there still is not that frustrating like forests lands of the plain land districts e.g. Bhawal-Madhupur and Barind tracts and the hill forests of Chittagong, Sylhet and CHT.

As per the landsat data CHT has 7,00,000 hectares of completely deforested and 3,55,000 hectares of partly deforested lands. The Bangladesh forest with its exuberant majesty and biodiversity depleted and shrank to 6 percent from 20 percent of land area within a time span of 50 years after 1947. This happened due to policy weakness, over exploitation and law and order failures. True, there is lack of legislation to provide protection to the national forest but poor implementation mechanism of the existing rules perhaps cause as greater damage in this regard (Hasan, 2001).

Physical and environmental causes consists of increased salinity, sedimentation, erosion and accretion, oil spills, problem in ecological succession, climate change impact, natural calamities, wild elephants, heavy rainfall and hail-storm are responsible for the forest degradation of three forest areas in Bangladesh.

5.12.10 Global warming causes climate change and sea level rise

Most of the climate change impacts in Bangladesh are likely to come from the south - that is, the Bay of Bengal and the adjoining North Indian Ocean. These waters are the sources of tropical cyclones and storm surges, coastal erosion, monsoon wind, evaporation for monsoon rainfall, floods, and droughts. Bangladesh is likely to be one of the most vulnerable countries of the world in the

event of climate change (Shah, 2012). The global warming due to the increase in greenhouse gas concentrations in the earth's atmosphere and the consequent sea level rise (SLR) are going to add fuel to the fire. Almost every sector of socio-economic life in Bangladesh is likely to be affected by climate change.

There are a number of reasons for the storm surge amplifications on the Bangladesh coast. Shallow water in the North Bay, the northward-converging nature of the Bay (at the head of which Bangladesh is situated), and high astronomical tides are the main causes of storm surge amplifications on the Bangladesh coast. The Meghna estuarial region is the area where most of the surge amplifications occur. The country's low and flat terrain is easily flooded by amplified surge waters, thus converting the coastal land area into a vast sea. Any increase in sea surface temperature (SST) is likely to cause greater convective instability, leading to an increase in the wind speed. The stress exerted by wind on water underneath is proportional to the square of the wind velocity. Thus an increase in SST due to climate change will lead to higher storm surges and a higher risk of coastal disasters in low-lying coastal areas of Bangladesh.

5.13 Conclusion:

Water is available in blue form in the rivers, green form in the plants, fossil form in the ground water, brackish form in the estuaries and saline form in the sea. In Bangladesh, water in its all forms serves its people since the historical time. It is the backbone of this densely populated country. In this modern time, development of infrastructure such as cities, industries, growth of population etc. brought new challenges. These led to the increasing abstraction and intervention to the natural water system and also introduce indiscriminate use of water. These continuous interventions now effect the physical, chemical and biological environment of water bodies in Bangladesh which in turn affect the man, animals and plants. Bangladesh can overcome these problems with scientific and holistic approach to water system. Water can be an economic good but not at the cost of human life and natural system of the environment.

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Chapter 6: Environmental Pollution In Bangladesh

Shafi M. Tareq

Abstract: *Environmental pollution is the byproduct of the development of civilization and in fact a price for the progress. The present environmental condition of Bangladesh is not at all equilibrium. Soil, water and air pollution are threatening public health, ecosystems and economy. Soil is being polluted due to the indiscriminate industrial discharge, use of unbalanced agrochemicals and dumping of solid wastes including radioactive waste. Water pollution is caused due to the industrial effluent, sewage disposal and solid waste damping into the waterways. Groundwater of Bangladesh is heavily polluted by arsenic. Air pollution is caused due to the increasing population, industrialization and vehicular exhaust of fossil fuel. Environmental degradation of Bangladesh is accelerated by poverty, over-population and lack of awareness on the subject. It is also manifested by deforestation, destruction of wetlands and natural calamities. Environmental pollution has many facets and the resultant health risks include diseases in almost all organ systems of human health. This paper will provide an overview of major types of environmental pollutions in Bangladesh and the associated problems.*

6.1 Introduction:

The dread of environmental degradation has touched almost all conscious people all over the world. The problem has taken an acute form in developing countries like Bangladesh. Bangladesh is the biggest delta of the world and is located in the tropics between 20°34'N to 26°38'N latitudes and between 88°01'E to 92°42'E longitudes. Bangladesh has the land area of 147,570 sq. km and the country has been classified into three physiographic regions- floodplain, terraces and hills including 24 sub-regions (BBS, 2009). It has a border on the west, north, and east with India, on the southeast with Myanmar, and the Bay of Bengal to the south. According to the 2011 census it is an abode of 150m population with the density of 964 persons per sq. km. Its per capita income as of 2013 is US$1,044 compared to the world average of $8,985 (IMF, 2013). The Government of Bangladesh is committed to rapid industrialization as a route to strengthen exports and employment opportunities. While these developments are beneficial in terms of employment and growth aspects, they have also added to environmental degradation. More than 1200 industrial sites were identified by the Department of Environment, GoB in 1997 as causing significant pollution.

Environmental issues have become major concerns due to the high rate of environmental degradation and their impacts on public health of Bangladesh. Soil

and water pollution, groundwater contamination and air pollution are the main environmental pollutions of Bangladesh. Environmental problems occur mainly due to population growth, urbanization, industrialization, rapid rise in transportation, inadequate and improper traffic management, poor sanitation systems and inefficient solid waste management (Alam, 2009). Environmental and health related problems have become a major global concern in the recent years. Arsenic exposure is a potential health risk to the local population in most of the parts of Bangladesh. Developmental activities such as construction, transportation and manufacturing not only deplete the natural resources but also produce large amount of wastes that leads to pollution of soil, water and air. Untreated or improperly treated waste is a major cause of pollution of rivers and freshwater ecosystem. High growth of population increases the habitats that are diminishing the plants in the rural areas particularly to gain new living spaces as well as to meet their requirement of fuel substitute for cooking, in brick fields and other small industries. It is envisaged that our unplanned economic growth in the past has increased environmental degradation and adversely affected both the renewable and non-renewable resources of the country. The country thus emphasizes on economic development with control of major environmental elements- land, water and air. Monitoring and evaluation of environmental pollutions and implementation of laws related to environmental issues are considered as the essential requirements to ensure sustainable economic growth in Bangladesh. Government as well as other organizations must take adequate steps to reduce the environmental pollution of Bangladesh.

6.2 Some Aspects of Environmental Pollution In Bangladesh

Like other developing countries Bangladesh faces the whole spectrum of environmental problems. Deterioration in the overall environmental conditions has become one of the major concerns of this country. Soil, water and air pollution are the main environmental issues in Bangladesh. The growth of industries in the country has generally been unplanned, without careful consideration of environmental protection issues. There are many industries in residential areas, causing air and water pollution through smoke emission and dumping of untreated effluents. Repeated discharge of industrial wastes- toxic chemicals, chemical compounds and organic materials in the environment brings the failure of the self cleansing mechanism of the environment. There are several toxic wastes, which do not disappear and persist for long time and cause severe damage to environment and human health.

6.2.1 Soil Pollution: Causes and Impacts

Intense urbanization, large scale industrialization and unprecedented population growth in the last few decades have been responsible for lowering soil quality. In

Bangladesh, the topsoil degrades due to natural processes and human activities. Soil contamination with metals is a serious concern due to their toxicity and ability to accumulate in the biota. The functional capabilities of soil deteriorate from activities related to agriculture, forestry, and industry.

On the other hand, urban sprawling and infrastructure development cause loss of available land. Natural events such as cyclones and floods cause land loss, and can also deteriorate functional capabilities of soil. Soil degradation in the coastal area results from unplanned land use, as well as intrusion of saline water. Soil fertility is a complex but important indicator for sustainable agriculture. In modern agriculture due to the use of inorganic fertilizers soil fertility is greatly affected. Soil reaction (pH), Organic Matter (OM) and different macro and micronutrients are the main determinants of soil fertility. OM is the key quality factor for retaining nutrients in soil and pH is the deciding factor for the availability of essential plant nutrients. In Bangladesh 30 Agro-Ecological Zones (AEZs) have been identified and their crop species and fertility status vary considerably based on the combination of the nutrient and organic matters exist. Bangladesh soils are suffering from chronic arsenic contamination and increasing salinity in the coastal region. On the other hand, indiscriminate use of pesticides and dumping of solid waste are the other causes for the deterioration of soil quality.

1.2.1.1 Main Causes Of Soil Pollution

Industrial pollution

Industrial pollution is a growing concern of the present days. Unplanned industrial development is of concern because it often encroaches on fertile land and industrial effluents deteriorate the quality of soils. Effluents, mostly untreated, are primarily discharged into rivers, streams and open land. Industrial effluents containing toxic heavy metals, fly ash, chemical residues, metallic and nuclear wastes greatly affect soil quality. A large number of industrial chemicals, dyes, acids etc find their way into the soil and are known to create many health hazards including cancer. As in Bangladesh industrialization is being increased rapidly, it is an important concern to monitor soil quality.

Solid waste

Although waste can be considered as "unrecovered wealth," it remains a concern in Bangladesh. Unplanned urbanization, coupled with an acute density of population provokes a plethora of industrial and commercial activities and thus accelerates the pace of economic growth that contributes to excessive amount of waste in Bangladesh. Rapid change in consumption and production patterns and a reorientation in our lifestyle determine the course of waste generation. Huge

amounts of waste that remains uncollected on the capital's streets every day due to the absence of proper waste management expose the city dwellers to greater environmental hazards and health risks. Uncollected waste dumped into the rivers and low lying areas or left on the roadsides not only block the city's drainage networks but also create an unhealthy and stinking environment. Rising waste volumes (Table 1) and increasing complexity of waste streams have become major and growing public health and environmental problems.

Table 1: Wastes Generation Scenario in Bangladesh (MoEF, Bangladesh, 2013).

Category	Total volume of wastes
Total volume of municipal solid wastes in urban areas*	4,866,505 tons/year 300 tons/day in Dhaka
Agricultural waste	65 million metric tons/year
Industrial waste (hazardous) from seven selected sectors (textile, hospital clinics, tannery, pesticides, fertilizer, oil refinery as well as paper and pulp industries)	109.47 million cubic meter/year (wastewater) 0.113 million ton/year (sludge) 26, 884 tons/year (solid waste)
Hazardous medical waste	12,271 metric ton/year
By 2025 (Solid waste)	17,155,000 tons/year 0.60 kg/day in Urban Areas

*Waste per capita (kg/day) - Urban: 0.41; Dhaka, capital city: 0.56

Unbalanced use of chemical fertilizers

The use of chemical fertilizers is directly linked to farming in irrigated lands. Three types of fertilizers such as Urea, Triple Supper Phosphate (TSP) and Muriate of Potash (MP) and four types of pesticides are commonly used in Bangladesh, which are insecticides, herbicides, fungicides, and rodenticides. Increased application of pesticides is being observed which has serious implication to quality of land and ecosystem. Farmers of Bangladesh are using pesticides since 1957 and at present on an average of 12-15 thousand tons of pesticides are used every year. Insecticides account for about 90 percent of the total consumed pesticide, and is used most for cultivating vegetables and *Rabi* crops. Although pesticides are used at low levels still they are a cause of land degradation. The pesticides sprayed over standing crops ultimately contaminate the surrounding soil. Research findings showed that pesticides applied at the rate of about one kilogram per hectare contaminates the topsoil to a depth of about 30 cm. Pesticides not only destroy harmful insects, but also destroy useful topsoil

microbes, which eventually reduce the biological nutrient replenishment of the soil.

Faulty Irrigation

The availability of irrigation water can be a blessing or a curse depending upon how it is used. During the Fourth Five Year Plan (FFYP, 1990-94) a tremendous increase was made in the installation of Shallow Tubewells (STWs) and Deep Tubewells (DTWs) for groundwater irrigation. Most of this irrigation water is being used on relatively impermeable highlands of piedmont plain, meander floodplain and in terrace areas. A very small area is being irrigated in the *haor* basins by this irrigation system. In the highlands, the cropping pattern is mostly transplanted HYV *Boro/Aus* followed by rain-fed transplanted *Aman*, but in the basins broadcast *Aman* is grown followed the HYV *Boro/ Aus* varieties. As a result of this irrigation, the land remains inundated in most of the seasons, which keeps an adverse effect on soils because of continued oxygen deprivation in the sub-soils. Chemical changes of soil material occur by forming toxic compounds for plants and constant percolation loss of essential nutrient elements including micronutrients and organic matter.

Salinity

Land with saline soil occurs in the young *Meghna* estuary floodplain and in the southern part of the *Ganges* tidal floodplain. Salinity in the coastal areas developed due to continuous accumulation of salt from tidal flooding and salt removal by leaching or washing by rain or inadequate freshwater flushing. Salinity during the dry season mainly develops from the capillary rise of brackish groundwater to the surface. Total salt affected area of the coastal area is 0.83 million hectares. According to PDO-ICZM (2004), 70% of the 2.35 million hectares within the Khulna and Barisal Divisions is affected by different degree of soil salinity.

Radioactive pollution

A number of radioactive isotopes are used in medicine, either for treatment or diagnosis. These can be left to decay over a short period after which they are able to be disposed of as normal waste. Radioactive medical waste tends to contain beta particle and gamma ray emitters. Residues from the oil and gas **industry often contain radium and its decay products. The sulfate scale from an oil well can be very radium rich, while the water, oil and gas from a well often contain radon. The radon decays to form solid radioisotopes which form coatings on the inside of pipe work. Industrial source waste can contain alpha, beta, neutron or gamma emitters. Gamma emitters are used in**

radiography while neutron emitting sources are used in a range of applications, such as oil well logging. Indiscriminate disposal of these radioactive wastes can be detrimental to the soil biota and can effectively damage the soil quality in long term.

6.2.1.2 Impacts of Soil Pollution On Environment & Human Health

Contaminants in soil result in reduced soil fertility, reduced nitrogen fixation, increased erodibility, larger loss of soil and nutrients, deposition of silt in tanks and reservoirs, reduced crop yield and imbalance in soil fauna and flora. Industrial wastes consist of a variety of chemicals which are extremely toxic to living beings. When these are in soil, they enter in the food chain causing a number of undesirable effects on human health. Metallic contaminants (Hg, Zn, Cd, etc) destroy bacteria and beneficial microorganisms in the soil. Some of the trade wastes contain pathogenic bacteria, e.g., *Anthrax bacillus* bacteria from tannery wastes. Open discharge of this waste in soil can cause epidemic. Sewage is the good medium for the growth of pathogenic bacteria, viruses etc. For example, *Vibrio cholerae* found in sewage causes cholera. Solid wastes result in offensive odor and cause clogging of ground water filters. Suspended matter in sewage can blanket the soil, thereby interfering with the soil moisture. Potassium fertilizers in soil decrease the valuable nutrient ascorbic acid (vitamin C) and carotene in vegetables and fruits. Pesticides retained in soil concentrate in crop, vegetables, etc., which taint them to such an extent that they are not usable. Organo phosphates pesticides used in soil cause extreme muscular weakness, tremors and dizziness in poisoned animals. Pesticides like DDT, endpin etc are known to seep gradually through soil into ground water and contaminate drinking water supplies.

6.2.2 Water Pollution: Causes and Impacts

Water quality is one of the most significant environmental challenges of the 21st century. Nearly half the people in developing countries suffer from health problems due to a lack of clean water and proper sanitation (UNDP, 2006). Water pollution creates serious health hazard for Bangladesh. Dumping of municipal wastes, hospital wastes and toxic environmental discharges from industries mostly pollute both surface and ground water sources. The most dangerous threat emanating from environmental degradation in Bangladesh is water pollution.

6.2.2.1 Main Causes Of Water Pollution

Water pollution stems from many pollutants such as, toxic chemicals from industrial activities, solid waste from urban areas with inadequate garbage collection and nutrient pollution from both point sources, such as sewage treatment plants, and from non-point sources, such as the diffuse runoff and

leaching of fertilizers, animal manures from farm fields, lawns, cities, roads, clear-cut forests, mines etc. These point and non-point sources (Fig. 1) are the main contributors of pollutants (industrial chemical, nutrients, suspended solid, solid wastes etc) in freshwater ecosystems.

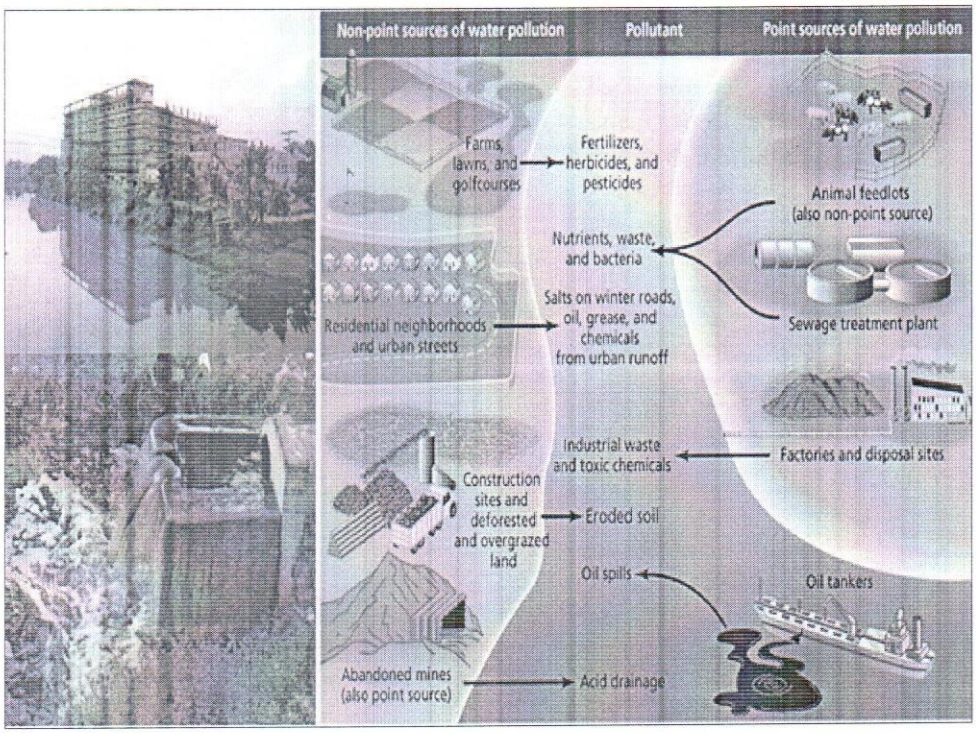

Fig. 1: Point and non-point sources of water pollution.

Industrial wastes (including ship breaking yards)

There are various types of the industries in Bangladesh of which major types are jute, pulp and paper, textiles, fertilizer, rubber and plastic, tannery, food and beverages, sugar, pharmaceuticals, tobacco, distilleries, ship breaking etc. Toxic substances are generally released as a result of manufacturing operations, effluent discharges, and accidental spills. When accidentally released into the aquatic environment, they can have severe adverse effects on aquatic ecosystems. Many compounds are very persistent in the aquatic environment, bio-accumulates in aquatic organisms, and is highly toxic to humans via the consumption of aquatic food. Tannery industries, located at Kalurghat in Chittagong, discharge nearly 150,000 liters of liquid waste per day while the Karnaphuly Paper Mill releases 0.35 tons of china clay everyday (ADB, 2004). The water of the coast of Shitakunda contains high concentrations of several heavy metals such as mercury, cadmium, lead, chromium, iron etc which greatly exceed the Bangladesh quality

standards for these metals (Fig. 2). This high level of metals is the result of the development of ship breaking industries in this area and their indiscriminate discharge of waste into open seawater.

More than 200 rivers of Bangladesh directly or indirectly receive a large quantity of untreated industrial wastes and effluent. Everyday approximately 700 tanneries of Dhaka city are discharging about 16,000 cubic meters of toxic wastes into rivers. The Department of Environment (DoE) has listed 1,176 factories that cause pollution throughout the country.

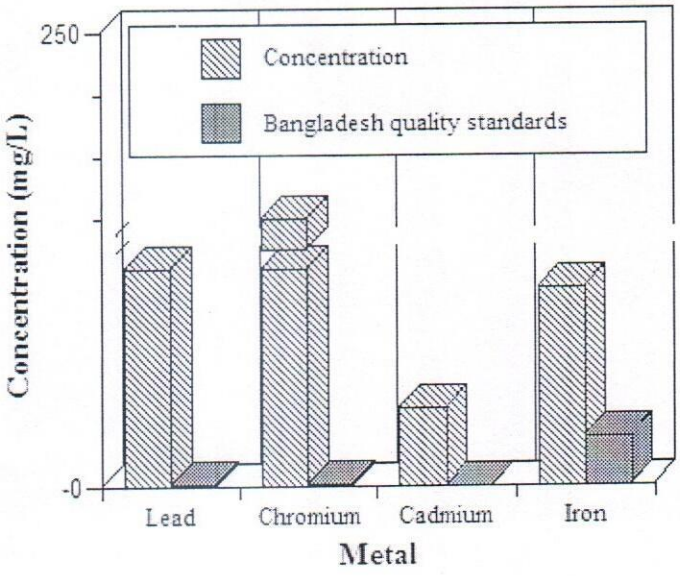

Fig. 2: Metal concentrations in the coastal water of Sitakunda area, near ship break yard (Islam, 2004).

Fig. 3 shows the percentages of pollution by five industrial sectors of Bangladesh in 2001. Among different industrial sectors (fertilizers, food, metals, pharmaceuticals, paper and pulp) paper and pulp industry is responsible for highest industrial discharge and pollution percentage.

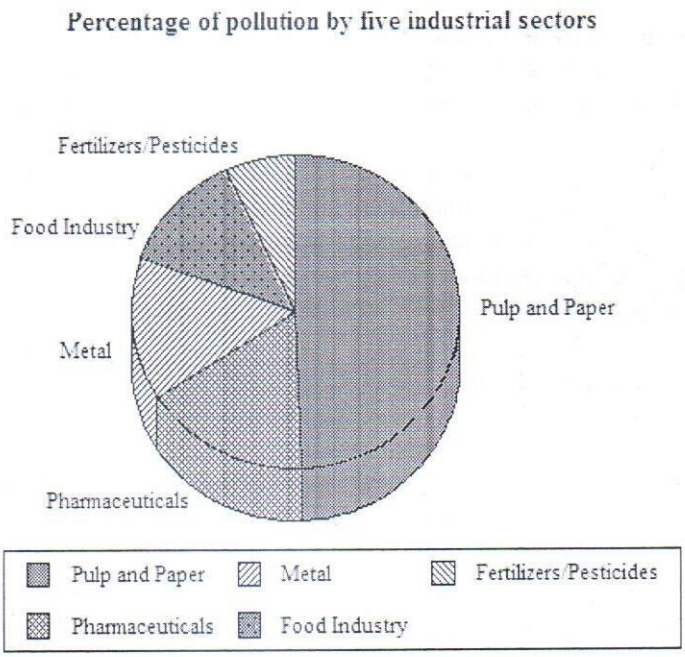

Fig. 3: Water Pollution by most five industrial sectors (Islam, 2001).

Sewage disposal

In fact, most of the cities of Bangladesh do not have any proper sewerage system or sewage treatment plant in place. All the urban cities are supported by septic tank and pit sanitation. Poor households use community latrines. However, these systems are directly or indirectly connected to canals or rivers through surface drain of the city. This resulted for about 3.5 tons per day of BOD load in the Karnaphully river in 1988 at Chittagong, when the population of the district was about 5 millions only (Ali, 1997). In Khulna, the domestic load was estimated at about 2.2 tons BOD per day when the population of the district was less than 2 millions in 1988. In 2001, population of these two major coastal districts has increased to over 2.36 million (Khulna) and 6.54 million (Chittagong) respectively (BBS, 2001). Assuming 100 gm of human waste is generated per person per day, the total quantity of waste of only these two cities amount to around 900 metric tons (MT) of human waste in a day. This situation is becoming more serious due to increase of population all over the country and lack of proper sanitation as well as sewage treatment facilities.

Solid wastes

The indiscriminate discharge of domestic sewage, hospital sewage and solid waste are the major sources of water pollution in Bangladesh. About 4,000 to

4,500 tons of solid wastes are generated daily and half of the generated wastes are disposed of in low lying areas or into river water. These solid wastes are associated with the problems of littering on roads, spilling around the bins, clogging of drains, indiscriminate dumping on vacant plots and cause serious environmental pollution. Most of the hazardous medical waste from the city's hospitals and clinics remains uncollected and gets mixed up with the household waste. Stacks of assorted waste putrefied in the open can spread various harmful diseases like hepatitis, HIV, dysentery, diarrhea, malaria, scabies and skin ailments. The dumping sites also create a toxic liquid substance called leach, which can trigger pollution even at the underground water level. More than 500 hospitals and clinics of Dhaka city generate and release hazardous and toxic wastes without any treatment. The generated solid wastes of six famous hospitals / clinics of Dhaka city are shown below (Fig. 4):

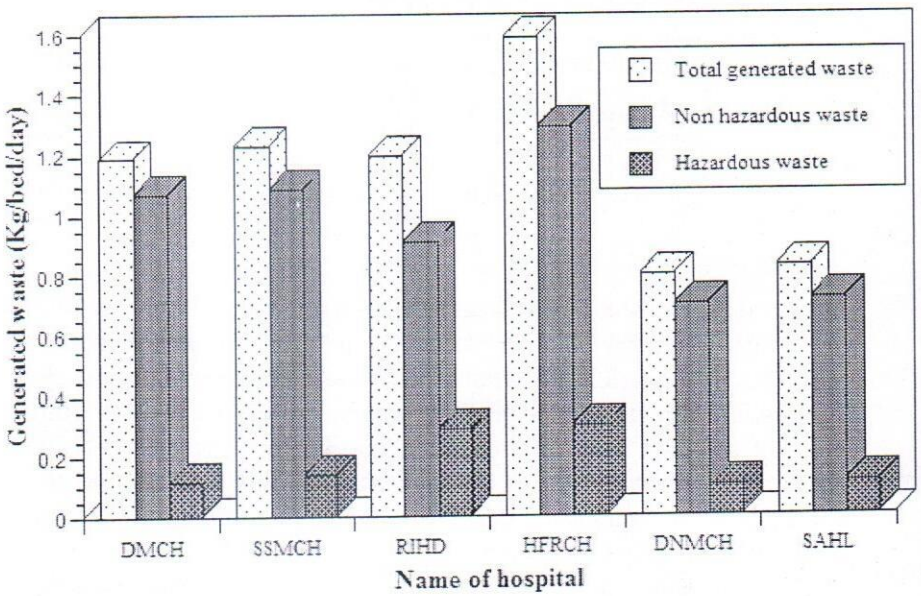

Fig. 4: Solid waste generation from six famous hospitals/clinics of Dhaka city (Alam, 2009). (DMCH= Dhaka Medical College Hospital, SSMCH= Sir Salimullah Medical College Hospital, RIHD= Rehabilitation Institute & Hospital for Disabled, HFRCH= Holly Family Red Cressent Hospital, DNMCH= Dhaka National Medical College Hospital, SAHL= South Asia Hospital Limited).

Agrochemicals

The total use of pesticides in Bangladesh was 18,080 MT in 2003, whereas it was only 3,985 MT in 1984 (PAB, 2004). The uses of pesticides in Bangladesh have

increased enormously in the last 20 years nearly six times from 1984. About 25% of pesticides may reach surface water system as residue during rainy season (ESCAP, 1987). Besides this, the same amount or even more may wash into the river system during flood inundation when nearly half of the country gets submerged. On the other hand, the issue of human health and environmental hazards caused by persistent organic pollutants (POPs) has got increasing concern of the whole world because of their toxicity and availability in air, water and food. It was reported that about 250 kg of PCB might release to the environment from each ship in the ship breaking yard of Chittagong area. Considering 90 old ships dismantled in each year, the total influx of PCB in Bangladesh from ship breaking industry could be assumed to be about 22.5 tons. The situation regarding POPs is certainly and undoubtedly devastating in the context of Bangladesh because most of these pollutants are used in agriculture as pesticides and 80% of the total population is still farmers and obviously they are exposed for long time to these chemicals and may face carcinogenic and non-carcinogenic health effects.

Salinity intrusion

Water and soil salinity is a common problem in many parts of the coastal zone of Bangladesh affecting agricultural and industrial activities. Saline water intrusion is highly seasonal. It is at its minimum during the monsoon (June-October) when the main rivers discharge about 80% of the annual fresh water flow. Saline water intrusion is aggravated in the coastal area of the country in dry season, when water flow from the river system becomes lean. In dry season months, the saline front begins to penetrate inland, and the affected areas rise sharply from 10 percent in the monsoon to over 40 percent. Generally, reduction of water flow causes saline water intrusion into the river system.

Arsenic contamination of groundwater

Arsenic in groundwater poses a serious environmental hazard for Bangladesh. About 97% of Bangladesh people have been using groundwater as the main source of drinking water but the water has been threatened by arsenic contamination. Groundwater arsenic contamination in Bangladesh is reported to be the biggest arsenic calamity in the world in terms of the affected population (Talukder et al., 1998). The Government of Bangladesh has addressed it as a national disaster.

The acceptable level of arsenic in drinking water is 0.05 mg/l for Bangladesh but in some places it is found more than 70 times higher than that standard. Bangladesh has the highest percentage of contaminated STWs (~20%) and an estimated 30 million people are dependent on those wells for domestic purposes. Table 2 shows the overall scenario of As calamity in Bangladesh.

Table 2: Statistics of Arsenic Calamity in Bangladesh

Total Number of Districts in Bangladesh	64
Total Area of Bangladesh	147,570 km^2
WHO Arsenic Drinking Water Standard	0.01 mg/l
Bangladesh Arsenic Drinking Water Standard	0.05 mg/l
Total Number of Shallow Tube-wells in Bangladesh	5 million
Total Number of Affected Shallow Tube-wells	3 million
Number of Districts Surveyed for Arsenic Contamination	64
Number of Districts Having Arsenic above 0.05 mg/l in Groundwater	59
Area of Affected 59 Districts	126,134 km^2
Population at Risk	75 million
Potentially Exposed Population	24 million
Number of Patients Suffering from Arsenicosis	10,554
Number of Patients Died of Arsenicosis	10

Source: Begum and Karim, 2000; World Bank, 2000; Meng et al., 2001; Safiuddin and Karim, 2001).

The groundwater in Bangladesh has declined progressively due to the excessive extraction of water for irrigation and domestic water supply, lack of water management and inadequate recharge of the aquifer. The groundwater declined beyond 8 meters in 12% areas of Bangladesh in 1986. This extent rose to 20% areas in 1992 and 25% areas in 1994 (NMIDP, 1996). The study on forecasting groundwater level fluctuation in Bangladesh indicated that 54% areas of Bangladesh are likely to be affected up to 20 meters in some areas particularly in northern part of the country (Karim et al., 1997). The map of arsenic affected area shown in Fig. 5 presents the severity of arsenic contamination in Bangladesh.

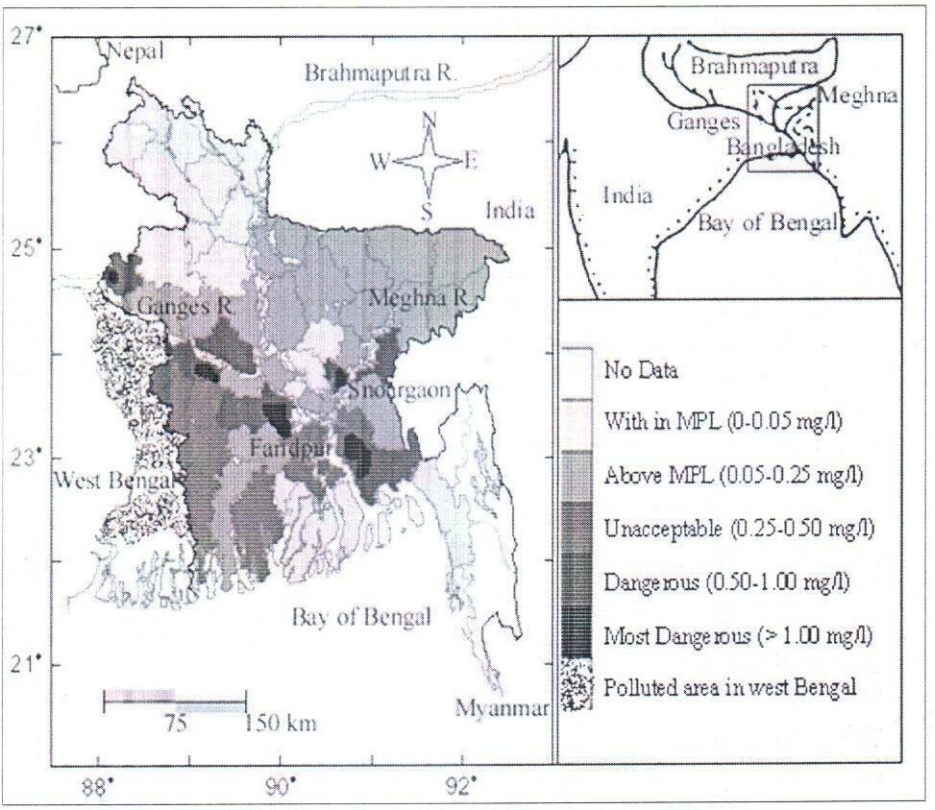

Fig 5: Arsenic affected area of Bangladesh.

Since 97% of the population of Bangladesh is drinking groundwater, arsenic contamination has evolved into a serious health hazard. The recent statistics on arsenic contamination indicate that 59 out of 64 districts of Bangladesh have been affected by arsenic contamination. Approximately, arsenic has contaminated the ground water in 85% of the total area of Bangladesh and about 75 million people are at risk. The reported number of patients seriously affected by arsenic in drinking water has now risen to 10554 (Table 2). As the people are getting arsenic also from food chain such as rice, fish and vegetables, the problem is growing more severe.

6.2.2.2 Impacts of Water Pollution On Environment & Human Health

When untreated sewage is emptied into rivers, it causes diseases like typhoid, dysentery and cholera. Algae grow uncontrollably, using the nutrients (N, P) and oxygen in the water and causing the death of all the water organisms. Harmful bacteria flourish in untreated sewage. When drinking and swimming water becomes contaminated, the disease-causing bacteria spread rapidly, making many

people ill. Sewage must be treated so that it can be recycled into the environment. Many industrial processes produce toxic wastes. In some cases, toxic wastes are illegally pumped into rivers, streams and dams. Chemicals like cyanide, mercury, lead and copper are non-biodegradable. Organisms are poisoned as the concentrations of toxins increase and passed through the food chain. The poisonous chemicals cause cancer and damage internal organs in people and animals. Factories and power stations sometimes pump hot water into rivers and streams causing thermal pollution. Increased temperatures kill the water plants and the fish, because fish are cold-blooded and cannot tolerate extreme changes of environmental temperature. This causes matter to decay in the water, with disease-causing bacteria thriving on the rotting material. Thus this pollution can damage whole aquatic ecosystem and people can be affected by consuming contaminated aquatic food and water.

6.2.3 Air Pollution: Causes and Impacts

Air pollution can be defined as any atmospheric condition in which substances (natural or man-made chemical compounds capable of being airborne) are present at concentrations high enough above their normal ambient level to produce a measurable effect on man, animals, vegetation or materials. Air pollutants are hazardous to human health and of high enough concentrations can even be fatal. The most important air pollutants are Carbon monoxide (CO), Sulfur dioxide (SO_2), Nitrogen oxides (NOx), Ozone (O_3), Hydrocarbons (HC) and Suspended Particulate Matter (SPM) (Ahmmed and Begum, 2010). Air pollution can be categorized into indoor and outdoor air pollution. Indoor air pollution is mainly associated with the use of biomass fuels during cooking with poor ventilation (Alam, 2009). As people spend most of their time indoors and the concentrations of pollutants may build up in an enclosed space, the risk to health may be greater to exposure to indoor air pollution than outdoor. Industrial emissions and automobiles are the principle sources of outdoor air pollution. Dhaka, one of the mega cities of the world, witnessed a very fast growth of urban population in recent times. Air pollution in Dhaka city is reported to be serious and damaging to public health. Concern over air pollution rate of Dhaka city ultimately led to the promulgation of National Ambient Air Quality Standards in Bangladesh in 1997 (Table 3).

Table 3: Bangladesh National Ambient Air Quality Standards (DoE, 1997).

Land use	8-hour average concentration ($\mu g/m^3$)			
Category	CO	NO_2	SPM	SO_2
Industrial/ mixed use	5000	100	500	120
Commercial/ mixed use	5000	100	400	100
Residential/ rural use	2000	80	200	80
Sensitive use *	1000	30	100	30

*Sensitive areas include national monuments, health resorts, hospitals, archeological spots, and educational institutions.

6.2.3.1 Main Causes Of Air Pollution

Traffic congestion

The Department of Environment, and other concerned agencies and organizations, have identified the two stroke engines used in auto rickshaws, tempos, mini trucks, and motorcycles as major polluters. These vehicles with two-stroke engines have the worst emission levels of all types' vehicles. Although the percentage of two stroke auto rickshaws is around 8%, some recent studies have shown that they contribute around 40% of PM10 and 50% of hydrocarbon (HC) in the atmosphere of Dhaka city. The second largest polluters are trucks and buses, although they constitute only 10% of the total automotive vehicles in Dhaka. Dhaka has been rated as one of the most polluted cities of the world. Bangladesh Atomic Energy Commission reports that automobiles in Dhaka emit 100 kg lead, 3.5 tons SPM, 1.5 tons SO_2, 14 tons HC and 60 tons CO in every day. In a survey conducted by the Bangladesh Road Transport Authority (BRTA), it was found that the two-stroke petrol engines are less fuel-efficient, and emit about 30-100 times more unburned hydrocarbons than four-stroke engines; and diesel engines emit 13 times more smoke than non-diesel four-stroke engines. The contribution of air pollution by different types of vehicle and the amount of pollutants emitted from vehicles in Dhaka city is shown in Fig. 6. Figure shows that in 1999 the highest percentage CO and HC pollution were caused by car and motor cycle and NO_x and PM pollution were caused by truck.

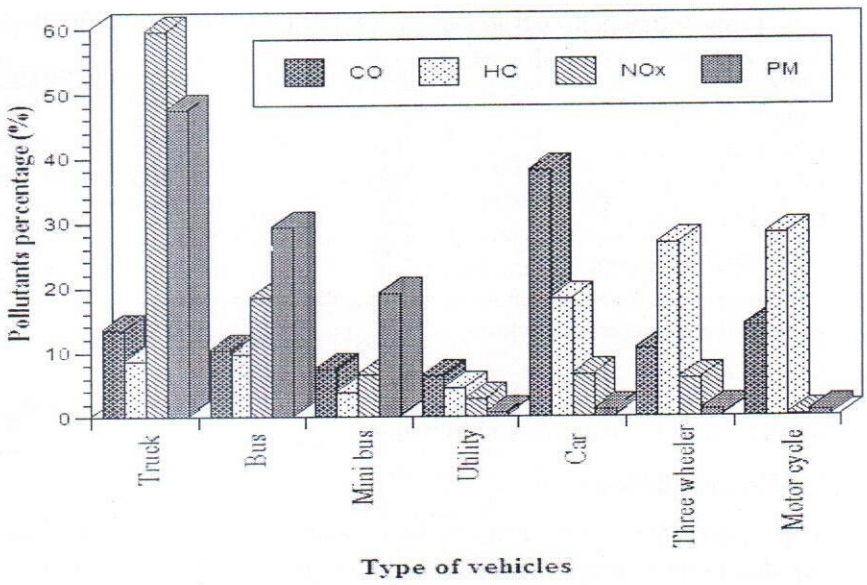

Fig. 6: Contribution of air pollution by different types of vehicles (Japan International Cooperation Agency, 1999).

Fuel burning and its quality

Air pollution mainly occurs due to burning of fossil fuels like coal, petroleum etc and associated black smoke. Pollution level of different biomass and fossil fuel in indoor environment is following -

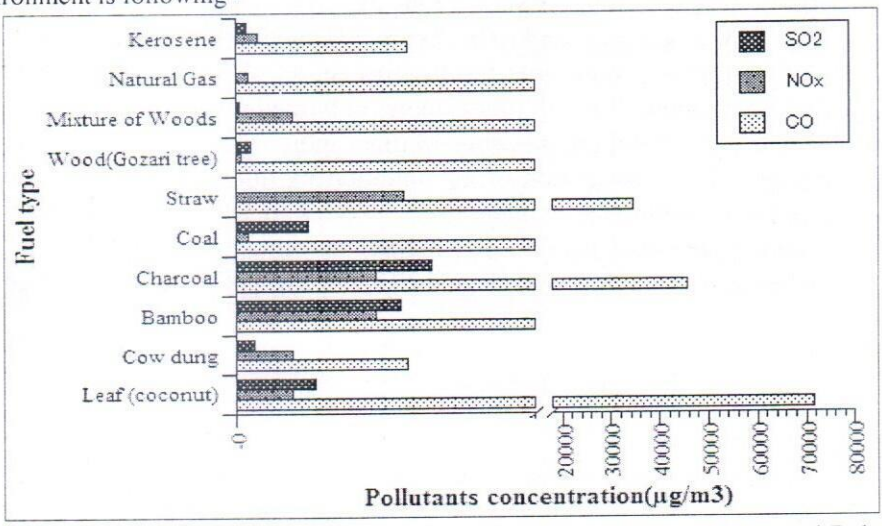

Fig. 7: Indoor air pollution levels at kitchen using different fuels (Zaman and Rahman, 2009).

Industrial emissions

Unplanned industrial development is another source of air pollution. Industries in Bangladesh are situated mainly in major urban areas, particularly in Dhaka, Chittagong, and Khulna. Accordingly, air pollution is concentrated mainly in these cities. Agro based industries like sugar, pulp, paper, tanneries and value added industries like textile, garments, pharmaceuticals, oil refineries, fertilizer and chemical industries are the major contributors for air pollution. Textile and dyeing, tanneries, pulp and paper, cement, metal, fertilizer, and chemical factories in particular emit PM, sulfur oxides, nitrogen oxides, carbon monoxide, and ammonia, all of which deteriorate air quality. The air pollution percentage of most five industrial sectors of Bangladesh in the year 2001 is shown in Fig. 8, where food industry is responsible for highest amount of emission (about 150,000 tons/yr) than any other industries.

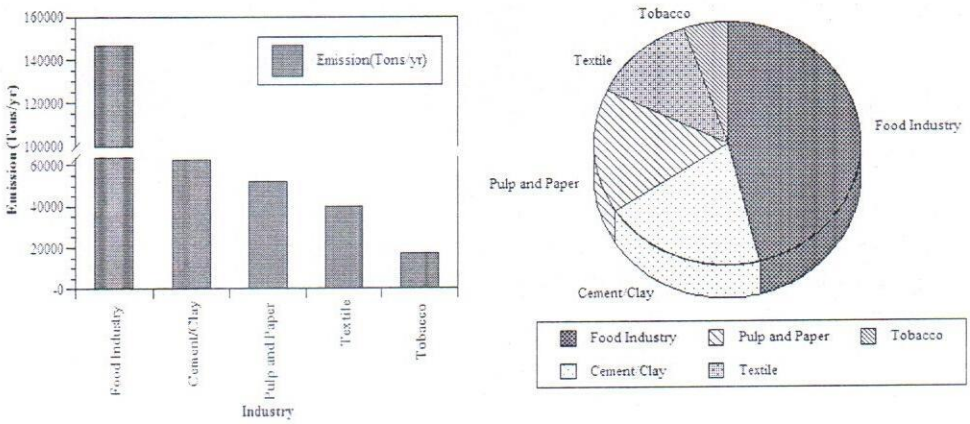

Fig. 8: Air pollution by most five industrial sectors of Bangladesh, 2001 (Islam, 2001).

Brick field emission

Majorities of brick-making kilns are of the conventional type, use coal and wood as their source of energy. This is mainly due to the unavailability of natural gas in most parts of Bangladesh. The air pollution from these kilns is not only due to the type of fuel used, but also due to the thermal inefficiencies of the conventional kilns. This causes emissions like SOx, CO, particulate matters (PM), and volatile organic compounds (VOC) that deteriorate air quality. Another significant factor is that brick kilns are usually clustered near big cites in various parts of Bangladesh. Therefore, the parts of the city in the immediate vicinity of the clustered brick-field have serious air pollution problems. Numerous brick making

kiln operating in the dry season are one of the major sources of air pollution in Dhaka city.

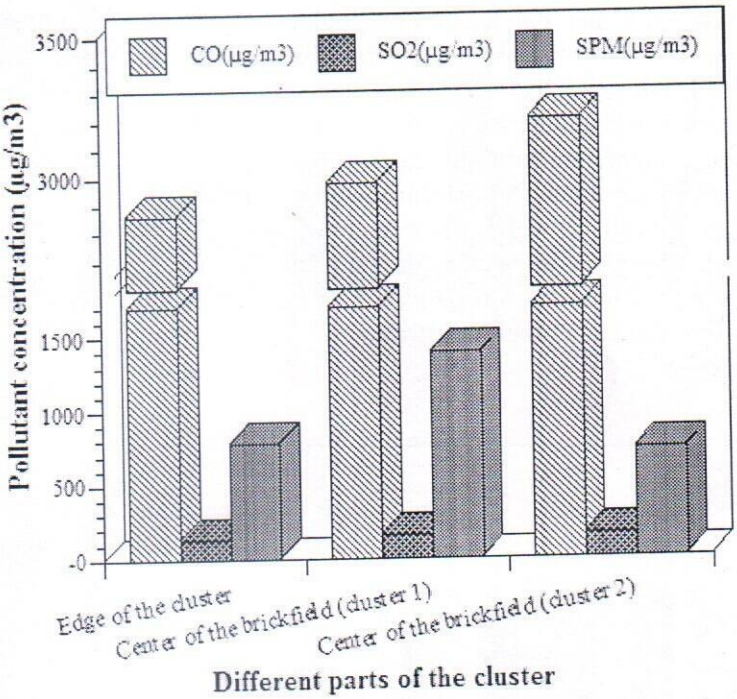

Fig. 9: Pollutants levels around the brickfield in Dhaka city (Ahmmed and Begum, 2010).

From Fig. 9, it has been noticed that the concentration of SPM is higher than the Bangladesh standard value for SPM (400 µg/m^3) and other pollutants level are within the limit.

6.2.3.2 Impacts of Air Pollution On Environment & Human Health

When fossil fuels are burned, it results in the release of carbon, which combines with oxygen in the atmosphere to form carbon dioxide (CO_2) and carbon monoxide (CO) in a process called combustion. Factories and power stations burn gas, coal and oil to produce heat which is converted into energy. Informal settlements obtain heat from burning biomass like wood, cow dung, hay etc for cooking and warmth. Pollutants like sulphur dioxide, smoke, ashes and soot are released into the air. The pollutants combine with the water in the air forming a dense mass. As the air warms and dries, the particles fall to the ground. Buildings and plants in industrial areas are always coated in a black dust. The plants covered with this dust cannot photosynthesize properly, and this impacts on plant growth and health. Air pollution can cause drowsiness, eye irritation, throat

irritation, persistent cough, asthma, nose blockage, respiratory infections, bronchial infections, colds and headaches in human being. Lead in air can affect the central nervous system, cause renal damage and hypertension. CO in air reduces the ability of blood to carry oxygen and exacerbates heart disorders. CO is released from the exhaust fumes of cars and trucks, and released into the atmosphere, combining easily with hemoglobin. A person inhaling CO will suffer from headaches, dizziness and feel tired. Large quantities of CO can cause death. Coal fires draw oxygen from the surrounding air and release CO, so fires made in poorly ventilated places can lead to asphyxiation and death. Smog impacts on human health because it irritates the eyes, chest and lungs. Asthma, bronchitis and eventually cancer result if large quantities of smog are inhaled on a regular basis. Air pollution mostly affects the urban population. Indoor air pollution is a greater threat to health than outdoor air pollution. Bangladesh could avoid 10,000 deaths and save between 200 and 500 million dollars a year if indoor air pollution in four major cities can be reduced to acceptable limits (Alam, 2009). If we continue to use fossils fuels at the present rate, we will run out of these resources within the next 50 years. We must look to find alternative processes to produce energy and prevent air pollution.

6.3 Conclusion

Environmental pollution begins with every type of human activities. It is more prone in Bangladesh. Soil, water, air- all are polluted by toxic industrial, vehicular and domestic wastes. In Bangladesh, the incidence of soil pollution is increasing due to the unplanned disposal of industrial waste, electronic wastes, medical wastes, radioactive discharge from ship breaking industries, unbalanced pesticides use etc. Most river basins of Bangladesh are heavily polluted. The surface water of the country is unprotected from untreated industrial effluents and municipal wastewater, runoff pollution from chemical fertilizers and pesticides and oil and lube spillage from sea and river ports. Atmospheric condition of both the urban area and rural areas are deteriorating due to air pollution. In urban area uncontrolled emissions from motor vehicles, anthropogenic activities, slum areas and high population densities have generated severe atmospheric and other form of pollution. Unpaved sidewalls, uncovered trucks, construction materials and irregular garbage disposal have created significant suspended particulate matter in the brick fields surrounding Dhaka city and other cities. In rural areas the principal sources of emission are from brick kilns, cooking stoves and burning of wood, coal and other bio-masses. Thus in rural area principal air contaminants are particulate matter and volatile organic compound. Environment of Bangladesh is being destroying due to the ever increasing pollution. It is impossible to totally stop the damaging effect of this pollution but the extent of damage can be

minimized by implementing proper strategies and initiating effective monitoring systems.

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Chapter 7: Population, Water and Flood Policy: Bangladesh Perspective

Md. Sirajul Islam

Abstract: *The main purpose of this paper is to bring into public focus the present status of water crisis both in Bangladesh and global context. With this end in view, this investigator reviewed relevant secondary data and government policies. It has been observed that both in local and global context, water is becoming a limiting resource day by day due to escalating demand of growing population. Every year about 2.2 million people are added to the existing population .Apart from this, water related disasters, trans-boundary water sharing and climate change impacts are some of the thorny issues that need to be addressed. In Bangladesh context, continuing debates on those policy matters were critically analyzed; and how to adapt with the changing conditions within the new policy framework is also suggested. It has been emphasized that a sustainable and integrated approach of water management is much needed to solve many of the water related issues and problems in this densely populated region of the world through some pragmatic measures and regional cooperation.*

7.1 Introduction

Water is life - development pre-requisite and a major element for functioning of the ecosystem. Most of the ancient civilizations grew near the water bodies like the Egyptian Civilization along the Nile, Persian Civilization along the Tigris and Euphrates, Indus Civilization along the river Indus, Chinese Civilization along the Yangtze or Europe along the Rhine. For the entire history, human civilization actually needed to stay closer to those water bodies for many of the beneficial purposes like collecting water for domestic or potable uses, food production for agricultural use and fisheries, industrial needs, and for navigation.

Actually, two of the important factors that determine growth of life and human civilization is - moderate climatic condition and abundance of water. As evident from the figures, population density worldwide is still quite low along the regions with harsh climatic condition, i.e. very low or high temperature, and in the regions with low rainfall or runoff volume - while high population concentration along the regions with high runoff or rainfall volume along with moderate climatic conditions.

Figure 1: Global Distribution of Population, water resources and Biological diversity (Taikan Oki, 2005)

Water

Source of life: 75% body fluid of human beings.

Shaping the earth:

- Plants and ecological communities require water.
- Erosion and deposition processes continuously changing earth's topography.

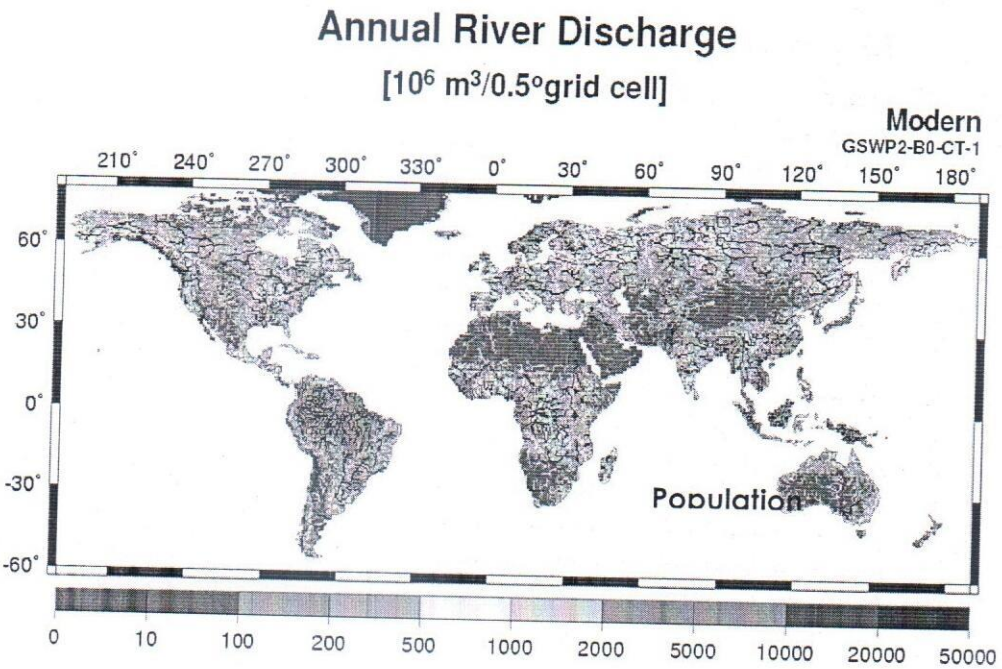
Development prerequisite :

- Development processes like agriculture, industry, navigation or power generation.
- Most of the ancient civilizations grew near rivers.

Moderating climate : Prevent extreme weather condition

Diluting pollutants : Most of the industries discharge wastes at water bodies after treatment - help diluting pollutants carrying them away

Nutrient cycling: Bio-elements or nutrients use to cycle rapidly if they are dissolved in water or have a liquid phase.



Population

In the context of Bangladesh, civilization once grew there because of its proximity to abundant water. However, high growth rate of population (1.35%) and considering its unsuitable geographic location, water scarcity or water related disasters, like flood, seasonal drought, salinity intrusion, etc have become a major economic and environmental concern now a days. This article provides a brief review of overall water resources scenario at a global scale, followed by some discussion on flood and its recurrence affecting country's economy. Discussed below some of the policy-constraints regarding water shortage in Bangladesh.

7.2 Water and Population

Even though 3/4th of the earth is covered with water, but not this entire amount is available for effective human uses. Out of this total water around 97% is saline, and ultimately around 3% or less is fresh water. The water availability problem is further aggravated by the fact that this 3% water is again distributed unequally over time and space. Over the year, water availability at a particular location varies because of seasonal changes. Over the space, depending on geographic location, climatic variation, and variation in water availability.

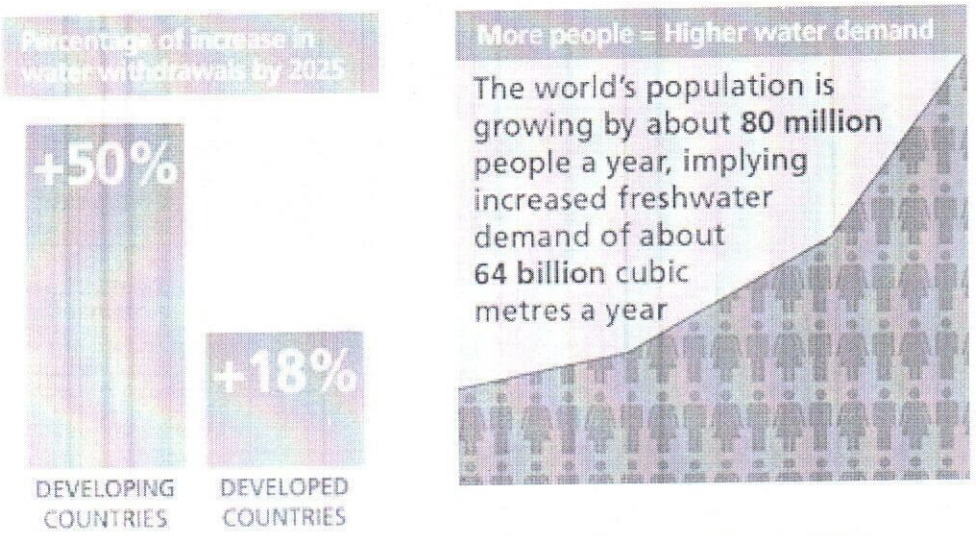


Figure2: Population and water uses – future projections (UN water, 2013)

As per the definition of resource, water can be categorized as a renewable resource or more precisely a *potentially renewable* resource. It means, unlike fossil fuel reserve, it will not be depleted totally, but it can be replenished after uses through hydrological cycle. However, while the total amount of freshwater is fixed, the demand for water is increasing day by day due to population growth and increasing use for agriculture and industrial activities. As shown in the Figure-2 above, even by the year 2025, a large percentage of increase in global water withdrawal rate is expected which will put huge pressure on available water resources.

7.3 Water- Population – Economy Nexus

While population tend to concentrate in areas with abundance of water, demographic and economic factors like population growth and economic development may affect water uses as well, ultimately affecting entire water regime. Apart from population growth, economic development causes increase water demand too. While developed countries consume more resources compared to developing countries, it includes consumption of water as well. In a global scale, water consumption can be grouped under three major categories namely, domestic (8%), industrial (23%) and agriculture (69%). Domestic and industrial water uses are highly sensitive to economic development; while water uses per person per day is around 300 liters for developed countries and by contrast it is around 100 liters or less for developing countries. Figure 3 below shows a relation of water population and economy nexus:

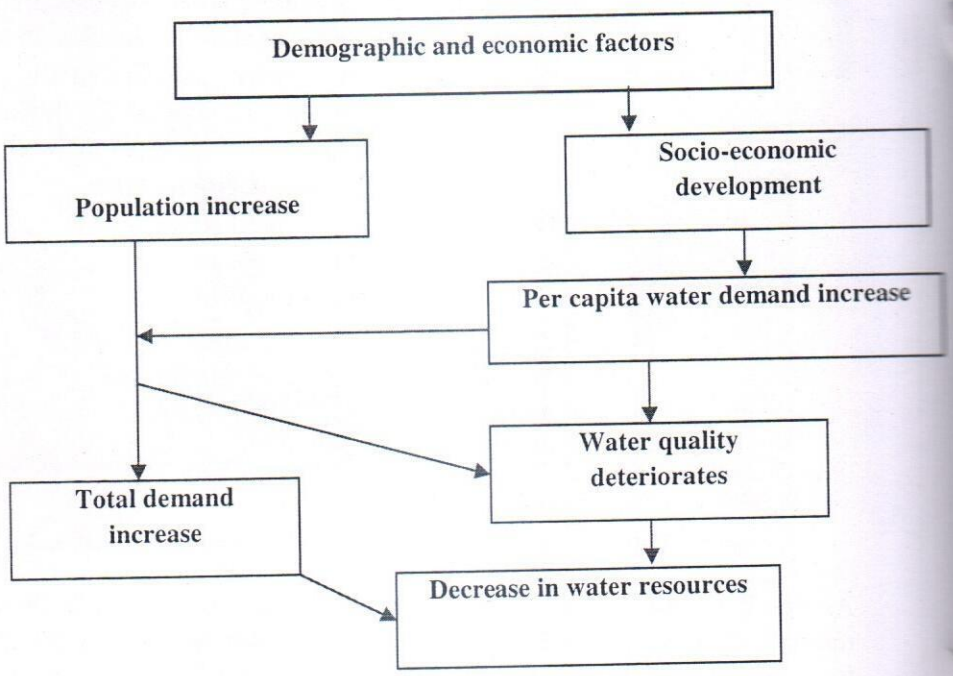


Figure 3: Population and economic factors affecting water resources

Water as an important element of socio-economic growth has been well explained by Falkenmark in her famous index that is named after her as "Falkenmark Index". The index explains the relationship of between water availability and population and economic growth as shown below;

- **Relative sufficiency**: > **1700** m3 /person/year
- **Water stress**: < **1700** m3 /person/year
  - *intermittent, localised shortages of freshwater*
- **Water scarcity**: < **1000** m3 /person/year
  - *chronic and widespread freshwater problems*
- **Absolute scarcity**: < **500** m3 /person/year

Figure- 4 shows the global scenario of water availability as per Falkenmark Index and the number of people under different stress level by the year 2025 and 2050 due to population growth and economic development and resulting growth in water demand. As per the index, a large number of countries are already suffering from water crisis and the number will increase in the years ahead. Water availability scenario may further aggravated due to some contemporary issues as

environmental degradation and resulting pollution which degrades the quality of fresh water reserve undermining its usability or climate change impacts.

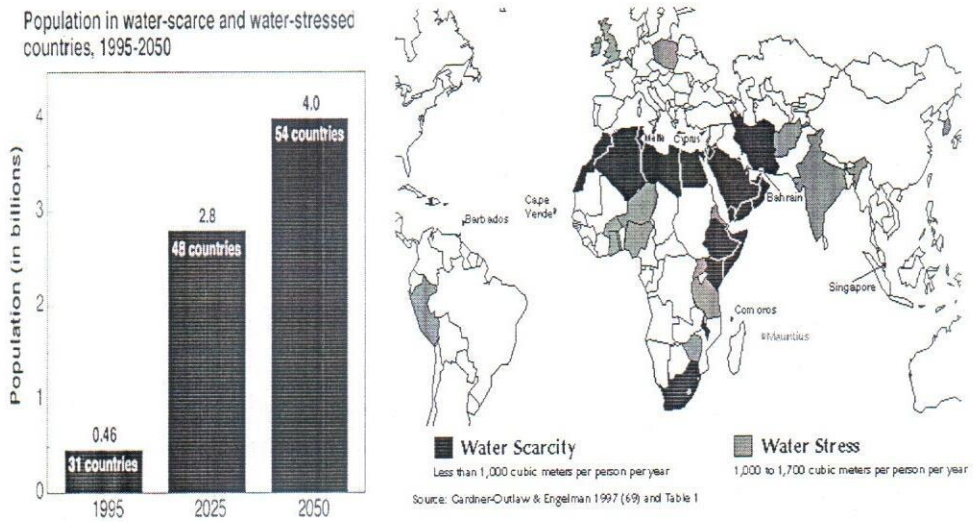


Figure 4: Falkenmark index and global water scenario (adapted from data by UN water, 2013)

As per *Falkenmark Index*, the annual water availability for Bangladesh is around 8000 m^3/person/year (UN Water, 2013), which means as per definition it is a country without any water shortage. However, unequal distribution of water over time, i.e. seasonal variation undermines this yearly figure to a great extent, where 80% of the rainfall in the region mostly occurs during monsoon causing flood – on the other hand, lack of water and resulting seasonal drought during winter or dry season. Dry season water availability is further aggravated due to water withdrawal along the trans-boundary rivers.

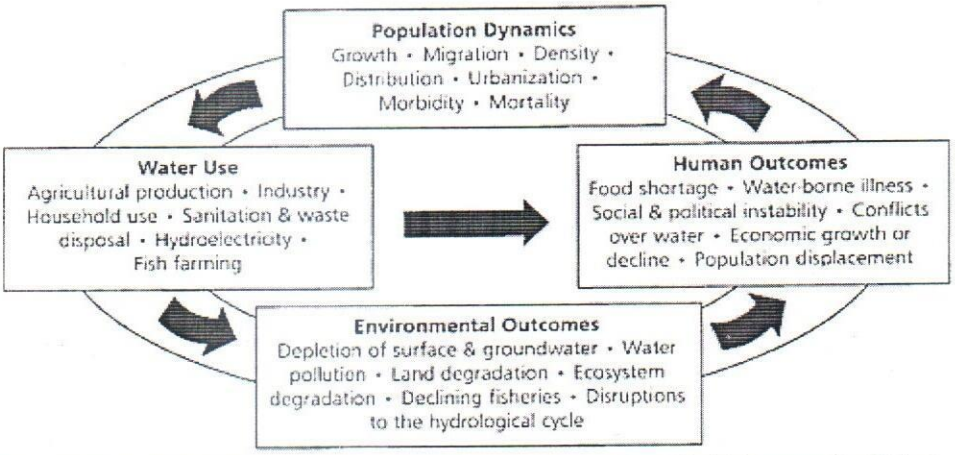


Figure 5: Population dynamics vs. water relation (Source: IUCN-The World Conservation Union)

Besides, water availability per person in quantitative term, water - population interaction is further complicated by a number of other factors like environmental factors, public health condition and level of economic growth. Figure- 5 explains the dynamics of population growth vs. water relationship in a comprehensive manner. Again, the relationships are mostly location specific and sometimes may relate to factors beyond cross national boundary.

7.4 Growth of Civilization along the Bengal Basin

As evident from the Figure 1, Bangladesh belongs to a zone where rainfall intensity and runoff volume are quite high. It also has moderate climatic condition. Being located in the downstream of three mighty river systems namely, the Ganges, Brahmaputra and Meghna – the country is crisscrossed by hundreds of rivers. Having a flat deltaic or flood plain, historically the country attracted a large population to settle here. Due to its fertile land and abundance of water for irrigation, fishing, transportation, and domestic uses, the people have been living here with relative ease and comfort.

Figure 6: Location of Bangladesh comprising three major river systems.

Approximately six percent of the country's total landmass is covered by permanent water bodies such as rivers, lakes, and estuaries. Around eighty percent of the country is a floodplain that is submerged for two to five months each year during monsoon period. It is these floodwater that brings large amounts of silt, making the land among the most fertile in the world. Presently,

Bangladesh is the world's most densely populated country with a population density around 1050 persons per square kilometer. History shows that once it was one of the most prosperous regions in the world, with huge agricultural production and a comfortable climate, ranging from 20 to 30°C throughout the year.

7.5 Major Water Related Problems in Bangladesh

While civilization in the area now comprising Bangladesh once grew along the region for abundance of water, water management now a day is still a major concern for its development. The country is agriculture based, and about 70% people still live in the villages. In general, the risks in the agriculture sector are mostly derived from water related disasters like flood and drought. Flood is one of the most dominant causes for affecting crop production in Bangladesh almost every year. Drought occurrence during dry season, which is further aggravated nowadays due to upstream water withdrawal among the trans-boundary rivers with India, also affecting the north-western part of the country. Coastal regions, on the other hand, are vulnerable to saline water intrusion and coastal flooding either due to water shortage along the major rivers during dry season as an effect of upstream water withdrawal, or increased intensity of cyclonic storm surges and steady rise in sea level due to climatic changes.

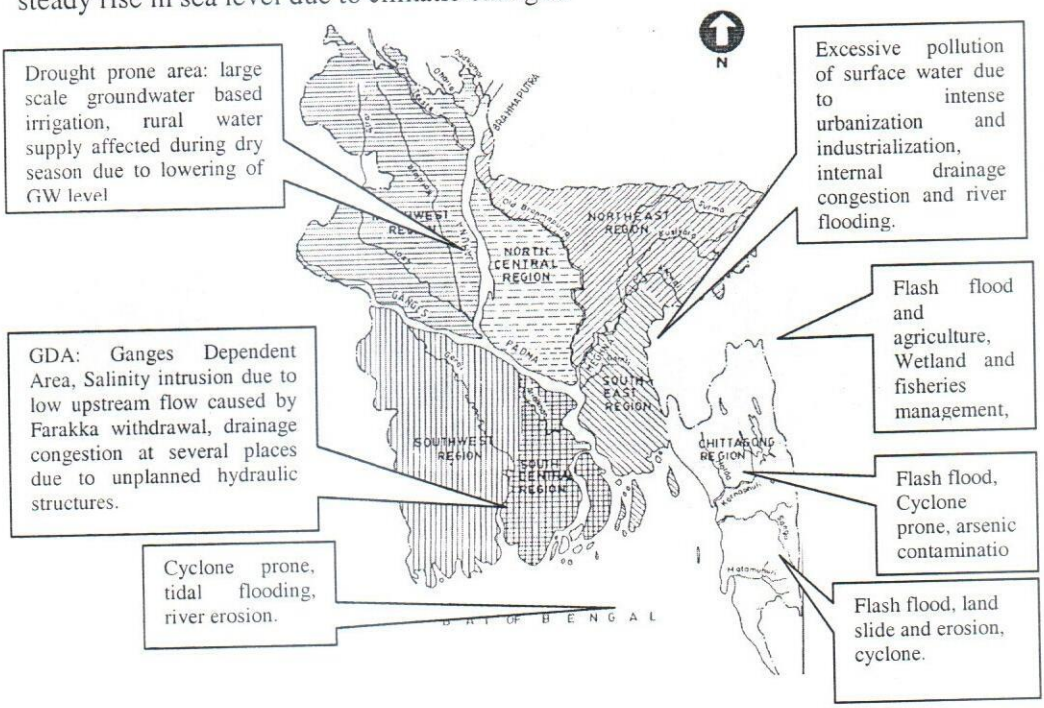


Figure 7: Seven Hydrological Divisions of Bangladesh and major water related problems (BWDB).

Depending on the geo-climatic features, the country is divided into seven divisions as shown in Figure 7 with unique nature of water related problems. Other than recurring occurrences of flood - rapid growth in population and encroachment into the flood plain, unplanned urbanization, industrialization and resulting water pollution and future impact of climate change are some other factors mostly aggravating the water problems of Bangladesh.

As mentioned earlier, 80% of the country is floodplain. As per definition, floodplain is a zone adjacent to river, acting as drainage route to drain out upstream water to its ultimate destination, i.e. sea. Usually settlement in the floodplain is restricted in many parts of the world or at least limited to some specific uses only. In the case of Bangladesh, high population growth and rapid urbanization are blocking the flood plain areas everyday with new settlements, and thus, clogging the drainage routes. Rapid urbanization along major cities with industrialization in absence of adequate legislative actions against pollution, the water quality of some major rivers has also deteriorated to alarming level. Dhaka is a perfect example, where almost all wetlands surrounding the city have been destroyed to accommodate ever-increasing population. Water quality of the rivers surrounding the city is also destroyed totally because of unabated discharge of unregulated industrial effluents.

Future projection of climate change as evident from IPCC reports (Table 1), it is clear that the rainfall pattern of the country in future will further aggravate the flooding and drought condition – while there is an increase in precipitation expected during monsoon, i.e. JJA (June-July-August) and decrease in rainfall during winter or dry season, i.e. DJF (December-January-February).

Table 1. Climate Change Scenario for Bangladesh (NAPA, 2005).

Year	Temperature change (°C) Mean (standard deviation)			Precipitation change (%) Mean (standard deviation)			Sea Level Rise (cm)
	Annual	DJF	JJA	Annual	DJF	JJA	
2030	1.0	1.1	0.8	5	- 2	6	14
2050	1.4	1.6	1.1	6	- 5	8	32
2100	2.4	2.7	1.9	10	- 10	12	88

Trans-boundary water sharing with upstream counties, specifically with India, is another burning concern. Because of its unsuitable geographic location, Bangladesh is at the downstream of the large river systems derived from the Himalayan mountain range. Around 90% of the Catchment and resulting water

flow of these rivers, flowing through the country is derived from out of the territory of Bangladesh so that it has little control over it. Due to lack of an international legislative framework to share water resources along trans-boundary rivers, upstream countries are always in advantageous position to withdraw water, and the victims are downstream countries like Bangladesh.

7.5.1 Flood - A Recurring Event: Among all the water problems, however, flood can be listed in the top. Due to its unsuitable geographic location, i.e. downstream of three mighty river systems and in the mouth of their drainage route to Bay of Bengal, Bangladesh is highly prone to catastrophic flood incidents. In fact, historically flood has been an almost recurring event for Bangladesh. Flooding in Bangladesh leaves numerous adverse effects including loss of life, destruction of crops and livestock, increased prevalence of disease, and destruction of property. On an average around one-fifth of the country is flooded every year, and in extreme years, two-thirds of the country can be inundated (Mirza, 2002). This vulnerability to flooding is exacerbated by the fact that Bangladesh is also a low-lying deltaic nation exposed to storm surges from the Bay of Bengal. In the list of damages, loss of agricultural products due to natural disasters and flooding rank very high. As shown in Table 2, economic losses in different sectors are increasing day by day due to flooding. This has obvious adverse implications on GDP growth.

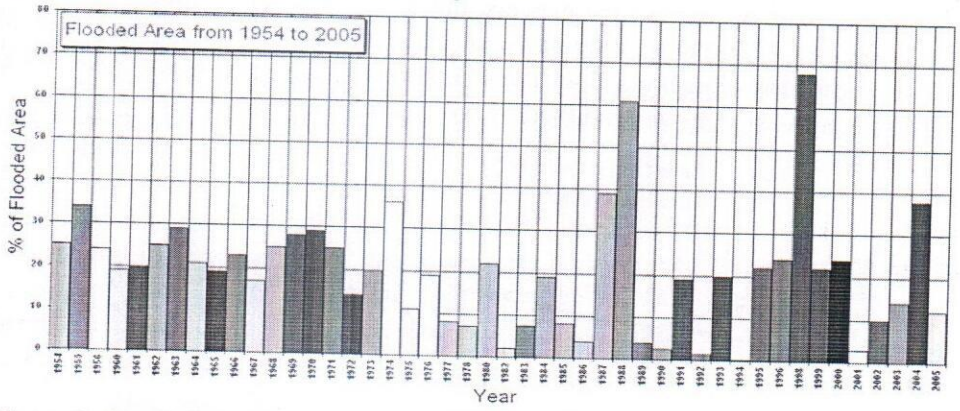


Figure 8: Flooded area in Bangladesh from 1954 to 2005

Table 2: Flood Damage To Selected Sectors in Two Selected Floods (1998 and 2004).

Sector	1998 Flood		2004 Flood	
	% of total damage	% of GDP	% of total damage	% of GDP
Infrastructure	38.6	1.8	69.7	2.36
Roads, Railways,	18.2	0.85	37.2	1.26
Institutions	20.4	0.95	32.6	1.10
Residential Sector				
Industrial Sector	12.0	0.56	4.7	0.16
Agricultural Sector	49.4	2.31	25.6	0.87
Crop Sector	42.8	2.0	22.2	0.75
Non-crop Sector	6.6	0.31	3.4	0.12
Total	**100.0**	**4.7**	**100.0**	**3.4**

(Source: Chowdhury, Islam and Bhattacharya, 1999)

As shown in Figure 10, according to IPCC 4th Assessment Report, climatic changes might contribute to significant increase in flood intensity in Bangladesh. This might be due to a number of reasons as increased glacier melt, increased precipitation, sea level rise and cyclonic storm surges. Higher temperatures will result in more *glacial melt*, increasing runoff from the neighboring Himalayas into the Ganges and Brahmaputra rivers. Given the altitude of the mountains and the enormous size of the glaciers, this problem will most likely continue over the century. The problem could be of even greater concern as there is evidence to show that temperatures in the Himalayas (where the glaciers are located) are rising at higher rates and thereby will contribute to enhanced snow melt.

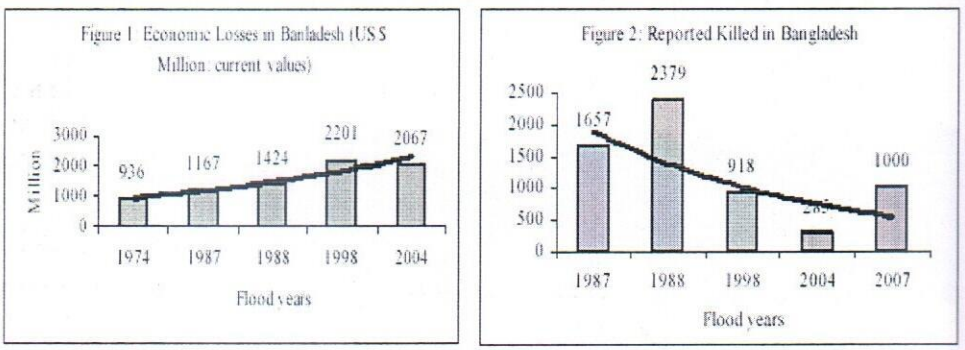


Figure 9: Economic losses and reported kills from floods in Bangladesh

7.5.2 Flood Control: Chronological review

Even in middle ages, big land lords or Jamindar built embankment at some parts of Bangladesh to protect their land from flooding, as for example the embankment along the Gumati river. After catastrophic flood in 1922, Mohalanobish, a Professor of Presidency College, Kolkata started to investigate

it. He, in fact, discouraged structural measures, but a comprehensive approach including floodplain management, rising house levels, etc. After some devastating floods in 1954-56 , a technical team led by J A Krug was sent from the UN to investigate the matter. He also showed frustration regarding the complicacy of flood plain nature of Bangladesh and pondered whether only structural measures would be enough. However, his commission suggested for emabankment oriented solution, with the rationale that to feed the ever increasing population, Bangladesh would need to produce more food so that some areas should be protected totally from flood. After 1988 flood, Flood Action Plan (FAP) was proposed, which again based on structural measures which was later on criticized by the people from all walks of the society.

7.5.3 Flood Control Debates: In fact, amid recurring flood, our ancestors still used to live in this place with prosperity. The question arises, however, while our ancestors migrated there once and found it to be a suitable place to live – why Bangladesh becoming unlivable nowadays, frequently suffering from devastating floods? How did our ancestors manage the flood problem?

A group of conservative people argue that the flood problem is due to unplanned settlements and modern flood control policies, such as the construction of embankments. According to them, these embankments are a type of structural measures, called "cordons," which simply hinder free flow of water along the flood plain and aggravate flood damage. We should not try to separate ourselves from the rivers, but instead compromise. The permanent solution to flooding lies in adopting the time-tested "dig, elevate, and dwell" formula for living in a delta or flood plain that was adopted by our ancestors. They dug ponds, lakes, and canals and used the earth obtained from these to elevate the ground level of their dwellings. They thus allowed the rivers to reach their doorsteps without drowning themselves. [3] Supporters of this group officially defined this approach as the "open approach" - that is, let the delta be open to allow the mighty rivers to breathe and thereby reduce the elevation of the flood level.

According to these proponents, other options like "cordon approaches" are not only technically unfeasible or environmentally unsound but also can create social problems. People dwelling inside the protected areas should not be treated differently from those living in the rest of the country. Again, because of those protected by cordoned or embanked areas, the water level at those unprotected areas rises according to continuity equations. This is sure to generate conflicts between areas that are protected from floods and areas that are not. In many cases, it happens that those unprotected people cut the embankment, sometimes even those who are living inside the cordoned areas.

Engineers and hydrologists, mostly from the public sector, however, disagree with the so-called "open approach," saying that the modern age is quite different

from that of our ancestors. Hydrological science has advanced significantly, such that instead of compromising, we should try to control floods. Using today's modern hydrological models, it is also possible to assess the probable impact of a flood control measure like drainage congestion or rise in water level in the surrounding areas. [4] Again, the situation in the delta has changed significantly, so the solution is not as easy as simply allowing a free flow, as proposed in the open approach. Over time, the population density has increased, agricultural production has diversified; and new cities and industrial areas of economic importance have immerged. We should at least save places of economic importance through the "cordon approach," for the interest of the nation as a whole.

After every large flood (Figure 4 [5]), debate takes places on a permanent solution to flooding in Bangladesh. For example, the flood in 1954 led to the Cruig Commission and the projects that it recommended. Similarly, the flood in 1988 led to the most controversial Flood Action Plan (FAP). Most of the large flood control structures like the Dhaka-Narayanganj-Demra (DND) project and the Brahmaputra Right Hand Embankment were built following the report of the Cruig Commission. A protective embankment surrounding Dhaka was created after the flood of 1988. The approaches were mostly structural, using the "cordon approach" either to protect an area of agricultural or administrative importance or to seal the river banks. The FAP was the most seriously criticized initiative in this context, due to its high dependence on structural measures. Many social scientists also say that flood control projects like the FAP are prepared mostly by engineers, leaving less emphasis on the participation of people from all walks of life.

Whether these cordoned flood control projects have failed, however, is a matter of continual debate. According to government engineers, the projects are not completely failed but could not produce expected results due to a shortage of funding for maintenance and up gradation. Nonetheless, the projects implemented to date contribute significantly to the national economy. Bangladesh's water management projects have enabled the country to produce 7.66 million tons of additional food grain annually, which is about 33 percent of the country's total production. Similarly, town protection projects like the DND project and the Greater Dhaka protection embankment effectively saved Dhaka from flooding during the 1988 unprecedented flood. In 1988, the damage caused by flooding in Dhaka almost constituted the damage bill for all of Bangladesh. The flooding of Dhaka thus paralyzed the entire country.

During some recent floods, however, another problem hit Dhaka: the overflow of sewage that flooded many low-lying parts of the city. The embankment surrounding Dhaka was designed to protect the city from floodwaters outside the city, but the pump stations were not enough to push out the floodwaters that come from inside the city. Unplanned housing, which has grown abundantly since the

embankment was built also aggravated the situation. Due to safety concerns inside the embankment, people are now even building their houses below flood level or in low-lying areas by filling water-retaining bodies such as lakes, ponds, and canals. Dhaka has experienced an unprecedented population growth in recent years and has already crossed the threshold of 10 million people to be named a mega-city. Land is precious in Dhaka, and most of the natural canals that historically flowed through the city have been either filled by illegal land grabbers or have been narrowed and clogged. All these factors have exacerbated the internal flooding conditions of the city, making life unbearable. Proponents of the "open approach" are quite critical of the supposed success of the Dhaka embankment, pointing to what they see its many drawbacks.

It is important to mention here that Bangladesh's geographical location makes it forever prone to flooding. Bangladesh is situated at the downstream end of the two mighty rivers, the Ganges and the Brahmaputra. Along with another large river, the Meghna, this Ganges–Brahmaputra–Meghna (G-B-M) basin covers an area of approximately 1.75 million square kilometers, constituting the second largest flow-producing catchment in the world, after the Amazon, with an annual discharge of approximately 1.35 trillion cubic meters (Figure 3 [6].) When the peaks of these three rivers synchronize, flooding is virtually unavoidable. Unfortunately, around 90 percent of the total river discharges in Bangladesh are generated outside the country, so it has little control over the situation. The regulation of water at the upstream sections of the rivers, in India, plays an important role, as 54 out of 56 trans-boundary rivers entering Bangladesh first run through India. Sedimentation by silt (about 600 million tons annually) in the riverbeds significantly reduces the total conveyance capacity of the rivers. Most of the sediment comes from the Himalayan region upstream and starts to settle just after entering into the flat plain of Bangladesh. Deforestation along the Himalayas plays an important role here. Clearly, the flood problem in Bangladesh cannot be solved by this country alone, but requires cooperation with its neighbors.

Bangladesh's high population density and its growing communication networks also obstruct the water drainage routes and increasing flood levels. The country's population is still growing rapidly, and people in search of new land often fill water bodies indiscriminately. Another important factor is the impact of long-term climate change and the associated rise in sea level. As a flat and low-lying country, Bangladesh is one of the most affected countries due to climate change. One meter rise in sea level, for instance, could cause around 17 percent of the country to be inundated. In addition, increased snowmelt in the Himalayan region in a warmer climate will further aggravate the flooding problem in downstream countries like Bangladesh.

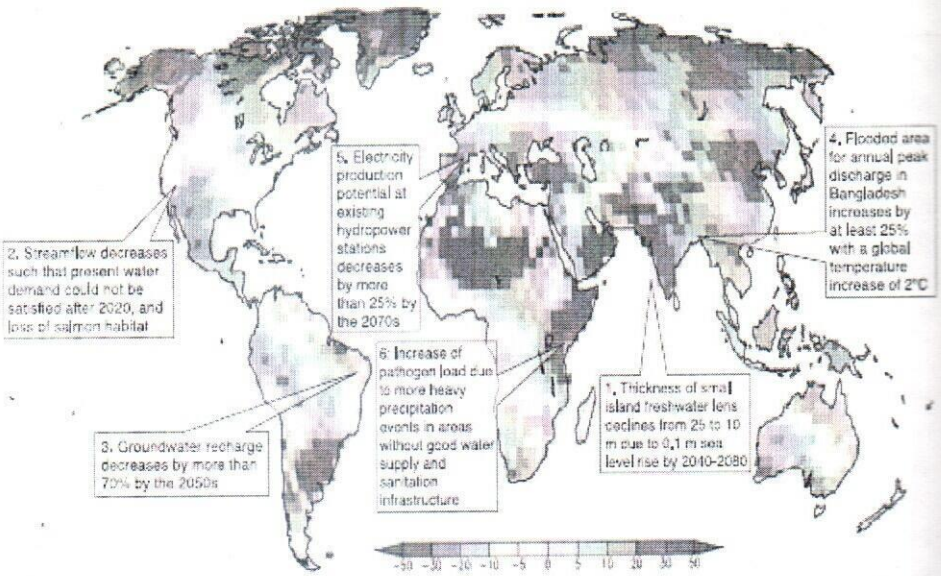


Figure 10: Climate change and probable impact on flooding in Bangladesh (Source: IPCC 4th Assessment, 2007)

7.5.4 Flood Control: Toward a sustainable solution: Clearly, it is impossible to permanently control flooding in such a complex situation either by use of the open or cordon approaches alone. The truly sustainable solution should be something between these two extremes. Cooperation with neighboring countries would be the best option, if this were possible. Unfortunately, little progress has been achieved to date on this issue. The solution also requires comprehensive research on the cause and effect relationship of flooding in Bangladesh that is more substantive than the typical studies proposed by many consulting firms. Unfortunately, such serious research is rarely performed on this issue, specifically in Bangladesh. To date, most of the flood-control projects that have been implemented in Bangladesh came out of the Cruig Commission report dated from half a century ago. The topography, settlement nature, and socio-economic condition of the country have changed extensively within this time. Neither the Cruig Commission report nor the Flood Action Plan was produced by local experts, but by foreign professionals. Little communication took place with local people in the preparation of these two documents. This leaves a wide range of possible flaws in the proposals that could not be detected through a purely theoretical understanding of the complex delta, without any practical experience in its intricacies. Of course, foreign experts are most welcome to participate, but there is a need for involving local experts having experience in the field. There is ample scope in Bangladesh to do substantial research on the subjects of flood theory and control measures.

7.6 Conclusion:

Historically, the rivers in Bangladesh hosted the country's large population by providing food, nutrition, and a means of transport. Today, Bangladeshis still think that these rivers are not as hostile, but as congenial and conducive of a good way of life in the region. Continued devastation by floods, trnasboundary water withdrawal, unplanned land use patterns and global scale-impact of climate change etc have made the people begin to wonder how long they can remain in harmony with these great rivers. There is an urgent need to find a sustainable solution to these problems. As a developing country with a myriad of socio-economic difficulties and meager resources, how far Bangladesh can progress towards achieving this goal is now a question to be addresses by the policymakers in the days ahead.

Reference:

[1] Geo Hive, "Global Statistics," http://www.geohive.com/
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[3] Nazrul Islam, "A Permanent Solution to Floods," *The Daily Star*, Dhaka, Bangladesh, 10 August 2004, http://www.thedailystar.net/2004/08/10/d4081015011 00.htm
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Chapter 8: Climate Change in Bangladesh: Is Social Marketing relevant?

Khandkar Galib B. Mohiuddin and Md. Khasro Mia

Abstract: *Centrality of this paper is to appraise how human activities affect climate in both developed and developing countries in respect of agriculture, business, human health, energy use, human settlement and urban design, population and migration, law, policies and politics and above all internaitonal relations, to cite a few. Most human activities that require producing energy from fossil fuel would emit carbon dioxide which causes climate change. In recent years, quite a number of initiatives were taken, but those had to face lot of impediments. Bangladesh is one of the world's vulnerable countries to climate change. Unless the government and all stakeholders take determined efforts to take precautionary measures from now onward, it will have disastrous consequences. One strategy that deserves priority is social marketing of information about the adverse effects of climate change and the provable measures to overcome thoses effects.*

8.1 Introduction

In 1978, Cooper anxiously predicted that human-activity-influenced-alteration to global climate could change not only economic and political relations, but also military relations among nations. This has gradually but surely, become a reality today, and at such a fast rate that we could never anticipate. National Academy of Sciences (NAS) of U.S.A. came to the stark conclusion in 2010 that "Climate Change is occurring and caused largely by human activities, and poses significant risk for – and in many cases is already affecting – a broad range of human and natural systems."[1] In addition, the effects are not limited to the areas Cooper has mentioned, but have spread wider than we could imagine. It has started affecting both developed and developing countries in agriculture, business, human health, energy use, culture, human settlement and urban design, population and migration, law, politics and policies, and international relations. As a result of these effects, we have seen increasing number of international conferences on climate change that attracted not only scientists and academics, but also policy makers in recent years, and in increasing numbers.

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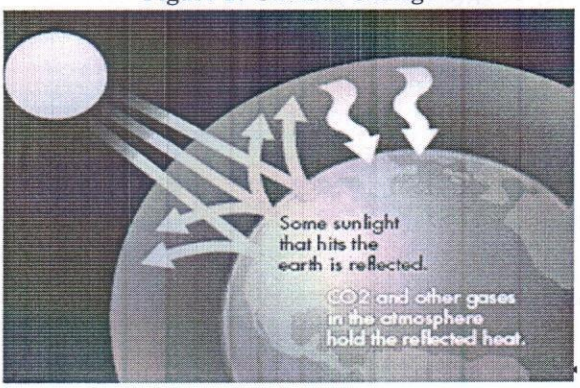
[1] National Academy of Science (2010). America's Climate Choices [website]. Washington, DC: National Research Council, The National Academies. Available: http://tinyurl.com/2cxtnep [accessed 29 August 2013].

Figure 1: Climate Change



Source: Federal Highway Administration, U.S. Department of Transportation [website]. Available: http://www.fhwa.dot.gov/environment/climate_change/mitigation/resources_and_publications/climate_change_brochure/index.cfm [Accessed 29 August 2013].

Understanding the gravity and complexity of the issue internationally, specialists and policy makers have formed an international body comprising climate experts, government officials and policy makers for the assessment of the effects of climate change – the Intergovernmental Panel on Climate Change (IPCC) in 1988[2]. The IPCC was formed with the support of World Meteorological Association (WMO) and United Nations Environment Program (UNEP), and is open to all United Nations' member countries. IPCC periodically publishes different types of assessment reports on climate change which are available in several languages.

8.2 Gravity, Complexity and Urgency of the Issue:

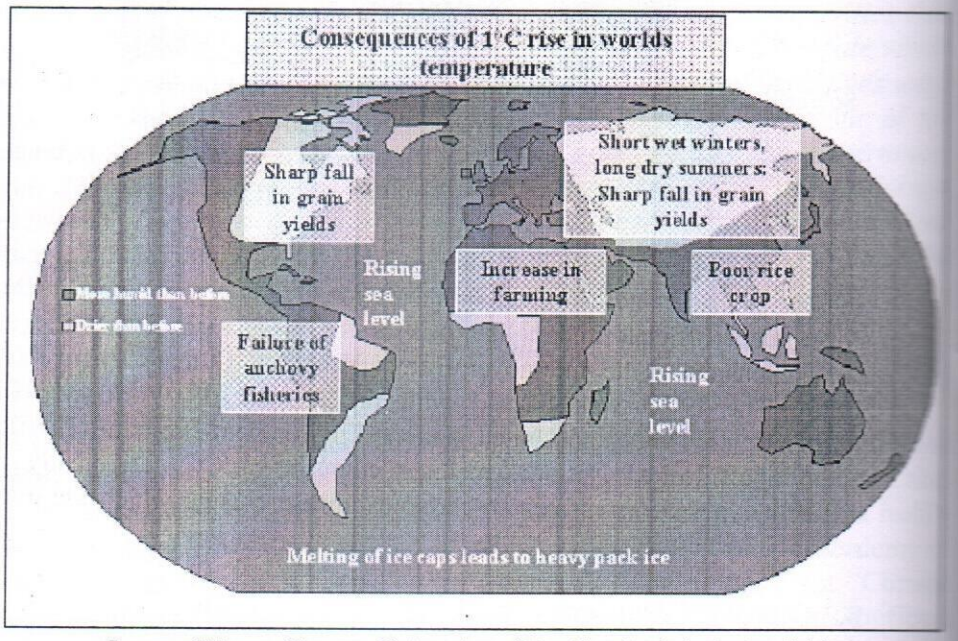
Increasing number of inter-disciplinary research studies on climate change has taken place in the recent years. These research studies have helped us develop deeper understanding regarding the causes, nature and effects of climate change. The grave and inconvenient truth is that climate change does not only affect any particular area of human life, rather alters human life-styles in various areas and threatens human life on this planet as a whole. As mentioned earlier, climate change has started to affect human beings and various sectors of economy such as, agriculture, business, human health, energy usage, culture, human settlement and urban design, population and migration, law, politics and policies, and

[2] Intergovernmental Panel on Climate Change (2013). Organization [website]. Geneva, Switzerland. Available: http://www.ipcc.ch/organization/organization.shtml#.UiRG2ZLX-DY [accessed 29 August 2013].

international relations. The discussion that follows briefly explains the probable effects.

Agriculture (Antle 1995, Mendelsohn and Dinar 1999, Adams et. al. 1988): The yields and crop cycles would be affected. In many cases, the change in natural environment would not support growing certain crops which are considered main crop for the area. In the worst case scenario, certain agricultural areas may become barren.

Figure 2: Consequence of Temperature Rise on Agriculture



Source: Climate Change. University of Reading [website]. Available: http://www.ecifm.rdg.ac.uk/climate_change.htm. [Accessed 29 August 2013]

Business (Kolk and Pinkse 2008, Newbery 2008, Clack and York 2005): Natural resources considered favorable for business in certain areas may not be available for use. The change in climate would also affect logistics, market locations and availability of human resources.

Human health (Kan 2011, Cole 2009, Sheffield and Landrigan 2011, Kovats et. al. 1999): Certain diseases that are more common in tropical regions would spread in larger geographic areas due to increased temperature of the globe. Animals, insects and parasites that carry certain diseases would spread in larger geographic regions. Change in environment might also affect human metabolism.

Energy usage (Papathansiou and Anderson 2001, Nordhaus 1991): At present, the most common sources of energy for both – economic purpose and household use – have been identified as a primary source of climate change, alterations in the level and type of energy usage will become imperative. In fact, organizations are already being forced to search for more environment friendly yet economic alternative sources of energy.

Culture (Denton 2002, Crate 2008, Steane 2004): Symbols and objects in certain cultures are based on natural environment and animals. Change of this environment and habitat of animals would require those cultures to be modified; and heritages in cultures would start becoming irrelevant.

Human settlement and urban design (Goodess et. al. 2007, Watkins et. al. 2007, Hacker and Holmes 2007): Architects all over the world are trying to cope up with climate change. The designing of not only individual homes but planning and designing of urban areas are undergoing massive changes to accommodate changes in natural conditions for living.

Population and migration (Dugmore et. al. 2007, Meyerson 1998): Some areas show signs of being more adversely affected by climate change. Sometimes those are forcing the population of those areas to shift to more livable areas. The changes in agricultural and business settings due to climate change would also affect migration. Few of those shifts are across country boundaries, but such instances are likely to increase in future.

Law (Posner 2007, Badrinarayana 2010, Smith et. al. 2009): As it became more evident in the past century that economic activity is one of the major contributors to climate change, laws relating to environment that regulate business need modification. The migration of population in new areas and settlement may require alterations to relevant laws as well. Further, as many times the largest contributors and the largest victims of climate change are different countries, international laws pertaining to the area of compensation and rehabilitation would require further review for improvement.

Politics and policies (Subramanian 2009, Sagar and Kandlikar 1997, Vasi 2006, Brunner 2001): Politics is gradually becoming more concerned with climate change both nationally and internationally, and this trend will continue. Policy makers are increasingly being forced to consider changes to policies and making them environment-friendly, even against the sentiments of the masses.

International relations (Fisher 2006, Cooper 2000): Many times the largest contributors and the largest victims of climate change are different countries. This adds a new dimension to international relations. The dynamics of international relations and bargaining power are starting to change as a result, but are far from being stable.

Another perspective of the understanding from the interdisciplinary studies on the issue of climate change is that climate change affects human life and life-styles across political and geographic boundaries. There are nations that are likely to get more adversely affected than other countries, but that does not mean other countries with different altitudes and geographic location do not get affected. For example, studies carried out by Antle (1995), Meldenson and Diner (1999) have highlighted the effects of climate change on agriculture of developing countries, whereas Adams et. al. (1988) show the effects of climate change on western agriculture. In many cases the change may not be similar, but the changes would affect both developing and western countries. Climate change is related to change of the overall atmosphere of the planet, and that affects all countries. Eventually, shift of habitat and migration of population might provide only a temporary sanctuary, but not long-term stability of life-style. Again, settling in new habitats require alteration of life-styles.

The effects of climate change in various areas are most of the times interrelated. For example, effects of climate change on agriculture and human health is likely to affect population and migration, which in turn is likely to require alterations in urban design, law, and international relations. Changes in business, energy use and agriculture would probably require alternation in economic activities and politics and policies. Some of these interrelations also affect each other mutually. For example, just like effects on agriculture and human health might affect population and migration, migration is also likely to alter agriculture and human health related issues. Understanding these interrelations can allow someone to comprehend the complexity related to effects of climate change on human life-style.

Although the specialists on climate change have in-depth knowledge of the issue, the urgency of acting upon the issue of climate change is not very clear to most people on this planet (Cooney 2010). Most people who are even aware about climate change tend to believe that climate change is a slow process which may affect nature in the distant future. Even those who have knowledge of how climate change may affect them do not have any idea about the time frame of such effect. The masses are not knowledgeable about how it has already started to affect nature, and consequently how their life-style is threatened in the immediate future. Cole (2009) warns that health-issues related to climate change could cause half a million deaths a year by 2030. This research-based warning is bound to make anyone living in 2010s feel uncomfortable. It points to the fact that effect of climate change would be felt a lot sooner than we anticipated – may be within a decade or two, and may force us to alter our living conditions in ways which we currently view as unfavorable.

8.3 Human Activities are the Primary Contributors

Carbon dioxide is believed to be the principal contributor to climate change worldwide (Ahmed et. al. 1996). Most of human activities that require producing energy from fossil fuel would emit carbon dioxide that would cause climate change. There are also other human-activity related sources of carbon dioxide emissions – agriculture, livestock, etc. There is also a natural rate of carbon emission from forests, but that is minimal compared to the amount of carbon the forests binds from the atmosphere. The bound carbon dioxide works towards alleviating global warming. There are other gas emissions that also contribute to climate change. Scientific studies also attribute gas emitted from volcanic activities in some live volcano to global warming. Some of these contributors to climate change have no relation to human activity at all.

From the very beginning of research focused on climate change, it was understood that combustion of fossil fuel is a major contributor to emission of carbon to the atmosphere (Rotty 1979), and industry-based economic activity is considered one of the primary contributors (Swart et. al. 1993). In its entirety, most human activity related to environmental degradation contributes to climate change (Betts et. al. 2008). For example, clearing of tropical forests destroy carbon sinks and releases them back to the atmosphere. Studies that compared different contributors to climate change suggest that all the major contributors to climate change are human activity related (Canadell et. al. 2007). In 2010, National Academy of Science (NAS) of U.S.A. also concluded that climate change is caused largely by human activities.

8.4 Initiatives

With the knowledge of effects of climate change existing for more than three decades, the world has seen various initiatives regarding the issue. The initial initiatives were targeted towards convincing policy makers about the effect of climate change. For this, there was, and still is, considerable funds spent in research studies on the effects of climate change. As researchers came up with stark findings one after another, conferences were organized inviting scientists and policy makers of different stake-holder countries to communicate the findings to the policy makers of those countries.

Table-1: Major Climate Conferences

Year	Location	Major discourses/ outcomes
1978	Geneva, Switzerland	International interdisciplinary scientific conference organized by WMO focusing on plenary sessions, research on climate data, identification of climate topics, integrated impact studies, research on climate variability and change.
1990	Geneva, Switzerland	International conference of scientists and policy makers organized by WMO focusing on first IPCC report, formation

		of United Nations Framework Convention on Climate Change (UNFCCC), formation of Global Climate Observing System (GCOS).
1992	Rio de Janeiro, Brazil	UN conference on Environment and Development, resulting in the UNFCC.
1995	Berlin, Germany	UN and stake-holder countries conference, first Conference of Parties (COP), focusing on outlining specific targets on emissions.
1997	Kyoto, Japan	UN and stake-holder countries conference focusing on broad outlines of emissions targets, resulting in Kyoto Protocol.
2000	Hague, Netherlands	Focused on clarifying and accommodating observations of certain stake-holder countries (e.g. U.S.A., Australia) regarding binding agreement of Kyoto Protocol.
2001	Marrakesh, Morocco	COP meeting focusing on finalizing the provisions of the Kyoto Protocol without support of U.S.A.
2007	Bali, Indonesia	UN (COP) climate change conference focusing on reducing deforestation in developing countries, transfer of technology.
2008	Poznan, Poland	UN (COP) climate change conference. Largest conference on climate issue till then with 12,000 participants.
2009	Copenhagen, Denmark	UN (COP) climate change conference. U.S.A. reached 'meaningful agreement' with some stake-holder countries.
	Geneva, Switzerland	UN conference focusing on climate predictions and information for decision-making, creating global framework to link scientific advances to needs of user decision-making.
2010	Cancun, Mexico	UN (COP) climate change conference focusing on required reduction of emissions from developing countries, adoption of 'Green Climate Fund' and 'Climate Centre', second commitment period to Kyoto Protocol.
2011	Durban, South Africa	UN (COP) climate change conference focusing on setting legally binding deal comprising all countries by 2015.
2012	Doha, Qatar	UN (COP) climate change conference focusing on developing successor of Kyoto Protocol by 2015 which would be implemented by 2020.
2013	Warsaw, Poland	UN (COP) climate change conference.

Sources:

a. World Climate Conference. Wikipedia [website]. Available: http://en.wikipedia.org/wiki/World_Climate_Conference [Accessed 29 Aug. 2013].

b. Kyoto Protocol. Wikipedia [website]. Available: http://en.wikipedia.org/wiki/Kyoto_Protocol [Accessed 29 Aug. 2013]

c. Oppenheimer, M. & Petsonk, A. (2005). Article 2 of the UNFCCC: Historical Origins, Recent Interpretations. *Climatic Change*. 73: 195-226.

Once the research community was itself convinced of the effects, it began searching ways for reducing the adverse effects as much as possible. It is not possible to reverse the effects of climate change with the current level of

knowledge of the human race. The human activities that contribute to climate change are so embedded in the modern life-styles and cultures that it is extremely difficult, if not impossible, to modify them soon enough. So the focus of researchers shifted to searching alternatives to substitute these activities or the objects related to daily activities. The search began for economic and environmentally friendly alternatives as source of energy (Barrett 2009). Research on all of these areas continues today.

The researchers soon started realizing that the pace of innovations is quite slow compared to the rate at which climate change is affecting the planet. Hence research also focused on adaptations to reduce discomfort associated with climate change, and also on modifications in policies and adaptations, e.g. housing and urban design, law, politics and policies, international relations (Francisco 2008, Gill et. al. 2007). Adaptation measures can be both – Reactive or Anticipatory. Reactive adaptation refer to those measures that are undertaken to respond to impacts of current climate variability and climate change, while Anticipatory adaptation refer to measures undertaken before impacts are observed (Klein 2002). According to fourth IPCC assessment report, adaptive responses can be of four types – (i) Technological, (ii) Behavioral, (iii) Managerial, and (iv) Policy.

Table-2: Types of Human Systems' Adaptation to Climate Change

Sector	Reactive	Anticipatory
Private	Moving home Changing insurance premiums Buying air conditioners	Changing architecture of buildings Buying hazard insurance Devising new customer products
Public	Offering compensation or subsidies Enforcing building codes Beach nourishment	Installing early warning systems Establishing new building codes Constructing dykes

Source: UNFCCC 2006.

Thanks to innovations resulting from research, a lot of products used in daily lives have been modified (e.g. energy lamps, hybrid cars) by businesses who predict stricter product requirements in the future. Even citizens of poor countries like Bangladesh have embraced solar energy for household use and have moved ahead of some industrialized countries in this regard (Wong 2009). The Canadian government put stricter policies and regulations in place to regulate business activities (Rivers and Jaccard 2010, Bernstein 2002), and the Australian government commissioned promotion of changes in household activities through mass communication media aimed at reducing activities contributing to climate change. A concept related to reducing carbon emissions is Carbon Trading which was initiated and promoted by the UNFCCC.

Table-3: Non-CO_2 Energy

	Wind	Solar	Nuclear
Viability	Proven technology, high altitude units not tested	Photovoltaics are proven technology	Generation-III+ technology available
Economics	Varies by location, high initial investment, can be lower than fossil fuel	Varies by location, high initial investment, can be lower than fossil fuel	High initial investment, lower than fossil fuel
Governance	Not significant, multilateral issues	Not significant	Profound challenges, specially for storage, reprocessing and proliferation
Scale	Can meet full global energy need	Can exceed full global energy need	Projected to grow to 15%+ of global energy need by 2050

Source: Barrett 2009.

The Carbon Trade developed as a result of the Kyoto Protocol. Signed in Kyoto, Japan, the Kyoto Protocol required 38 industrialized countries to reduce their greenhouse gas emissions to levels that are 5.2% lower than those of 1990 for these countries between the years 2008 to 2012. The protocol was designed to ensure that these targets are met by the specific date, along with fostering international cooperation and development objectives (Chameides and Oppenheimer 2007). As a favorable by-product, the Kyoto Protocol also fosters protection of tropical forests as it may work as carbon sinks to bind carbon from the atmosphere that resides in the form of carbon dioxide (Laurance 2007, Epstein 2007). Carbon is an element in fossil fuels which when burnt, releases carbon dioxide and acts as a green house gas, and contributes to climate change. The idea of carbon trading gives economic value to carbon allowing organizations to trade it. If an organization buys carbon trade, it buys the right to burn it up to the buying-level beyond its allocated levels (McKibbin and Wilcoxen 2002).

Table-4: CO_2 Capture and Sequestration Technologies

	Viability	Economics
Carbon capture/ storage fossil fuel plants	Many proven technologies, but scale capture not demonstrated	\$25-90/tCO_2
Land-based biomass capture/ storage	No such plant yet demonstrated	\$50-110/tCO_2
Ocean fertilization	Verification difficult	\$4/tCO_2
Increasing ocean alkalinity	Not yet demonstrated	Practical method does not exist
Industrial air capture	Prototypes developed	\$135/tCO_2

Source: Barrett 2009

8.5 Impediments to Initiatives

The natural human tendency to resist change is one of the major underlying factors that impede the initiatives to alleviate effects of climate change. Sometimes the change is accepted very slowly and gradually. In other cases, we may see evidence of total denial prior to a party feeling the effects in a significant way. According to Francisco (2008) – adaptation strategies have hardly been considered by many Southeast Asian countries as recently as in 2005.

Not necessarily all researchers and policy-makers totally agree yet to the human-activity induced causes of climate change, although the number of such experts are gradually reducing. A reason for this disagreement was the imperfect measurements and forecasts regarding climate change, its effects, and probable outcomes of initiatives that might be taken (Rivers and Jaccard 2010). Few of the researchers and policy-makers do not necessarily agree on the initiatives and there are experts who are critical about initiatives (Bernstein 2002). For example, Nussbaumer (2007), Dinan and Rogers (2002) have their observations regarding Carbon Trading.

Any new initiative is expensive. Technological advancement of human beings has not yet reached the level where our environmentally friendly solutions are also economical. Sometimes the cost of applying an adaptation strategy outweighs the economic value of certain economic activities (Barrett 2009). Although no one can put an economic value on human survival on earth, it is natural that in the current climate change scenario we cannot expect a lot of initiatives from personal business or government level. Burke (2007) had attributed such cases to the absence of Adoptive Leadership. We have observed scenarios where developed and industrialized countries like U.S.A responded negatively to international proposals (McKibbin and Wilcoxen 2002).

Current technology is yet insufficient to make environment friendly solutions that are economically viable, but there has been progress. There has been substantial progress of technological innovation – from sources of energy, harnessing energy, to usage of energy. Rao et. al. (2006) argue that technological learning by itself is not sufficient for alter the course of climate change and that climate policies are absolutely necessary complementary element. Spillovers across technologies and regions due to learning results in increased upfront investments, but lower costs of carbon free technologies and also leading to emissions reductions.

It is indeed very sad that few of the industrialized nations, often the larger contributors to climate change, tend to shy away from such agreement claiming it would hamper the stability of their economy. On the other hand, developing countries tend to argue that the industrialized nations have developed stable economies by contributing to climate change in the past, and the developing countries should not be deprived of doing the same (Reddy 2007). Nordhaus and Yang (1996) had explained that to have a real impact on climate change, all the relevant initiatives have to be carefully interrelated and well-concerted. As long as all countries do not sign agreements with a view to reducing contributors to climate change, and do not develop strategies in an integrated way for which the final outcome of separate initiatives might not achieve much.

'Diffusion of Responsibility' concept of psychology suggests that when a responsibility is shared collectively among a large group of people, the responsibility has a low probability of being carried out, compared to that when individuals are held individually responsible. The adaptation to climate change and taking initiative at the individual level is costly with no likely additional benefit to individual self. In such a case individual households cannot be expected to behave more responsibly and shift from the comfort of their usual ways of doing things by modifying their daily chores.

A major flaw of initiatives regarding climate change is that majority of the initiatives are developed by the industrialized nations, whether the implementation is by an industrialized or developing nations. This may have caused the policy makers and specialists behind the initiatives to miss out on certain aspects that are different for developing nations. Dankelman (2002) goes so far as to say that the policies and initiatives regarding climate change might not be optimal when policy-makers comprise primarily of males. From a less critical stand point, even if the policies are optimal for a group, it is likely a group most of the times will not dedicate all or required level of its resources in implementing a plan or policy if the group was not included in the formulation of the plan or policy. That the number of participants and representation from developing countries is increasing in COP conferences is definitely a good sign in this regard.

global climate change, localized activities like ship-wrecking industry in Bangladesh contribute to climate change at a smaller geographic area that directly adversely affects adjacent areas (Ziser and Sze 2007). As a result of relaxed and sparingly implemented environmental regulatory policies and insufficiently resourced implementation bodies, Bangladesh also has seen increasing activity in improperly equipped leather processing and chemical plants that also affect areas in a similar fashion. The initiatives of Bangladesh in such cases have to focus on domestic scope at a national level. In this regard, apart from developing stricter regulatory policies at the national level to minimize and prevent such activities, citizens and policy makers of Bangladesh need to be made aware of such causes and their effects.

There have been studies to find out about contribution of Bangladesh to global climate change. Ahmed et al. (1996) suggested that in the 1990s Bangladesh had a net negative impact on global climate change. This means that in the 1990s Bangladesh emitted less greenhouse gas compared to how much it took back. The concept of carbon sinks is discussed earlier. The study calculated the net impact by taking into consideration the amount of carbon is up-taken by the forests in Bangladesh, whereas it included even methane emitted from agriculture, livestock and households; and also included carbon emissions from various sources. The study suggested that the forests of Bangladesh acted as a net sink for approximately 6.86 Teragram (Tg) of carbon in 1990. This statistic stands starkly against the effects of climate change that Bangladesh would face.

As the sea-level rise in Bangladesh and in other low-lying countries and many of the causes and effects of climate change cannot be controlled by the affected countries alone, there is the need of international cooperation on this issue (Badrinarayana 2010). The citizens and policy makers of Bangladesh alike would have to be properly informed about the effects, causes and probable initiatives on this issue. Moreover, they should try to inform the citizens and policy makers of countries that are largest contributors to climate change so that they can gain an advantageous position in negotiations regarding initiatives and required resources for international cooperation.

8.7 How the Future Policy Makers of Bangladesh See Climate Change

'Climate Change' is a term that most of the privileged educated class across countries and cultures, are familiar with. This is the result of the hyped up communication on this issue in international and national media from 1980's that peaked later that decade. While the generation that reached adulthood in or prior the 1990's is sufficiently aware of what 'Climate Change' is and how it occurs. The generation that was born in the last decade of the last century was not even fortunate to experience the media frenzy on this issue. This generation is the current 'youth'. Climate change has already started affecting the world, and a few

countries including Bangladesh would be affected more than any other country. The fortunate youth that is getting university education at this moment will be the policy makers at government and private organizations in the near future, when they would be hit hard with the issue.

As already discussed, climate change is primarily caused by human activity, and tackling this issue would require change in perception and behavior pattern of human beings. However there is no significant research that tried to understand the perception of climate change among any population. A recent study carried out suggests that the concepts that youth from Bangladeshi universities associated with climate change are:

Global Warming	Increase in Population	Change in Seasons	Ozone Depletion
Deforestation	Natural Disasters	Human Health Problems	Harmful Industrial Emissions
CFC Emissions	Energy Wastage	Industrialization	Acid Rain
Water Pollution	Air Pollution	Earth Quakes	Chemical Waste
Car Emissions	Increased Urbanization	Reduced Habitat for Wild Animals	Skin Cancer
Oil Spillage	Soil Pollution	Greenhouse Effect	Shorter Life Spans
Rise in Sea Levels			

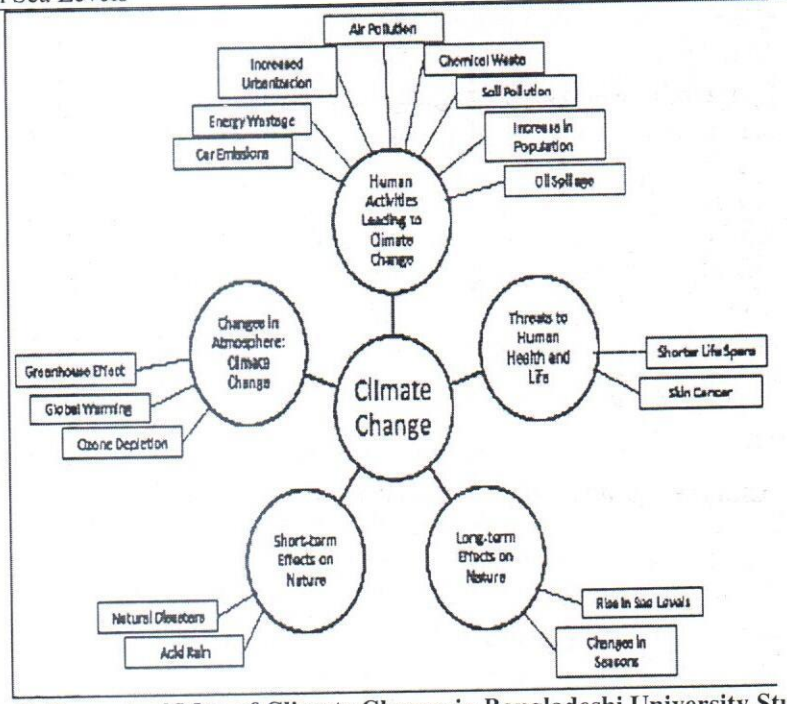


Figure 3: Perceptual Map of Climate Change in Bangladeshi University Students

Based on quantitative analysis, the study also developed a perceptual map of climate change that is presented below. The details of the study and the quantitative analysis are available at the 'Appendix' at the end of this article.

The associations and the perceptual map do not include any initiative taken by any national or international organization, nor does it include any concept relating to the responsibility of individuals regarding climate change. This points to a major flaw in the initiatives on climate change – there is disconnect between the knowledge about climate change that experts posses and the knowledge that the masses posses. This point was also presented earlier. Cooney (2010) and Henning (2005) argued that the knowledge failed to spill over from specialist scientists and policy-makers to masses, or even other policy-makers.

Another point to note is that the youth of Bangladesh seem not to be aware of the threat to human habitat that climate change poses. Interestingly, in the list of associations they mentioned reduced animal habitat, but nothing regarding human habitat. The grave reality is that Bangladesh would most likely be affected in this area most seriously. The migration of population within the country due to climate change has already started. This would be one of the most burning issues for the future policy-makers of Bangladesh when space for habitat and economic activity will be reduced as a result of climate change.

8.8 Need for Social Marketing:

The gap of knowledge between the specialists and the masses could be mitigated through marketing. It is common at present to use marketing to educate the masses to induce behavioral change. These types of marketing and communication to masses fall in the area of social marketing. Use of traditional marketing principles for modifying behavior regarding social issues is known as Social Marketing (Kotler and Lee 2008, Andreasen 2002). Social marketing is used by development organizations or governments to modify behavior of individuals to benefit individuals or society at large (e.g. family planning, smoking cessation, water conservation, literacy). Social marketing incorporates the different areas of marketing – product design, ensuring ease of behavior change and accessibility of relevant materials, communication and public relations, etc. It is not a new concept for Bangladesh. Actually Bangladesh has a history of successfully using social marketing to induce positive changes in behavior of its citizens. Campaigns used for home-made oral saline to combat diarrhea and communication for family planning are examples of successful social marketing in Bangladesh that were appreciated worldwide.

Using social marketing to educate the citizens of Bangladesh regarding climate change would not only ensure that future policy-makers of the country are well aware of different aspects of the issue, but also will create awareness among the

mass leading to increased political pressure to act urgently upon it. The need for international collaboration to combat effects of climate change was discussed earlier. This perspective is specifically important for Bangladesh as it is one of the serious victims of climate change, which is primarily caused by industrialized nations. To create political pressure on the policy-makers of industrialized nations, Bangladesh may also examine the possibility of social marketing in those countries to educate the masses of those countries. Maldives' president held a cabinet meeting underwater to create awareness about effects of climate change in 2009. The incident received huge media attention worldwide and created some awareness on the gravity of the issue for Maldives. This is an example of social marketing attempting to create worldwide awareness on climate change.

Figure 4: Maldives' president underwater to create worldwide awareness

Source: Journihilism [website]. Available: http://journihilism.org/?p=166 [Accessed 29 August 2013].

8.9 Conclusion

For a country like Bangladesh, time is a precious resource to take initiatives for combating effects of climate change. Every moment lost spells out lost-opportunities to take initiatives before the situation worsens. Unfortunately, Bangladesh and the world as a whole have not yet ensured best possible ways to inform the masses about – the gravity and urgency of the situation, the initiatives taken and the responsibilities of global citizens individually. It may be possible, with the aid of social marketing, to avert the imminent disaster that may require us to change our life-styles and habitat. If we try our best, we may expect our future generations to carry the effort forward.

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Chapter 9: Environmental Assessment of Drought in the Northwest Region of Bangladesh

Nazmul Ahsan Khan and Nepal C. Dey

Abstract: *The Northwest region of Bangladesh is characterized by its diverse landscapes with semi-arid climate. The adverse impact of increasing trend of drought prevalence has turned the life, livelihood and ecosystem in danger. The region has been experiencing consecutive years of below-average precipitation, variability as well as lowering of aquifer level in ground water leading to water crisis for drinking and irrigation for agriculture as well. Agricultural land use and cropping pattern is changing over time to adapt with this emerging harsh situation. Northwestern region of Bangladesh faced extreme drought during the year 1994-95, marked as the driest year for many parts of the country. During drought period there was an increase of temperature and dust compared to previous years. It was revealed from analying time series data (1986 to 1996) that during the drought period, groundwater levels declined on an average more than 1 m compared to the previous years. Local people shared their impression that during drought period most of the tubewells could not supply the same quantity of water as previous years. It was also observed in the region that a significant number of shallow tube wells failed to supply water. A significant number of people in this region suffered from water scarcity even surface water bodies including ponds or having little volume of water with impurities. People have to collect potable water far away from their residence to maintain their water requirement. A number of people from those areas are severely suffered by diarrhea and dysentery due to unsafe water.*

9.1 Introduction

Drought is a recurrent phenomenon in Bangladesh and the most complex of all natural hazards (Shahid & Behrawan, 2008). Resulting in serious economic, social and environmental costs and losses in both developed and developing countries, drought has severely affected most countries in recent years, and on multiple occasions in many cases (www.amazon.com). As water is the most important input for crop production as well as sustainable natural environment but its distribution it holds is extremely skewed in time. The bulk of the annual rainfall that occurs during monsoon begins in June and keeps on till September. As a nature of consequence, water availability may become super and/or sub-normal with respect to its requirement at many places. The year, 1994 was relatively dry monsoon, made adverse effects on the storage of surface and groundwater. The northwestern (NW) region of Bangladesh has been affected

largely due to the shortage of water normally available for irrigation. In addition, water shortage for domestic consumption was usually identified as principal constraint for the people during the dry season. Lack of water or drought in the region has profound impact that can be listed as economic, social and environmental (Sajjan et al., 2002; Brammer, 1987 & Takara and Ikebuchi, 1997). Drought is one of the most severe environmental stresses and affects almost all plant functions (Shinozaki et al., 2002). During the period of 1973-87, about 2.18 million tons of rice was damaged due to drought –the corresponding loss was 2.38 metrictons due to flood (Paul, 1995). Drought affects annually about 2.32 and 1.2 mha of cropped land during the *Kharif* (Nov to June) and *Rabi* (July to Oct) seasons in Bangladesh (BARC, 2000).

Drought that was occurred in 1994-95 in Bangladesh, particularly with a severe out-break in the north-western part of the country has left the respondent in a precarious condition. The irrigation system in the agricultural sector almost collapsed as most of the shallow and hand tubewells went dry and posed a serious threat to food grain production. The situation turned worse due to drying up of surface water bodies like canals, ponds, *beels*, and rivers in the region. The groundwater level dropped to an abnormally low level in 1994-95 compared to the level in previous years. Most of the shallow tubewells had been inoperative or not functioning with full capacity. The environmental impact of drought is summarized below

Table 1: Environmental Impacts of Drought

Areas	Effect
Damage to animal species	▪ Reduction and degradation of fish and wildlife habitat ▪ Lack of feed and drinking water ▪ Greater mortality due to increased contact with agricultural producers, as animals seek food from farms and producers are less tolerant of the intrusion ▪ Disease ▪ Increased vulnerability to predation (from species concentrated near water) ▪ Migration and concentration (loss of wildlife in some areas and too many wildlife in other areas) ▪ Increased stress to endangered species ▪ Loss of biodiversity
Hydrological effects	▪ Lower water levels in reservoirs, lakes, and ponds ▪ Reduced flow from springs ▪ Reduced stream flow ▪ Estuarine impacts (e.g., changes in salinity levels) ▪ Increased groundwater depletion, land subsidence, reduced recharge ▪ Water quality effects (e.g., salt concentration, increased

	water temperature, pH, dissolved oxygen, turbidity)
Damage to plant communities	▪ Loss of biodiversity ▪ Loss of trees from urban landscapes, shelterbelts, wooded conservation areas
Others	▪ Increased number and severity of fires ▪ Wind and water erosion of soils, reduced soil quality ▪ Air quality effects (e.g., dust, pollutants) ▪ Visual and landscape quality (e.g., dust, vegetative cover, etc.)

Soil moisture is sufficiently lacking during winter season (dry period) in Bangladesh. However, respondents are growing winter crops (e.g., Vegetables, *Boro*) in an incremental rate mostly depending on groundwater to satisfy its demand for extra food. Monsoon rainfall has a direct effect on groundwater recharge. Due to subnormal rainfall in 1994, winter season experienced a lowering of water table below suction level. The predominantly shallow tube well zones of northwest region of Bangladesh fell short of supplying its irrigation requirement from the underground source. It is of particular interest to assess the groundwater deficit prevailed in the winter season. It will provide an indication of the amount of dependable water resources available in the area concerned to supply its irrigation requirement.

From the existing database, it is revealed that the northwest part of the country is frequently hit by drought as a whole **(Fig. 1).** Traditionally the area has a high potential for agricultural production round the year. The area came under severe attack of drought in the 1994-95 season, and naturally was the focus of news media and public concern. Therefore the aim of the study was to assess the environmental impact of drought in the northwest region of Bangladesh.

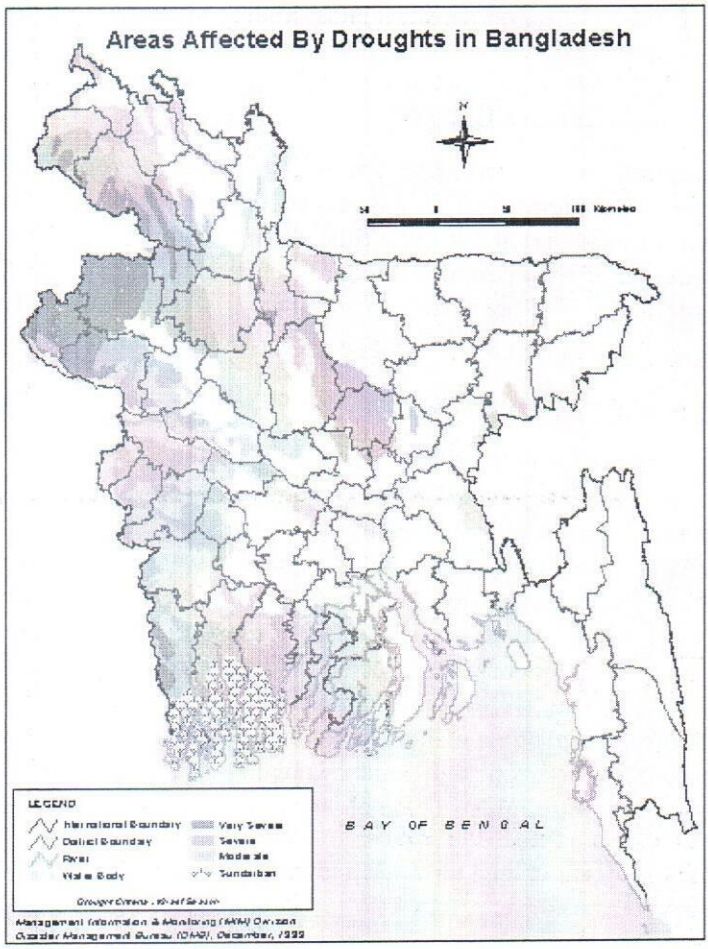

Figure 1. Drought prone regions of Bangladesh
(Source: www.sdnpbd.org/sdi/international_days 2006)

9.2 Methodology

The study was carried out in Badarganj of Rangpur district and Kishoreganj of Nilphamari district. Groundwater level data from 1998 to 1996 were collected from Bangladesh Agricultural Development Corporation (BADC) offices of the respective District. A questionnaire was prepared for surveying the environmental impact of drought, which was usually not available from any known sources. Due to time and resource constraints, survey was conducted for a limited number of households, which has been selected randomly from the two Upazilas (small unit of a District) of the study area. For getting reliable information, careful attention

was given to questionnaire design, sampling technique and administration of the questionnaire.

9.2.1 Questionnaire Design

The questionnaire was designed on the basis of knowledge of some similar previous questionnaires. It was aimed to make the questionnaire a structured, target oriented and at the same time flexible enough to accommodate the general impression of the respondent about the overall effect of drought in the area. The questionnaire was pre-tested during the early field visits before being finalized. Few corrections and modifications were identified on the basis of pretest results. .

9. 2.2 Sampling Technique

Questionnaires were filled up by interviews with different category of respondents. Total of 120 respondents were selected for taking interview. For getting a representative sample, a two-stage sampling procedure was followed. In the first stage, drought affected five unions were selected for the questionnaire survey. These are Kishoreganj, Nitai and Putimari from Kishoreganj thana and Ramkishnapur and Radanagar from Badarganj thana. In the second stage of sampling, respondent were selected randomly from blocks of the selected unions. The respondents were divided into four categories according to the amount of land ownership. Percentage of respondents participated in the interview were categorized based on their land ownership as shown in Table 2. Percentage of respondents was higher in case of land ownership between 50-300 decimal.

Table 2. Percent of land ownership interviewed in two Upazilas

Upazila	Landless (%) (0.0 decimal)	Marginal (%) (0-50 decimal)	Middle (%) (50-300 decimal)	Big (%) (>300 decimal)	Total (%)
Kishoreganj	0	10	60	30	100
Badarganj	8.3	1.7	46.7	43.3	100

9.2.3 Administration of the Questionnaire Survey

During interview session, eight Block Supervisors (BSs, now called Sub Assistant Agriculture Officer (SAAO)) from the representative areas were hired for helping the interview with the local people. These SAAOs are the government employees under the Department of Agricultural Extension (DAE). They are all trained in motivating and organizing the local people. Their main task is to provide with agricultural extension services to the framers of the locality. In this regard the motivations for selecting these SAAOs were that they are familiar with the local problems and at the same time they are conversant with the local colloquia. They

were given training for interviewing the respondents. After completion of the training, SAAOs interviewed the selected respondent in their houses.

9.3 Results and Discussion

9.3.1 Draw Down of Groundwater Level

It was revealed from our analysis of time series data (1986 to 1996) that groundwater levels were dropped more than 1 m during 1994-95. During the field visit from 7 to 23rd June 1996, it was revealed that groundwater extraction technologies in these areas were predominantly by shallow tubewells. It was observed that in the drought year (1994-95), groundwater level was much below than the previous years as well as next year (**Fig. 2**). It was also found that groundwater levels in 1994-95 at Nageshwari (RA36) and Pateshwari (RA71) were about 6 m below the ground level. Similarly, the GW levels were 3 to 5 m below the ground level at Ulipur and Gobidanagar areas during the 1994-5-95. So it was expected that the extra lowering of water table would produce the water level to go beyond suction level (7 m below the pump level) at the point of tubewell operation. This is why that most of the tubewells in that region failed to supply adequate irrigation water during 1994-95.

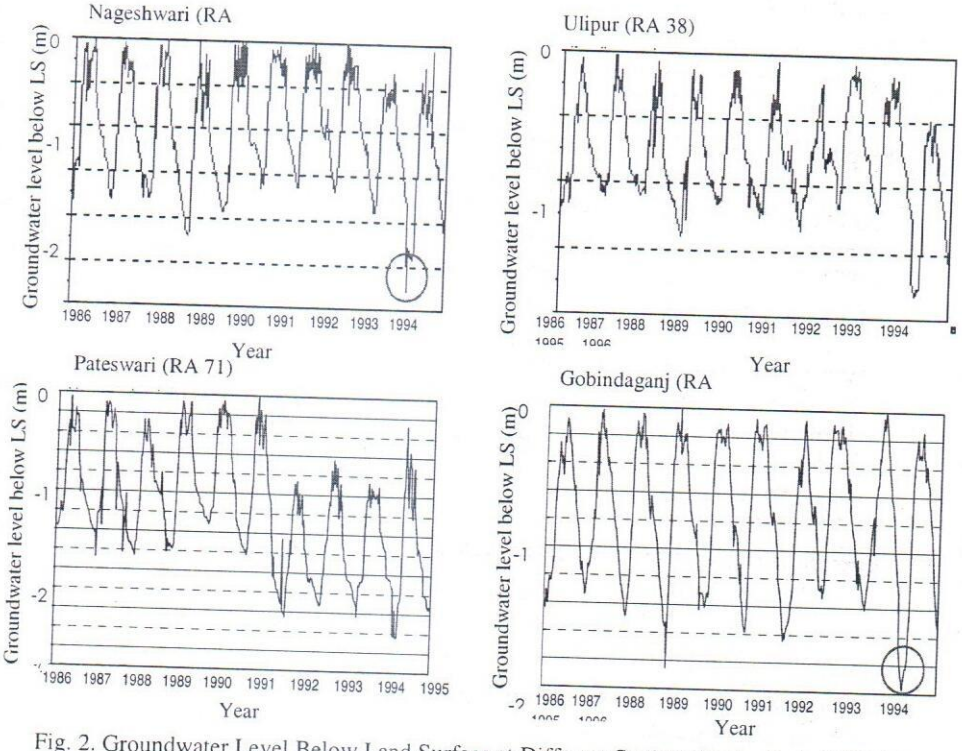

Fig. 2. Groundwater Level Below Land Surface at Different Stations for the Period 1986-96.

9.3.2Environmental Impact

Summary of responses of respondents about environmental impact data related questions are presented in Tables 3 and 4. Table 3 indicates that all the respondents of both the Upazilas opined about decrease in availability of ground and surface water compared to previous years. Most of the respondents observed that vegetation and plants had severely been affected by seasonal drought, moisture stress and soil water deficit. The respondents narrated their experiences to that during drought period, there were abnormalities in the physical environment in the form of increased temperature, hot and dusty air.

Table 3. Environmental Impact (Compared to Previous Year)

Item	Percent of Respondents in Kishoreganj			Percent of Respondents in Badarganj		
	Increase	Decrease	No Change	Increase	Decrease	No Change
GW level (*)	0	100	0	0	100	0
SW availability (**)	0	100	0	0	100	0
Vegetation	0	95	5	0	97	3
Plants	0	95	5	0	97	3
Temp.	100	0	0	100	0	0
Dust	100	0	0	100	0	0

*Ground water **Surface water

Health related responses of Kishoreganj and Badarganj are presented in Table 4. In 1993, the respondents in Kishoreganj and Badarganj suffer from fever. But in 1994-95, sufferings from fever were relatively less, while sufferings from dysentery and diarrhea increased due to use of unsafe drinking water. Half of the respondents of Badarganj indicated that they did not consult the doctor in 1993 but during 1994-95 almost all of them were compelled to consult the doctors.

Table 4. Health Related Responses

Item	Percent of Incidences in Kishoreganj		Percent of Incidences in Badarganj	
	1994-95	1993	1994-95	1993
Malaria	0	0	0	0
Diarrhea	**33**	8	23	3
Typhoid	1.6	5	1.6	5
Fever	68.6	**86.6**	**55**	**70**
Dysentery	**52**	10	**57**	10
Other	5	1.6	8.3	5
No Disease	0	5	3.3	21
Consult the Doctor	100	93.3	96.6	56.6

Local people shared their impression that during drought period most of the tube wells could not supply the same quantity of water as previous years and next year. Also many HTWs went out of operation. An interesting fact came out through questionnaire survey that even experiencing the scarcity of tubewell water during the 1994-95 year, many of the respondents could not use pond or other surface water bodies due to drying up or having little volume of water. About 100 percent respondents replied that HTWs were the source of drinking water in 1993. However, 93 percent of respondents informed that drinking water source was HTW and 7 percent replied sources were STW/DTW (Table 5). Cattle's water was usually from pond in 1993 and that 37 percent respondents informed but due to surface water shortage in the drought period, 18 percent respondents replied that pond water was the source of water for cattle only.

Table 5. Percentage of Water Users' in drought Year (1994-95) and Year 1993 at Badarganj Upazila.

Item	1994-95						1993					
	Drinking Water		Bathing Water		Cattle's Water		Drinking Water		Bathing Water		Cattle's Water	
	Percent of Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist .(m)	Percent of Respondent	Avg Dist (m)
Dug Well	0	0	0	0	0	0	0	0	0	0	0	0
River Water	0	0	0	0	6.7	50	0	0	0	0	7	0
Pond	0	0	0	0	**18.3**	0	0	0	8.3	0	**37**	0
HTW	93	0	93	0	50	0	100	0	92	0	47	0
STW/ DTW	7	0	7	50	17	50	0	0	0	0	3	50

About 93 percent respondents informed that HTWs were the main sources of bathing water in the drought year: where as HTWs as well as dug well and river water were also used as bathing water sources in 1993 (**Table 6).** Pond and HTWs were the sources of water for cattle in 1993. However, percentage of respondents declined to 28 in case of pond water as source of supply and increased to 43 percent in the case of HTWs during the drought year due to shortage of surface

water. People had to collect water for the cattle from the pond from 400 meter far distance from the residence.

Table 6. Percentage Water Users' in Drought Year (1994-95) and Year 1993 at Kishoreganj Upazila

Item	1994-95						1993					
	Drinking Water		Bathing Water		Cattle's Water		Drinking Water		Bathing Water		Cattle's Water	
	Percent of Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist (m)	Percentof Respondent	Avg Dist (m)	Percent of Respondent	Avg Dist. (m)	Percent of Respondent	Avg Dist (m)
Dug Well	0	-	3.3	200	1.7	0	0	-	28.3	30	8.3	10
River Water	0	-	3.3	-	10	**500**	0	-	3.3	200	7	400
Pond	0	-	0	-	**28.3**	**400**	0	-	6.7	-	33	20
HTW	100	50	**93**	30	**43**	20	100	30	**62**	10	28	-
STW/ DTW	0	-	0	-	5	**500**	0	-	0	-	12	50

9.4 Conclusion

The northwest region of Bangladesh was affected largely due to the reduction of water availability for drinking and irrigation. It was revealed from the time series data (1986 to 1996) that on an average, groundwater levels declined more than 1 m in Kishoreganj and Badarganj areas. Badarganj was more affected area than Kishoreganj. There was an increase of temperature and dust in the drought year. During drought period most of the tubewells could not supply the same quantity of water as well as many HTWs went out of operation. Local people shared their impression that during drought period they could not use ponds or other surface water bodies due to drying up or having little volume of water with impurities. People had to collect drinking and bathing water far away from their residence to maintain their water requirement. The people of those areas were severely affected by dysentery and diarrhea due to unsafe drinking water.

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Chapter 10: Public Health Effects of Fragrances and Perfumed Cosmetics

Minhaz Farid Ahmed and Hassan Mahmud

Abstract: *Perfumes and aromatic cosmetics have found their way into the common people's dressing tables. Its use in hiding undesirable body odor has reached such an abundance that the potential toxic characteristics hardly crosses people's mind. To review the 'taken-for-granted' attitude about the safety of such commonly used substances is the key motivation of this study. Therefore, the primary task was to determine the scientific evidence on the toxicity of aromatic marketed commodities and its effects on human. Meanwhile, the perfume manufacturing companies legitimately got their way out of the adverse effect of perfumes. Therefore, direct interviews were arranged with the medical professionals to ascertain their academic knowledge about the issue and their real life interactions with patients suffering from the use of such substances. The results of this study did not really depict a very positive picture as the safety test on chemicals in aromatic compounds done by designated organizations exhibited great fluctuations with tests done by independent organizations and in both cases, not all chemicals were put under scrutiny. In some cases, the number of tests carried out were also not sufficient for giving final verdict on its impact on human. Thus, this matter deserves far greater public attention than it currently does.*

10.1 Introduction

Perfume is a substance that emits and diffuses a fragrant odor, especially a volatile liquid distilled from flowers or prepared synthetically. Generally it is a mixture of alcohol and fragrant essential oils extracted from flowers, spices, etc. or synthesized, used especially to impart a pleasant long-lasting scent to the body, stationery etc. However, not necessarily all perfumes use alcohol e.g. attar; and there are several perfumes available in the market such as rose-water (Perfume consists of water scented with oil of roses), cologne (Liquid or solid made of fragrant essential oils and alcohol), deodorant, roll-on, body spray, patchouli, etc. Most of the modern day's perfumes have its origin in the synthetic sources. These synthetic aromas are created as an alternative, when extraction from the natural sources is not possible. For example, the fragrance of the orchids is not possible to be extracted (Charles, 2006). Perfumes made from synthetic origin brought revolution in the perfume market and become widely available at very affordable prices.

Diethanolamine (DEA), toulene, etc. have severe neurotoxicity and one of the most lethal compounds capable of causing neurotic damage. The Environmental Working Group's (2010) analysis of products labels and tests commissioned by the Campaign for Safe Cosmetics has found that popular fragrances e.g. American eagle seventy seven, halle by halle berry, etc. contain 14 secret chemicals such as benzyl salicylate, benzyl benzoate, diethyl pathalate, galaxolide, etc. on average, which severely disrupts the hormone of both men and women. Oxybenzone, benzophenone-1, galaxolide, tonalide etc. chemicals are affecting both the estrogen and androgens (male hormones) and benzophenone-2 is also affecting the thyroid hormone. Although these chemicals are found in lab tests, however they are not listed on product labels. Similarly, there are chemical sensitizers e.g. benzyl salicylate, limonene, linalool, etc. in almost all popular perfumes. Moreover, 66% secret chemicals have not been assessed for safety that are found in product tested and 19% chemicals are not assessed for safety that are listed on labels due to the loopholes in the existing law.

A study shows that 72% of asthma patients have adverse reactions to perfumes. Moreover, asthma has increased in the past decade by 31%, and in the same period asthma deaths have increased by 31%. Women and those over 65 years of age, suffer the highest death rate for asthma due to the impacts of perfumes (Shim and Williams, 1990). Though people know too much use of perfume is detrimental, yet the provocative advertisement could not stop people using perfume. In Bangladesh, almost every people of upper, upper middle and middle class are using perfumes. As a result, the number of patients of skin disease are increasing day by day. Therefore, the use of perfume cannot be totally stopped by doing some motivational or awareness building works rather it is necessary to enlighten people about the safe use of it.

10.2 Objective

The objective of the study was to explore the harmful effects of overusing of perfumes through scientific evidence and inform the readers about its safe use.

10.3 Methods and Materials

This study is based on both primary and secondary data. The primary data were collected from the direct inquiry of medical professionals regarding their academic knowledge on the topic and their direct interviews with patients suffering from the use of such fragrance products. Face to face interviews and web based interviews with two doctors were greatly aided in gathering the data. The secondary information was based on academic printed publications as well as web based publications on the subject.

10.4 Present Status of Perfumed Product

The campaign for safe cosmetics was a national coalition of nonprofit of different interest groups which carried out an independent investigation on different brands that are marketed. The results that came out were shocking. There were serious allegations made against the perfume companies of adding secret chemicals in their fragrances, without carrying out enough tests on these chemicals (Anon 2013 a).

***Secret Chemicals*:** Laboratory tests revealed 38 secret chemicals in 17 name-brand products, with an average of 14 secret chemicals per product. American Eagle Seventy Seven contained 24 secret chemicals, nearly twice the average found in other products tested (Environmental Working Group 2010a).

***Multiple Sensitizers*:** The products tested contained an average of 10 chemicals which are known to be sensitized and can trigger allergic reactions such as asthma, wheezing, headaches and contact dermatitis. Giorgio, Armani and Acqua Di Gio contained 19 different sensitizing chemicals that can trigger allergic reactions, more than any other product tested (Environmental Working Group 2010a).

***Multiple Hormone Disruptors*:** A total of 12 different hormone-disrupting chemicals were found in the tested products, with an average of four in each product. Three products each contained seven different chemicals with the potential to disrupt the hormone system such as Halle by Halle Berry, Quicksilver and Jennifer Lopez J. Lo Glow. With each product, six of these chemicals mimic the hormone estrogen, and the seventh are associated with thyroid effects (Environmental Working Group 2010a).

Legal Loophole: The main reason why the perfume companies can afford to get away with mixing such chemicals is due to loopholes in the law. Under normal circumstances, any product manufactured for us that contains chemicals is put under investigation by the FDA (US Food and Drug Administration) first. However, an aromatic compound in this case with the exception of food additives is a glaring omission. FDA states that its legal authority over cosmetics is different from other products regulated by the agency, such as drugs, biologics, and medical devices. Cosmetic products and ingredients are not subject to FDA pre-market approval authority, with the exception of color additives" (FDA 2009).

Toxicity in Chemicals: The effects of toluene range from brain damage to degraded performance in psychometric tests. Other neurological damages include anxiolytic effects, frontal lobe epilepsy, etc. Toluene is also believed to be an initiator for asthma problems as well as triggering asthma amongst already patients derived from patterns of occupational asthma problems. Chronic toluene

abuse can lead to irreversible renal, hepatic, pulmonary and cardiac toxicity. Toluene levels of 500 ppm or greater are considered immediately dangerous to life and health (Benignus, 1981). Therefore, it can be seen that toluene is a very hazardous compound and people being exposed have the risk to be subjected to viscous suffering.

Table 1: List of Toxic Chemicals

Name of Chemicals	Toxicity
1, 4-dioxane	A carcinogenic contaminant of cosmetic products may cause cancer or birth defects (NTP, 2008).
bromo-2-nitropropane-1	Toxic causes allergic contact dermatitis (ACDS, 2010).
Alcohol, Isopropyl (SD-40)	A very drying and irritating solvent and dehydrator that strips skin's natural acid mantle, making skin more vulnerable to bacteria, moulds and viruses (Epstein 2001).
Butylated Hydroxyanisole (BHA)	It causes allergic contact dermatitis and contains toluene (ACDS, 2010).
Cocoamidopropyl Betaine	It can cause eye and skin irritation (ACDS 2010).
MEA (Monoethanolamine)	It causes allergic reactions including eye problems, dryness of hair and skin, and could be toxic if absorbed into the body over a long period of time (Epstein 2001).
TEA (triethanolamine)	
Diazolidinyl urea	It causes allergic contact dermatitis, contains formaldehyde- a carcinogenic chemical that is toxic by inhalation and a strong irritant(ACDS2010).
Cocoamidopropyl Betaine	It can cause eye and skin irritation (MSDS 2008).
FD&C Color Pigments	Synthetic colors made from coal tar and contain heavy metal salts that deposit toxins onto the skin, causing skin sensitivity and irritation. Animal studies have shown almost all of them to be carcinogenic (MSDS 2008).
Formaldehyde	Formaldehyde is a known carcinogen, causes allergic, irritant and contact dermatitis, headaches and chronic fatigue. The vapor is extremely irritating to the eyes, nose and throat (MSDS 2008).
Isopropyl Palmitate	A fatty acid from palm oil combined with synthetic alcohol. It can cause skin irritation and dermatitis (MSDS 2008).
Polyethylene Glycol (PEG)	Potentially carcinogenic petroleum ingredient that can alter and reduce the skin's natural moisture factor (MSDS 2008).
PVP/VA Copolymer	A petroleum-derived chemical used in hairsprays, wave sets and other cosmetics that count as toxic (MSDS 2008).
Quaternium-7, 15, 31, 60	It causes skin rashes and allergic reactions (Epstein2001).

Octinoxate (octyl methoxycinnamate)	It is UV absorber that has been linked with estrogenic activity in vitro and in vivo. Octinoxate binds to and stimulates the human estrogen receptor (Gomez, 2005).
Oxybenzone (benzophenone-3)	It is a sunscreen ingredient and reported to act as an endocrine disruptor(NTP 1992).
Diethyl phthalate	The chemical is associated with effects on the reproductive system including sperm damage (Hubinger, 2008).
P-cymene(paracymene)	Inhalation exposure associated with neurotoxicity (Bohl, 1999).
Alpha-pinenes	Inhalation exposure to high concentrations associated with irritation of the respiratory airways (Nielsen, 2005; Rohr, 2002;Venkatachari, 2008)
Benzyl acetate	Benzyl acetate has been reported to cause mutations and have carcinogenic activity in some animal studies (NTP, 1993).
Tonalide	It has been reported to interfere with estrogen and androgen (male) hormones. Tonalide has been found in the bodies of humans and in breast milk (ven der Berg, et. al., 2008).
Heliotropine	A synthetic chemical with a vanilla smell and flavor known as photo toxin (Tenenbaum, *et. al.*, 1984).
Lilial	A skin sensitizer listed by the European Union as a recognized consumer allergen in fragrances (Charles, 2009).
Octinoxate	It may cause photo allergic effects (Klammer, *et. al.*, 2007; Rodriguez, *et. al.*, 2006).
Benzyl salicylate	European Union reported as one of the most frequently consumed allergens.
Anethole	It can cause liver toxicity and possible liver carcinogenicity.
Ethanol	Ethanol intoxication in children is associated with hypoglycemia.
2,6-dimethyl-7-octen-2-ol	Industry review of dihydromyrcenol reported irritation lack of sensitization associated with this ingredient. Developmental toxicity is minimal.
Trans-betaionone	It is a recognized consumer allergen (Lalko, 2007; RIFM, 2007).
Limonene	It is listed by the European Union as one of the known consumer allergens.
Terpineol	Studies in the open scientific literature are focused primarily on sensitization (Bhatia, *et. al.*, 2008).
Musk ketone	It is associated with estrogenic effects (TNO, 2005).
Parabeans	It can be absorbed through the skin, blood and digestive system, found in biopsies from breast tumors (TNO. 2005).

10.5 Health Impact Associated with Fragrances

Perfumes today are not only made from flowers but also from toxic chemicals. Almost every perfume is synthetic. There is a dramatic increase in people who are made sick by fragrances because so many products are now scented. Many baby

products are also scented with chemical perfumes. Babies are more vulnerable to perfumes and disease- causing agents, so when they come in contact with some toxic pollutants, they become susceptible to get affected. It is also hazardous to people who are trying to recover from cancer and other illnesses.

***Irritant Contact Dermatitis*:** It is the skin reaction to a particular irritant that results in inflammation of the skin and itchiness. Irritants cause approximately 80 percent of cases of contact dermatitis. Both sexes are equally susceptible to irritant contact dermatitis. Those with dry skin or who have one or more of the conditions (eczema, asthma or hay fever) are more likely to develop an irritant contact dermatitis. This is called an inflammatory response. The chemicals involved (inflammatory mediators) include lysozymes, prostaglandins, histamine and kinins. Some inflammatory mediators cause increased blood flow while others attract further inflammatory mediators (TNO 2005).

***Milliaria*:** When people spray perfumes it just blocks the skin pore. Therefore, sweat cannot be emitted through sweat glands and no bad smell emits from sweat. But sweat is an excretory element and it is needed to excrete some heavy metal and some other bodily compounds e.g. arsenic, mercury, gryseosulvin, etc. Sweat is a natural process to cool or regulate body temperature. This process pulls blood away from the body's core and toward the surface of the skin, and then the sweat evaporates. This transfer from liquid to vapor requires heat energy which is drawn from the surrounding atmosphere, namely, the body. Heat is pulled out of the blood and skin and thus cooling the body. So when sweat cannot emit, it may cause milliaria (Anon 2011).

***Itching*:** Itchiness is an uncomfortable sensation in the skin that feels as if something is crawling on the skin and makes the person wants to scratch the affected area (TNO 2005).

***Burning*:** Some people possess very thin skin layer. When they contact with fragrances, these chemical damage their skin. There are several types of burns, with names that reflect the layer of skin that is damaged. Generally, burning of skin with fragrances falls under the category of first and second degree burn. First degree burns are superficial and minor. This type of burn only affects the epidermis, or outer layer of skin, and usually heals in three to six days. Second Degree Burns is moderate burns that affect the top and middle layers of the skin (TNO 2005).

***Pruritis*:** It is the intense sensation of itching. Pruritus can result from drug reaction, food allergy, parasites, aging or dry skin, contact skin reaction, such as poison ivy, chemicals fragrances etc. Severe itching often causes damage to the skin (Charles, 2004).

***Hyperpigmentation*:** Skin pigmentation disorders are conditions that cause the skin to appear lighter or darker than normal, or blotchy and discolored. Skin pigmentation disorders occur because the body produces either too much or too little melanin, a pigment that creates hair, skin, and eye color. Melanin protects the body by absorbing ultraviolet light and there are many chemical responsible to hamper the melanin production (Charles, 2006).

***Photo Allergic Reaction*:** A delayed hypersensitivity involving the reaction between sunlight or other radiant energy source and a chemical substance to which the individual has been previously exposed and sensitized. The most common reaction to fragrances is contact dermatitis, a delayed hypersensitivity reaction. However, other reactions include immediate contact reactions (contact urticaria) and photo-allergic reactions. Fragrance mixers (FM) and balsam of Peru (BP) are used to screen for fragrance allergy (Charles, 2006). Patch test study and result showed delayed contact reactions to FM occurred in 6.6% of females and 5.4% of males (Canadian Research and Information Foundation, 1990).

***Skin Acne*:** Skin acne is an inflammatory disease of the sebaceous glands and hair follicles of the skin that is marked by the eruption of pimples or pustules, especially on the face. It could be permanent as a result of chronic impact. It is very common in every family. Generally babies don't get any acne naturally. But there is much evidence that little babies also get acne. When asked their parents, they admitted they have been using some baby lotion, shampoo, cream, etc. and they also acknowledged that most of them were scented. Otherwise a child usually doesn't get acne (Charles, 2006).

***Allergic Contact Dermatitis*:** A red, itchy, weepy reaction where the skin has come into contact with a substance that the immune system recognizes as foreign body, such as poison ivy, poison oak or certain preservatives in creams and lotions. This type of reaction reflects a specific sensitivity or allergy to a specific substance. All areas of the skin that are in contact with the allergen develop the rash. The rash will disappear if you avoid contact with the substance. If exposure to an allergen persists, the skin becomes drier, thicker and scalier with a change in the pigmentation (color). This is also called allergic contact eczema. Allergic contact dermatitis usually occurs 48 to 72 hours after exposure, and will wax and wane depending on exposure (Charles, 2006).

10.6 Discussion

Based on the interviews with the doctors and secondary data, it can be stated that there are high possibilities of chemical intoxication owing to the presence of fragrances. Fragrances block the openings of the sweat duct that excretes body odor. It can lead to irritant dermatitis (Figure 1), Milleara (Figure 2), etc. The mechanism of sweat, although foul smelling and apparently dirty process, is

Figure 1:Children suffer from scented diaper (irritant dermatitis)

Figure 2: Milliaria

Figure 3: Burning of skin due to perfumed cosmetics

Figure 4: Irritation at place of using after shave lotion

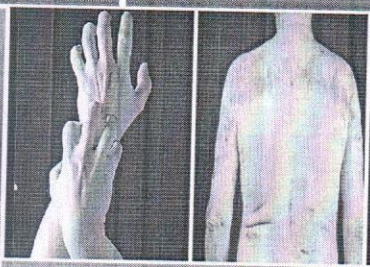

Figure 5: a) Intense itching b) damage of skin due to itching

Figure 6: Hyper pigmentation due to perfume spray in armpit area.

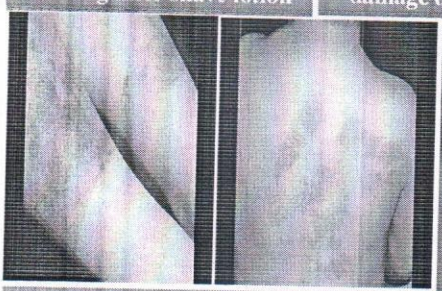

Figure 7: (a+b) Photo allergic reaction due to chronic exposure of perfume

Figure 8: (a) Acne of using perfumed baby product, (b+c) acne on different parts of face

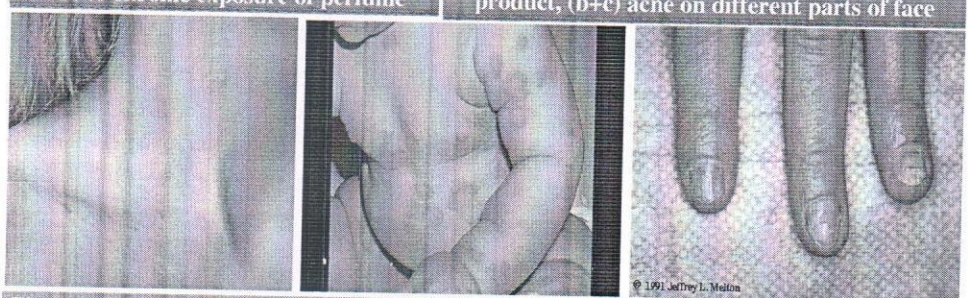

Figure 9: Allergic contact dermatitis. a) rash on neck b) rash on whole body cause for lotion C) reaction of using nail polish

Source: Figure 1 (http://www.dermatlas.net), Figure 2 (www.symptomstreatment.org), Figure 3 (http://www.advancedskinwisdom.com), Figure 4 (http://www.artofmanliness.com), Figure 5 (http://www.nsc.gov.sg), Figure 6 (http://www.healthhype.com), Figure 7 (www.riversideonline.com), Figure 8 (www.healthnetlaserandskin.com), Figure 9 (Anon 2012).

actually an essential one. In order to reduce the smell of the odor, the best practice would be to take regular showers. In some cases sweating can be caused by stress, anxiety and sometimes also from bulkiness. It might be a disease in a few people, but that has to be sorted out by proper medical treatment.

Chemicals from perfumes primarily enter through air follicles and from there, it travels to epidermal and finally to the dermal layer of the skin. Moreover, over use might lead to absorption of chemicals into the blood circulation system (Khanam, 2012). On acute level, it might cause burning (Figure 3), irritation (Figure 4), redness, itching (Figure 5), hyper pigmentation (Figure 6) etc. On chronic level exposure (Figure 7), acne (Figure 8), allergic and contact dermatitis (Figure 9), photosensitivity, etc. can occur (Saki, 2012). It is also said that chemical absorption into the blood circulation system for 10-20 years can cause renal cancer and there have been a few patients like that especially users of 'Fair & Lovely'. In medical term it is called monomorphous acne and this is the early stage of squamous cell carcinoma, a dangerous skin cancer. Therefore, it is believed that the product might be a carcinogen (Anon 2013). The body needs to sweat to be excreted as it the only excretory path to get rid of heavy metals (Anon, 2013). Moreover, the presence of bacteria in the body like *Staphylococcus aureus* further breaks down the chemicals and cause harmful effects. Sometimes, people are motivated by the tricky advertisement on television to use herbal perfumes and many patients come to doctors with side effects after using those so called herbal products.

Although the extensive use of perfumes might damage the body organ severely, some people use too much perfume. These people use roll-on and body spray on a larger surface area and in a greater quantity than normal perfume. Body sprays cover the whole upper part including arm pit. Some people spray for several seconds in their armpit. Therefore, a high dose of fragrances gets ready to penetrate the skin. In this case, the chemicals have gone further than dermis layer. From hair follicle, which in the dermis layer, it goes further in the papilla of hair which is epidermis layer. Then it comes into contact with nerve fiber to penetrate the fiber and go into lymphatic and blood vessel resulting contact with blood. Once blood is contaminated, the whole body become vulnerable as in this route of exposure liver cannot detoxify the fragrance element.

Multiple Chemical Sensitivities (MCS) is caused by overexposure to toxic chemicals. People don't feel the effects suddenly though health is being damaged continuously and MCS or other illnesses will develop if people continue to be exposed to toxic chemicals (Canadian Research and Information Foundation, 1990).

It is not really acceptable in this age of democracy and media for some industries to remain as discreet as the ingredients they use in the fragrance industries. The people have a right to know about the products they use. The industrial policy to halt government intervention cannot be respected any more as soon as they overlap with people's security issues. For that matter, there is an urgent need to refine the existing laws on fragrances. The consumer's side also has their own part to play to ensure their health security. Remaining aware of the side effect of things they use is a must. In case of fragrances, people have to strictly come into understanding in their own terms that despite all temptations and rosy publicity stunts spread by the industry think tanks, fragrances are not essential substances but they are more of luxurious products. Therefore, keeping their use in control will only benefit the individuals. Whilst some of the potential negative health impacts have not been officially proved yet, they have shown strong enough correlations to be alert.

10.7 Conclusion

Perfumes contain toxic substances such as benzyl salicylate, benzyl benzoate, diethyl phthalate, etc. Overuses of perfumes substantially affect the skin by creating Milleara, extensive itching, hyper pigmentation, etc. Children are badly suffering from the irritant dermatitis, rash on the whole body, etc. due to the scanted diaper and lotion, respectively. There are loopholes in the legislation of producing perfumes, which need to be reviewed in order to recommend the safe use of these fragrances. However, some remedial and acceptable measures can be taken. For instance, In order to reduce the smell of the odor, the best practice would be to (i) take regular showers; (ii) To get rid of bad body odor people could use attar, which are organic so the toxic impact would be minimal and attar is usually used in a little surface area; (iii) It could be better to use talcum powder to get rid of bad smell and sweat as it has less chemical compounds; (iv) Strong laws are warranted to protect people from the destructive effect of the use of perfumes; and (v) More awareness campaigns are necessary to enlighten the people for the safe use of perfumes.

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PART: III

ECONOMY

11. Social Business
12. Income Inequality and Female Labor Force Participation in Bangladesh
13. Globalization, Employment and Women's Empowerment
14. Does Higher Education Raise Income Inequality?
15. A New Paradigm of Human Resource Management Practices in South Asia

Chapter 11: Social Business

Muhammad Yunus, Nobel Laureate

[Reproduced below without any distortion the speech by Professor Muhammad Yunus in which he has very clearly stated his doctrine of social business delivered at Chatham House, London on 25th November 2011. The first part is an address of welcome by Lord Boateng; while the second part is Professor Yunus' discussion on social business]

Lord Boateng:

Good afternoon and welcome. Welcome to Chatham House and a particular welcome to our members who are watching and participating in all of this as it is streamed live on the Chatham House website. That means that we are actually going to be pretty disciplined in the course of this afternoon session. I'm going to ask you when we have the discussion later on to be as succinct and as brief as possible with your questions and your contributions otherwise I fear I'm going to be cutting you off in your prime and we want as many of you as possible.

This event today is part of a series of events to mark Aung Sung Suu Kyi winning the Chatham House Prize of 2011 around the theme of democracy and human rights. We couldn't have this afternoon a better interlocutor in that regard than Professor Muhammad Yunus not least because his whole life – as you all know – has been devoted to empowering and enfranchising the poor, recognising that there can't be human rights without the right of all of us to participate in the economies in the countries in which we live. A pioneer and a laureate for his work on microfinance, he has also created a multibillion dollar Grameen Group of social businesses which touch the lives of millions of poor people all over the world in markets that are all too often neglected by the mainstream banking and commercial sector.

He is here today to receive a doctorate from LSE – and from those of us who are connected to that university one way or another that is a particular plus – and we are delighted Dr Muhammad Yunus that you are able to be with us here this afternoon and I invite you to address us around the theme of 'Social Business: A Way to Solve Society's Most Pressing Problems'.

Muhammad Yunus:

Thank you. Thank you very much. I'm delighted to be here and thank you for your kind introduction. I have been hearing about Chatham House but I have never been here. This is the first time and it's a wonderful experience.

Briefly I will just give you an idea how I got started in what I do and why I did it. I was a teacher just like any young teachers do anywhere, teaching my class in Bangladesh. But Bangladesh was going through a terrible situation at that time in the mid-seventies. There was famine in the country. We had just come out of a liberation war to become a separate country in 1971 and we were still going through the euphoria that we were going to create a beautiful country and everything would be solved. But instead we were going down and ended up with famine.

So that's when you feel the emptiness of what you teach. I was teaching economics. You see what I teach, all of those elegant theories, they don't make any sense to people outside the classroom. I thought that I – in a state of feeling rotten about it – should make myself useful to the people next door, to the inner city campus, those in the village. So my ambition was to see whether I could make myself someway useful to the people there even if I was only there for one day for one person.

So while I was doing that I tried a few little things but I discovered a whole new world of people who lived there: what they do and what kind of problems they face. This was quite unknown to me because economics makes you have a birds-eye view. You fly high and you think you see a lot and you think you understand everything because you're seeing everything. And you fool yourself. With what I was doing I felt I had a new kind of perspective: I had a worms-eye view. I see very closely, I see very clearly, I understand. The problems didn't look as complicated as it looked from the sky. So I'm trying to make myself someway activated to find those tiny little solutions.

One thing that came to my attention was the loan sharking in the village. I'm sure you're familiar with the loan sharking everywhere, including the cities. This was very pathetic because these tiny loans are given to the poor people and literally their entire life is controlled by the person who gave them the loan. And their life is made miserable because of it. So I wanted to see how much money was involved, how many people were involved. I made a list. There were 42 names on that list of people who borrowed money when it was finished. The total money they borrowed was $27. I couldn't believe that people had to suffer so much for such a little bit of money. It was never taught in my classroom or in my textbooks. So I thought for a while about the unkindness of the whole situation. Then I realised that I can solve this problem

– at least in this particular case. All I have to do is give this $27 to these 42 people, ask them to return the money to the loan sharks and they will be free. The loan sharks cannot touch them anymore.

I did that right away. I didn't expect what the reaction would be. I thought that this needed to be done and I did it. But the sensation that it created in the village...

they couldn't believe that somebody would do such a thing. Seeing this phenomenon I asked myself, 'If you could make so many people so happy why shouldn't you do more of it?' So I thought I could do more of it, something so simple. And before I thought I could continue to do this, maybe I could go to the bank to link the bank with the people. Instead of going to the loan shark you go to the bank to lend to the people.

When I proposed it to the bank, the manager fell from the sky. He said, 'Are you kidding me? The bank lending money to the poor people: do you know who they are?' I said, 'I know, I work with them.' He said that they would never pay back and I said how did he know? So we had a long debate where he would not budge from his position and I would not budge from my position. It went on a long time that led me to other high officials in the banking system. Everybody gave me the same answer: that it could not be done.

So after months of trying and I couldn't find a way to open it, I said that I would be a guarantor. I will sign every piece of paper you give me. I take the risk, you give the money. That took another couple of months to persuade them. Finally they agreed and I started signing papers and getting money to the people – a very small sum. And I came up with ideas how to make it easy for people to pay back and they were paying it back 100 percent. I had no problem.

So that was the beginning of what later became known as microcredit. The term didn't exist before 1976 when we began that. So that word had to be invented and introduced into the language and then the other alternative name microfinance came to describe the same thing and we created a bank out of it – The Grameen Bank. Today it works all over Bangladesh. We have 8.3 million borrowers of whom 97 percent of them are women. They take tiny loans to start income generating activity and they pay the loan week by week in weekly terms. This is what microcredit is all about.

They say. 'It's so wondrous, it's so wondrous.' People say, 'How do you do that? How can you get money from people who don't have any money? You lend money and they pay you back!?' It's tough times getting money out of the rich people particularly in Bangladesh. It's very tough. The bigger you are, the most likely that you are the big defaulter. People said, 'How do you do that?' And I said that it was very simple for me. I didn't need a rule or principle to do that, I just look at the banks. I don't know anything about banking. I just bumped into it. I have no idea. So I looked at the conventional banks and how they do it. Once I learnt it, I just did the opposite. They go to the rich, I go to the poor. They go to men, I go to women. Ninety-seven percent of our borrowers are women. They go to the city centre and make a big office. We go to the remote village – we always work in the village – they ask for collateral. What collateral? I said that poor people have no collateral, why are you asking them? That question doesn't exist

in this situation so we dismissed collateral.

Once you dismiss collateral another thing happens. They have lots of lawyers in the conventional banks. We have no lawyers. What do we need lawyers for because we don't have papers? We are the only lawyer free bank in the whole world and our bank works beautifully, our payments have no problem. We are not the one that has got into the collapsing situation in 2008 when the big banks were falling apart. It's a very funny situation about 2008 for me personally because banks were explaining in 1976 that you cannot lend money to the poor people because they are not creditworthy. In 2008 the same year we started a program in New York City called Grameen America to lend money to the poor in New York City. It was working beautifully because we followed the same principle we followed in the village in Bangladesh, we have not compromised anything. But later in the year – we started in January

– later in the year the financial crisis came. Big banks almost on the other side of the street started collapsing while this little bank, which started several months back, was flourishing. I said I wished some journalist here would be asking me now, 'Who is credit worthy?'

So this is the mystery of banking. You don't know what you're talking about. One by one, it's a long list the differences between Grameen bank and the conventional bank. The conventional bank always wants to know how much experience you have in the business you want to do with their money. You have to prove that you are an expert in the business, that you know everything to convince them you can run the business well. When we go to a woman to tell her that we want to lend her money, would she be interested? She tells us, 'No way, I'm not interested. I don't know what to do with money. Give it to my husband.'

We train our staff so that when we see a woman and talk about Grameen Bank she says she doesn't know anything, please don't give her any money, she can't handle money. You always know she's the one we're looking for. She says no not because she doesn't know anything, it's because the answer she gives is not her voice. It is the voice of history, the history that was created her. For generations she has been told that she is no good. Good for nothing. Only men can do things, not the women. So she is just responding as a person to the history that she has been taught. She is packed with fears. That's what society has given her, fears. It's our job, now that we've found one, to peel off these layers and layers of fear that she is surrounded by and to finally let her emerge and peek at the world and say, 'Maybe I should try.' And that is the moment we have been waiting for.

It took us six years to achieve a 50-50 level because our ambition was that the number of men and the number of women should be even. I have been critical about the banking system in Bangladesh. Not even one percent of borrowers are women. This is totally unjust. So I wanted to make it a just system and this took

us six years. Then we saw that money going to the family through women brought so much more benefit in comparison to men. You could write books about it. How it is different. Then we said why are maintaining this 50-50 level, why don't we focus on women because that's where you make the biggest change in the family. So we started focussing on women. Since, the result was many years back we became 90 percent, 95 percent, 97 percent and this is what Grameen is.

When microcredit spread outside Bangladesh like in New York City – we have four branches in New York City – where we have 6,500 borrowers and are 100 percent women. In a country where it is illegal to discriminate on the basis of gender, we made our rules in such a way that we can get over this law. We said they don't come to us. It's offered but they don't come to us. It's the hurdles we create for them.

So that was successful and we were invited to do it in Omaha, Nebraska. We opened a branch in Omaha, Nebraska. People got excited. They said, 'We want it, please come here, we will give you all the money to run it.' We were invited to Indianapolis so we have another branch in Indianapolis. Now San Francisco and Detroit are waiting to open two other branches there.

So this is the universality of the whole thing. It works in every situation because banking is done in such a skewed way. It became some sort of institution where it is geared to the big guys and the big corporations. The real people missed out on the whole system. If you look globally, you see two-thirds of the total population are not touched by the banking system. It's only a one-third system. Why are we running around with only the one-third system and not doing it for the rest of the people. Is it because they don't need the money? The poor guy has as much ability as anyone else but just doesn't have the first unit of money to start something on their own. So nobody gives them one. I always say, 'To catch a dollar, you need a dollar. With an empty hand, you never need a dollar.' So somebody has to put a dollar in their hand so they can go and make a living for themselves and feel confident about it.

This is the microcredit scenario that we have built up. People say that we are looking for the entrepreneurial poor; only they can do it. What do they mean entrepreneurial poor? Everybody is entrepreneurial. They say only the entrepreneurial poor will be successful. That never entered my mind to look for entrepreneurial poor. When I go to a woman, she says she doesn't know anything. I train my staff to say to that woman, 'You are the one we are looking for'; because I believe all human beings are entrepreneurs. It's in the DNA of human beings. That's how we survive on this planet. Suddenly you are saying that some people are entrepreneurs and others are not, just because you want to serve entrepreneurial people. You make a class. That is the wrong conception of human

beings. All human beings are packed with unlimited capacities and unlimited potentials. Simply society just never gave them a chance to bring it out. Like this woman I was describing, you need to peel back the layers and layers of fear to give the poor people what they needed. Poor people are just like any other human being. They are not different human beings.

I give the example of the Bonsai tree. I say take the seed of the tallest tree in the forest and plant it in a little flower pot and it only grows this much. Then you wonder what happened, what is wrong with the seed. There is nothing wrong with the seed. You didn't give it the space to grow. That's why it came out like that. Poor people are like Bonsai people. Simply society never gave them the space to grow. If society had given them the space they would be as tall as anyone else, their children would be as cheerful and achieving as anybody else. There is nothing wrong within the human body and within the human system.

As I go along I wanted to show that they were entrepreneurial so I started a program about five years back to lend money to the beggars. You can't be poorer than beggars. The message that we gave and the discussion that we had was as you go along, house to house begging, would you like to carry some merchandise with you? Some cookies, some candies, some toys for the kids as you visit the families... I said, 'You're going there anyway. It's not extra work for you.' And then they said right away, 'Yes!' So we started giving them loans and they started going there, initially very shyly saying they have something to sell and would the people be interested. And it became very popular. Everyone wanted to buy something from them because they are known as someone who always comes and begs for food, begs for money and so on but now she wants to sell so everybody supports her.

We thought we would have 1,000 maybe 2,000 beggars in the program and test out whether a beggar can be an entrepreneur. It became so popular we ended up with more than 100,000 beggars in the program. By now more than 20,000 beggars have stopped begging completely, they are very successful door-to-door salesmen. Others have become successful shopping agents because house-wives cannot always go to the markets sometimes so they get the beggars to go and bring them things and they get their cut and get good business. Some have taken their first loan, paid it back and have taken out a second loan, third loan and so on.

So you see the progress in that. Again it gives a glimpse of human beings and what they can do if given an opportunity. All we did was open up the possibility that you can borrow money and add this business along with the other businesses. So that those that are not closing down their begging division yet, they want to be comfortable and know that this is a new business that they have and they're doing very well from it. So they will go through this testing and come to that conclusion.

I have been looking at problems as they come and try to see how to solve them. Now looking back, whenever I saw a problem my distinctive reaction was to create a business to solve the problem. So I keep on creating businesses. As I see a problem I see a business to solve the problem. In the process I have created many companies. People say that I must be a very rich man because I own so many companies. I say that I'm not a very rich man; I'm just a guy that I always was. People ask what I do with all these companies and I say that I don't own any single share of these companies because I never intended to make money out of those companies. That's not the purpose of those companies; the purpose of those companies was to solve problems.

Then I realised this is the kind of business that is missing in the world. When you look at the poor person you wonder why there is poverty. Is it because the people don't want to work, their illiterate or their ignorant? Is that why they are poor? Every time you see this woman that you meet in the village and you talk to her about what she does with the money you realise it is not her who is responsible for the poverty. It is the system that is responsible for the poverty. Poverty is not created by the poor person: poverty is created by the system we built. Concepts we have infused into ourselves and we feel so glorified that we have such a beautiful system, an enormously intricate system that we built – it is fantastic. It's not: that is what created all of these problems.

Poverty is an externally imposed phenomenon; it is not an internally created phenomenon. So once you see it's externally created, and then you go around and fix it up. If we fix the system, there will be no poor people because there is nothing wrong with the person.

So I look at it and decided what the things that are going wrong are? I identify the banks as an institution. Just as an example, let's look at the banks. They say that it cannot be done. You cannot lend money to poor people. That's why we created our own banks. Now after 35 years and the entire globe is running without any problems. Why can't the banks extend themselves to cover everyone, why do they have to create an exclusive banking system? Nobody talks about that.

That's where we've gone wrong. We've created institutions that hear problems but who don't want to touch it anymore. I talk about the institutional framework, conceptual framework. Conceptual framework is looking at the way we have designed the economic framework. In the economic framework we assume that all human beings will do in business is make money. So money making is the mission of the business. Not only we say that but we go a little bit further. We say maximisation of profit is the mission of the business. Isn't this a misrepresentation of human beings in the economic interpretation of human beings? Because human beings are not kind of a 'robber-like' being where all you do is make money. Not a single dimensional being. Human beings are multi-

dimensional beings. Making money is only one dimension. What about all of the other dimensions? Theoreticians picked the one aspect

– selfishness among us; we all have selfishness in us for our self-preservation

– and built a whole theory of economics on top of it. Forget that we have all these other dimensions, such as selflessness.

I keep repeating that every human being is a combination of selfishness and selflessness. At least you pay attention to the selfless part of it when you are designing this big edifice of theoretical framework. Economists say that if you want to be selfless and you want to do good for others, then step out of the world of business and become a philanthropist. I'm not talking about being a philanthropist, I'm talking about business and I want to be inside that business world and express my selflessness. How do you do that? I say, well, I knowingly have done that. I have created all of these companies not for myself but to solve problems.

We can build businesses on the basis of that principle, on the basis of selflessness, and I started calling them social businesses. These are businesses not for making money for their owners; these are businesses that solve intricate problems every day in a business way. What is wrong with that? It's a non-loss, non-dividend company to solve problems. Investors over time can take back the investment money but nothing more than that. Not because government has said that or they have made it a rule. No, you have decided that this is what you want to do.

So you can have two businesses. One is a profit-making business to make money. There is nothing wrong with that. But then you also have a social business so you want to solve problems. In a profit-making business everything is for money. So the centre of attention is money in the profit-making business. In a social business everything is for others and nothing is for me – and I enjoy it.

Making myself happy by making money is good, I'm not opposed to that. But you are depriving yourself of another happiness, a happiness that comes from making other people happy. That is an enormous happiness but you have deprived us because we don't get a room or don't get a door through which you can enjoy that happiness. I said I wanted to open the door for happiness.

Nobody cared. They said, 'How can you do that without profit? Nobody is interested in it.' I said, 'I am interested in it. How can you say nobody is interested in it?' I said that if you put it in your textbook then young people will grow up discussing it. What should I do when I grow up? Should I be in profit-making, should I be in social business? If I am in a social business what is the problem? I would like to solve, and how do I design that business to solve those problems. This should be part of the growing-up process.

In the universities and business schools there will be two departments giving MBAs. In today's MBAs you train people so they can go out, work very hard so that the shareholders of the company can make a lot of money because you work for them, that's all you do. You have a good salary and you enjoy yourself but you are dedicated to somebody else, somebody making money. I said that MBA is fine, I'm not opposed to that.

Why don't we have another department giving social MBAs? You learn how to create a business to solve problems. Your everyday exercise in the classroom is, which problem are you looking for, how do you design it? If my design is better than yours than I get a better grade because I have a better solution for that. It is done in a business way too because money comes back.

People say they do this in charity all the time but I say there is a difference between charity and business. In charity money goes, it does the job and never comes back. If you can transform it into a social business: money goes, does the job and comes back. And you use the money again and again. You recycle the same money endlessly. It is a self-propelling machine when you build this business and it is sustainable. That gives you enormous capacity.

Luckily something happened and made the issue clearer. I had a chance meeting with the chairman of a multinational company called Danone. It is a French based company. During the discussion I said why don't we have a company jointly in Bangladesh? He agreed right away. Then I said, 'I'm not finished yet. It's going to be a social business.' He said, 'What is a social business?' So I gave him a big spiel about social business. He and I shook hands and he agreed. I thought maybe he didn't understand the Bangladeshi English that I was talking or I didn't understand his French-English so we got lost on the way.

I was on the way to attend another conference in Doraville – it was a women's conference – and on the way I sent a long email to him summarising what we had discussed and what we should do. This immediately gave him a chance to say that maybe he did not understand me and to feel free to correct me if I might have given him the wrong impression. He immediately replied and said he understood every word; he agreed with it and let's go ahead with it [sic]. This was 2005, the company was created in 2006 and we went into production in 2007. This company has been in production for four years to solve the problem of malnutrition among the children of Bangladesh. Bangladesh has a population of 160 million people. Half the population is under the age of 21 – the median age – so you can see how many children there are. Almost half of them are malnourished. Almost 46 percent of the children of Bangladesh are malnourished.

So there are many efforts going on: some work, some don't work. So we said let's concentrate on this issue because it's the future of the country. If you are malnourished you are physically stunted, if you are malnourished you are

mentally stunted. All the money you put into education does not get there because it does not catch what you are doing. So you need to get the receiving part well so that you can catch it and grow.

So we concentrated on that. What we did was to produce a special kind of yoghurt, because Danone is a yoghurt expert. We gave them this task: to produce a yoghurt that will solve this problem. We decided that we will put all the micronutrients that are missing in the children into this yoghurt. Vitamins, iron, zinc, iodine, everything, and we will make it very delicious because Danone knows how to make things delicious, particularly yoghurt.

So we started selling this yoghurt. Children love it, they eat it, it is very cheap so even the poorest child can afford it, and make a marketing system where even poor people can access it. If you put it in the store, the poor people don't go to the store to buy it. You bring it to their doorstep. Children follow this person who is bringing this yoghurt. So they like it. Now, studies have shown that nutrition is improving among the children who are taking it.

So this is all dedicated to that particular purpose: not making money for Danone, not making money for Grameen. We're all legally bound not to take any profit of this company. We can take back the investment but that's it. That's a social business. Many other companies came to do the social business. We had a social business with Veolia to produce water in Bangladesh and Adidas to produce shoes affordable to the poorest person who walks barefoot. We challenged them to produce shoes for under €1. They were shocked. Adidas shoes under €1. They said this is a big task and I said Adidas is a big company! Why do you want to do a small task? You should be proud to do the big tasks. They took that challenge and it took them two years to produce those shoes. Now it is being marketed. We have a series of [inaudible], 'Grameen and Co' and so on.

All of these things that have happened to us, all of the crises, all of the problems that we have ended up with are because we went wrong in designing the system. It's a design fault that when you step down on the staircase you always stumble. This isn't always your fault. Someone miscalculated that one step and you stumble every time. That is what is happening. All of these crises put together are a giant wake-up call – but we don't want to wake-up. Come on, don't sleep. You can go back to sleep, you can fix it and stop the alarm but only for a while. It will keep on going and then it will explode.

We are coming to the end of our civilisation. This is what it's doing. We need a different kind of civilisation where we do not have all of these things that we have created. It is a mess. We have right now all of the information and all of the ability to redesign the whole system. It is a system where there will be no poor person because it's not in the person and a system where nobody will be called an unemployed person. What is this unemployment? An able bodied human being

with creative power, unlimited power remaining totally unutilised: Is this the civilization that we are bragging about? Does it make sense? It doesn't make sense to me. It's a total wastage.

Let us carry on. It's only 1 percent, it's only 5 percent and it's only 50 percent. Let's go ahead, we'll fix it. What happened to that 50 percent or 5 percent or 1 percent? They are human beings on this planet but because of this screwed up system they have to suffer. They are capable, they want to work. You can't find a way to make this work and you blame them for that. I feel ashamed, if I am an unemployed person but why should I feel ashamed? Is it my fault?

So we have to go back and redesign the system that we have built so that our successes will be greater than what we have now. But the present civilization's problems are so gigantic that we couldn't fix anything: poverty, diseases, the environment, you name it. We have to scrap that system. It's not a question of Band-Aids. It's a total question of redesigning and recreating an entirely new civilization. That's what we have to do. Thank you very much.

Chapter 12: Income Inequality and Female Labor Force Participation in Bangladesh

A.F.M. Ataur Rahman

Abstract: *Income inequality is an important socio-economic issue, which has deep implications on many aspects of an economy. Female labor participation is sometimes argued as a factor that can affect income inequality. Theoretically, such argument makes sense in case of a growing economy. This issue has been discussed in Carter (2007), Bergh and Nilsson (2010) among others. Using Cointegration method, this paper explores existence of the long-run relationships between income inequality and female participation in labor force of Bangladesh. Granger causality test is also done to get an idea about precedence and underlying dynamics of the variables under study.*

12.1 Introduction

High level of inequality is a scar on economic development. Our grandeur achievements become nonsensical when we see high disparity in economic opportunities among different groups of an economy. Consumption, the fundamental motivation of taking economic toils also can assume a wide range within a certain society. This has made income inequality a focus of investigation for development economists. There is a plethora of theoretical, cross country as well as country specific studies on this issue. It has social dimensions and therefore country specific economic and social factors affect in its extension.

Inequality can be measured in various dimensions for a given population. The most popular measurement of it is income inequality which measures the difference in the levels of income among different strata of a society. It is commonly measured by using Gini coefficient[1]. Other measures of inequality available in literature are consumption inequality, wage inequality, education inequality and so on. For this paper, income inequality has been used.

Along with being morally and ethically an undesirable phenomenon, some researches have argued that high levels of income inequality in detrimental to growth (see Persson and Tabellini, 1994; Alesina and Rodrik, 1994; Deininger and Squire, 1996 among others). A counter argument, known as the equity-efficiency argument (Okun, 1975; Stevans, 2012) motivates that inequality leads to greater capital accumulation and hence fosters economic growth. Thus,

[1] Originally proposed by Corrado Gini (1912)

working within the neo-classical paradigm, inequality cannot be dismissed as purely evil.

The inequality-growth argument first entered mainstream economics with Kuznets (1955). His paper argued that, as a nation transitioned from an agrarian society to an industrialized one, income inequality is first going to rise and then fall. Inequality will rise due to migration of workers from rural to urban areas and from agriculture to manufacturing sector. With better living conditions in the urban areas and better wages in manufacturing sector, income inequality rises. However, over time, with improved education and training opportunity, a greater number of people can make the transition. In the second phase of the process, income inequality falls. This will make the graph of income inequality, plotted against time, look like an inverted-U. Support for this type of relationship was found in Nielsen and Alderson (1997), Higgins and Williamson (1999), Clark, Xu, Zou (2003), Barro (1999, 2000, 2008) among others.

Even though the fact that income inequality has existed in all previous human societies, studies suggest that over time, this trend has gained momentum and led to a greater accumulation of wealth at the hands of a few (Chang and Ram, 2000). Due to expansion of market economy and increased complication in production process in recent past access to economic opportunities sometimes get limited to only a certain group of a society. Such situation may inhibit income generation of poorer group (see Korzeniewicz and Moran, 2005; Dreher and Gaston, 2006; Rodrigues-Pose and Tselios, 2010; Bergh and Nilsson, 2012; Kim and Lin, 2011; Benedict, 2011; Mountford and Rapoport, 2011; Acar and Dogruel, 2012; Stevens, 2012).

Certain governments have tried to curb this trend through appropriate fiscal and public welfare policies (public education, healthcare, progressive taxation, gender friendly policies etc.). However, a move towards a free market system (persuasion of rather headless efficiency) and the rapidly declining strength of socialist arguments in policy making over the last two decades have made these less effective (Milanovic and Squire, 2005; Sala-i-Martin, 2005; Easterly, 2007).

In this study, using cointegration method, we shall attempt to find out existence of any long-run relationship between income inequality and measures of female participation in labor force in Bangladesh. Granger causality test will also be used to get an idea about precedence and underlying dynamics of the said variables.

Unpaid work does not necessarily contribute to the growth of a country as long as we stay within neoclassical paradigm and measure an economy's growth by GDP or GNI. Therefore female participation in formal sector can contribute to growth by increasing household income. However, increased female income can have different impact on income inequality situation. If female labor comes out of low

income family then that can ease up income inequality situation but will worsen it if the extra labor is from high income group.

Bangladesh is a growing country with predominantly traditional social structure. Woman although respected in the society are mostly expected to stay inside home and provide vital support. Recently this trend is challenged by new, confident, outgoing, educated female labor force both in rural and urban areas. And we expect that to have an effect on income inequality scenario of the country.

There are many country specific studies on the impact of women's participation in formal sector on income distribution (see Karloy and Burtless, 1995, for the U.S. between 1959 and 1989; Cancian and Reed, 1999, for the U.S. in the period 1968-1995; Del Boca and Pasqua, 2003, for Italy during the period 1977-1998; Amin and Da Vanzo, 2004, for Malaysia between 1976 and 1988) though to the best of our knowledge we have not found one on Bangladesh. These studies have used a wide range of methodologies starting from developing a full scale model to VAR based cointegration technique.

Some researches have used counterfactual distributions to this end (Betson and van der Gaag, 1984; Cancian and Schoeni, 1998; Burtless, 1999; Cancian and Reed, 1999; Reed and Cancian, 2001; Del Boca and Pasqua, 2003; Amin, 2003; Amin and DaVanzo, 2004). They measured inequality under different assumption on women's employment rates or computed on total household income less women's earnings. The main result of these studies is that inequality in households' income distribution would be higher without women's earnings.

Selective mating has been found as a reason behind rise in income inequality where educated, high-paid women only marry other educated, high-paid men, vice versa (Thurow, 1987), creating an artificial division in the society. In the same vein, Bluestone (1990) argued that the rising world inequality experienced during the 1970s was primarily due to a greater number of women entering the workforce. More recent paper, such as Acar and Dogruel (2012) found a positive relationship between pay inequality and rising female labor participation in the workforce since wages are still not gender-neutral.

Other factors that might affect income inequality includes the type of political regime (Benabou, 2000; Bourguignon and Verdier, 2000; Verdier, 2005; Milanovic and Williamson, 2007; Kemp-Benedict, 2011), type of institutional structures (Chong and Calderon, 2000: Cong, 2004; Chong and Gradstein, 2007; Sunde et al., 2008; Easterly, 2007), historical factors (Angeles, 2005), organizational development (Acemoglu et al., 2002; Engerman and Sokoloff, 1997; Engerman et al., 2000; Snower, 1999), financial development and deepening (Beck et al., 2007; Kim and Lin, 2011) etc.

The paper is organized as follows: the next section discusses methodology which is followed by the description of data and empirical findings. Concluding remarks are presented in the last section.

12.2 Methodology

Macroeconomic variables are mostly interconnected with each other and income inequality is no different. Therefore, it is little optimistic to develop a comprehensive model that will include all possible explanatory variables of inequality, measured by Gini coefficient. Hence, we took the avenue of testing existence of long term relationship among variables of concern and Gini coefficient using the method of cointegration. If variables x and y are cointegrated then regression between the two variables will produce stable results according the following equation even when two variables are not individually stationary.

$$y_{it} = \rho x_{it} + \varepsilon_{it}$$

That is the above regression will produce technically stable results. However, technical stability is tested through investigating residuals ε_{it} of the equation. This procedure was first proposed by Engle-Granger (1987) and then extended by various researchers including Pedroni (2004) who applied it for panel data.

The process starts from investigating into stationarity among individual variables. There are few unit root investigation techniques available including Augmented Dickey Fuller (ADF)[2] test and Phillips Perron (PP)[3] test. We used both of them. ADF test runs the following regression to test null hypothesis of $\alpha = 0$.

$$\Delta y_t = \alpha y_{t-1} + \delta x' + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \beta_3 \Delta y_{t-3} + \cdots\cdots + \beta_p \Delta y_{t-p} + \varepsilon_t$$

Here x is the vector of exogenous variables. PP test is an improvement on original Dickey Fuller test and uses the same null hypothesis of $\alpha = 0$. However, it modifies t statistics of α to take care of problems developed due to serial correlation. To be specific it calculates test statistics according to the following relationship:

$$\tilde{t}_\alpha = t_\alpha \left(\frac{\gamma_0}{f_0} \right)^{0.5} - \frac{T(f_0 - \gamma_0)(SE(\hat{\alpha}))}{2 f_0^{0.5} s}$$

Here t_α is the t statistics of α, $\hat{\alpha}$ is the estimate, $SE(\hat{\alpha})$ is coefficient standard error, and s is the standard error of the test regression. γ_0 is a consistent estimate

[2] Originally proposed by Dickey and Fuller (1979) and later worked on by MacKinnon (1991, 1996)

[3] Originally proposed by Phillips, P.C.B. and P. Perron (1988)

of the error variance and f_0 is an estimator of the residual spectrum at frequency zero.

Johansen's methodology for determining cointegration takes its starting point in the vector auto regression (VAR) of order p given by

$$y_t = \mu + A_1 y_{t-1} + A_2 y_{t-2} + \cdots\cdots + A_p y_{t-p} + \varepsilon_t$$

Here y_t is an $n \times 1$ vector of variables that are integrated of order one commonly denoted as $I(1)$. This equation can be rewritten as

$$\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t$$

Where

$$\prod = \sum_{i=1}^{p} A_i - I \text{ and } \Gamma_i = -\sum_{j=i+1}^{p} A_j$$

If the coefficient matrix $\prod$ has reduced rank $r < n$, then there exists r number of cointegrating relationships among the variables of the group.

Other symbols used have their usual meanings.

Upon finding existence of long term relationship, we ran Granger Causality test. Causality test proposed by Granger (1969), tests precedence of occurrence between two variables and should suffice causality except for the cases of reverse causality. Regressions that we will estimate during causality test are the following:

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots\cdots + \alpha_l x_{t-l} + \beta_1 y_{t-1} + \cdots\cdots + \beta_l y_{t-l} + u_t$$

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots\cdots + \alpha_l y_{t-l} + \beta_1 x_{t-1} + \cdots\cdots + \beta_l x_{t-l} + v_t$$

The reported F-statistics are the Wald statistics for the joint hypothesis $\beta_1 = \beta_2 = \beta_3 = \cdots\cdots = \beta_l = 0$.

12.3 Data

To measure female labor force participation, we use female to total labor force and female labor participation rate from WB databank. Definitions of variables are given in Appendix A.

For income inequality, we use the Gini dataset from Standardized World Income Inequality Data (SWIID) developed by Solt (2008). SWIID is an improvement on WIID, which was created by World Institute for Development Economics

Research of United Nations University (UNU-WIDER), which was based upon the dataset developed by Deininger and Squire (1996). The set contains over 5,000 observations from over 160 countries.

Gini Coefficient measures the extent to which the distribution of income or consumption expenditure among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

For our analysis, we will use both the net Gini (*Gini_net*) and market Gini (*Gini_mkt*). Gini_net is the income inequality within the country after taxes and transfers. Gini_mkt is the gross income inequality in the country, existing before taxes and transfers.

Due to the lack of data availability, our analysis will be restricted within a two-decade period from 1990 till 2010.

12.4 Empirical Findings

Summary of unit root tests are given in the following table, which indicates that the variables have unit roots with first degree integration which qualifies them to be used in cointegration analysis[4].

Table 1: Results of Unit Root Test

Variable	Level of integration	
	Augmented Dickey Fuller test	Phillips Perron test
Gini_net	I (0)	I (1)
Gini_mkt	I (1)	I (1)
Openness	I (0)	I (1)
Domestic credit to private sector	I (1)	I (1)
Labor participation rate, female	I (0)	I (1)
Labor force, female	I (1)	I (1)

Then we ran pair wise cointegration tests among variables and results are given below:

Female labor and Income Inequality

[4] Details are available on request

Female labor participation captures the percentage of female labor engaged in job out of total female labor. This tells the extent of female working for pay. Results found are given in two following tables. For both definitions of inequality (Gini_mkt and Gini_net) we found existence of two cointegrating relationships among variables.

Table 2: Cointegration Test between Inequality and Female Labor participation

a) Inequality measured by Gini_mkt

Sample (adjusted): 1992 2010
Trend assumption: Linear deterministic trend
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.816263	38.60686	15.49471	0.0000
At most 1 *	0.286583	6.416106	3.841466	0.0113

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

(b) Inequality measured by Gini_net

Sample (adjusted): 1992 2010
Trend assumption: Linear deterministic trend
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**

None *	0.613314	26.58158	15.49471	0.0007
At most 1 *	0.361663	8.528892	3.841466	0.0035

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

While the results are strong and econometrically sound those indicate the presence of a third variable in the group. Following Rahman and Senan (2013) and others we suspected this third variable as GDP, a measure of overall performance of the economy. Regarding stationarity we found GDP of Bangladesh to be cointegrated of degree two and therefore we used its first difference in our estimation. Cointegration results, presented below confirm our intuition:

Table 3: Cointegration Test between Inequality, GDP growth and Female Labor participation a) Inequality measured by Gini_mkt

Sample (adjusted): 1993 2010
Trend assumption: Linear deterministic trend
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.810337	51.19061	29.79707	0.0001
At most 1 *	0.630375	21.26553	15.49471	0.0060
At most 2	0.169853	3.350750	3.841466	0.0672

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

(b) Inequality measured by Gini_net

Sample (adjusted): 1993 2010
Trend assumption: Linear deterministic trend
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.809873	45.44404	29.79707	0.0004
At most 1 *	0.537160	15.56287	15.49471	0.0488
At most 2	0.089926	1.696127	3.841466	0.1928

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Our next attempt was to find out directions of causality among these four variables. We used Granger causality (or non-causality) test to identify the direction of precedence. Results presented in the following table shows that these four variables are connected with each other through a number of relationships. First growth of GDP granger causes female labor participation. However direction of relationship is negative indicating that higher GDP growth lowers female labor participation. Which conforms our intuition of using female as reserve labor.

On another front we found female labor participation and Gini_mkt moving simultaneously having positive relationship among them. This is probably an indication that when inequality increases (rich getting richer and poor becoming poorer) more female labor enters into job market. Results also show that Gini_mkt precedes GDP growth. All these pieces when reconciled then we can say that when inequality (measured by Gini_mkt) increases then that boosts up the economy but that also depresses female labor participation. However, in another vein increase in inequality increases female lab participation, therefore effect of Gini_mkt on female labor participation becomes ambiguous.

Table 4: Results of pairwise Granger causality test

a) Between GDP growth, female labor participation and Gini_mkt

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
DGDP does not Granger Cause FLABPAR	19	16.7968	0.0008
FLABPAR does not Granger Cause DGDP		0.02726	0.8709
GINIMKT does not Granger Cause FLABPAR	20	12.4949	0.0025
FLABPAR does not Granger Cause GINIMKT		5.55397	0.0307
GINIMKT does not Granger Cause DGDP	19	10.7714	0.0047
DGDP does not Granger Cause GINIMKT		0.01021	0.9208

(b) Between GDP growth, female labor participation and Gini_net

Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
DGDP does not Granger Cause FLABPAR	19	16.7968	0.0008
FLABPAR does not Granger Cause DGDP		0.02726	0.8709
GININET does not Granger Cause FLABPAR	20	2.31857	0.1462
FLABPAR does not Granger Cause GININET		1.75295	0.2030
GININET does not Granger Cause DGDP	19	0.56788	0.4620
DGDP does not Granger Cause GININET		22.0495	0.0002

The story is little different when we use Gini_net instead of Gini_mkt. Simultaneity of occurrence between inequality and female labor participation remains no longer valid. Not only that, causality between GDP growth and inequality gets reversed. The difference between Gini_net and Gini_mkt is in tax payment, while the former is measured with after tax earnings, the later is calculated with untaxed income. This rather simple difference reverses the causality. This can be explained by accepting existence of large underground economy in Bangladesh, which is found in many studies (see Rahman and Khan, 2013 for a review). When overall inequality increases, that leads to GDP growth. Therefore source of inequality must be out of formal GDP calculations. Of course, formal inequality (calculated with after tax income) is affected by GDP growth. Such is a manifestation of large unreported sector within Bangladeshi economy.

Female to total labor and inequality

Female to total labor is the percentage of female in labor force and it is found to be cointegrated with inequality in either definition.

Table 5: Cointegration Test between Inequality and Female to total Labor
a) Inequality measured by Gini_mkt

Sample (adjusted): 1992 2010
Trend assumption: Linear deterministic trend
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.743609	29.66753	15.49471	0.0002
At most 1	0.181595	3.807569	3.841466	0.0510

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

b) Inequality measured by Gini_net

Sample (adjusted): 1992 2010
Trend assumption: Linear deterministic trend
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.711015	26.69396	15.49471	0.0007
At most 1	0.150889	3.107747	3.841466	0.0779

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

In both cases, inequality and percentage of female labor in total labor force occurs simultaneously. As inequality increases more and more female enters into labor market. That may be of two reasons. In high income group female workers can enter into labor force when favorable economic opportunities open up for them. And in low income group pressing need may force female workers to enter into labor force as their economic situation worsen.

Table 6: Results of Granger causality test between inequality and Female to total Labor

Pairwise Granger Causality Tests
Sample: 1990 2010

Null Hypothesis:	Obs	F-Statistic	Prob.
GINIMKT does not Granger Cause FTOTOTLAB	20	32.3989	3.E-05
FTOTOTLAB does not Granger Cause GINIMKT		5.93893	0.0261
GININET does not Granger Cause FTOTOTLAB	20	22.9924	0.0002
FTOTOTLAB does not Granger Cause GININET		17.5573	0.0006

Causality (or precedence) results show that female labor force has simultaneous relationship with inequality. Their mutual relationship is positive and significant. That is as female labor increases among total labor inequality increases and vice versa. This effect is not uncommon as Thurow (1987) argued with his selective mating proposition that says high paying females find their mate from high paying males worsening overall inequality situation.

However, female labor participation rate shows one-way causality: from inequality to labor participation. This result says that when previously poor becomes poorer and previously rich becomes richer then female labor participation rate increases. In the first case, female labors can be considered as "reserve force"[5], who come out only when situation becomes sufficiently serious. That in plain language, women enter into labor market when they are forced to. However, the second case is more challenging to explain. When rich become richer, then women may enter labor force for non-economic reasons (passing time, socialization, self-actualization etc.), identifying that there is no compelling financial need for their job. In another vein, opportunity cost of not engaging into job may increase with richness as well. Increasing affluence may come with access to capital, infrastructure facilities and things like those to start a business.

12.5 Conclusion:

In this exercise, we tried to identify whether long run relationships exist between inequality and female labor participation. We found that female labor are somewhat considered as "fancy" or "reserve" labor in Bangladesh who come out only when the situation is sufficiently pressing or easy. We also found indirect t evidence of large underground economy in Bangladesh.

Appendix A: Definition of variables

Labor force, female (% of total labor force): Female labor force as a percentage of the total shows the extent to which women are active in the labor force. Labor force comprises people of age 15 and older who meet the International Labor Organization's definition of the economically active population.

Labor participation rate, female (% of female population ages 15+): Labor force participation rate is the proportion of the population ages 15 and older that is economically active: all people who supply labor for the production of goods and services during a specified period.

[5] Maruani (2000) used the term "workers reserve"

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Chapter 13: Globalization, Employment and Women's Empowerment

Rifat Akhter

Abstract: *In this research, an attempt has been made to investigate how the global economy has continued to marginalize the position of women and has sustained unequal power relations between men and women. Besides development theories, two theoretical perspectives have been used to discuss globalization and women's empowerment. These are the Woman and Development perspective (WID) and the Gender and Development perspective (GAD). The findings of this paper indicate that the labor market that has been created under neo liberal economy has taken away women's option to choose their occupations. Feminization of labor force has proved that inclusion of women in the labor force is not enough. Women's incorporation in the labor force may not be perceived as empowerment, if they do not have better working environment, if they cannot bargain their wages and rights, and if other options have been taken away from them. In that case, women's work is stimulating a country's economic growth but not empowering them. These women are only fulfilling the gap between their existing resources and need. Thus, while exploring gender empowerment issue, we need to use a model that explores the three components of gender empowerment.*

13.1 Introduction

The main objective of this research is to explore the impacts of globalization on labor market and women's empowerment. Two arguments have been used to discuss globalization and women's empowerment, These are the Women and Development perspective (WID) and the Gender and Development perspective (GAD). The Restructuring of global economy at the end of the colonial period has connected countries around the world through what have been called a "development project" later redefined as a "global project," and often characterized as "globalization". Even though people of third world countries encompass the primary aim of globalization, in reality only one fifth of the world's population are its beneficiaries (McMichael 2004). Previous works on women's positions in the global economy has pointed out that global economy not only promotes unequal relationships amongst different countries around the world but also increases gender inequality through "male biased" development projects and programs (Dunaway 2001; Elson 1989; Elson 1995; Enloe 1989; Enloe 2000; Mies 1986; Misra 2000; Pyle and Ward. 2003). Globalization has segregated labor markets horizontally by gender with women and men in different occupational roles. It has also segregated labor force vertically with women

concentrated in the lowest paid, least protected, and least-powerful positions. Such segregation in the division of labor has led to the specialization of work, privatization of property, and the growth of state bureaucracy (Hartmann 1990). In this paper, I aim looking at how the global economy has continued to marginalize the position of women and has sustained unequal power relations between men and women.

This paper has six sections. The section-I summarizes theories that examine globalization and development, and explores how the theorists themselves have perceive gender/women's position in the global economy. I also discuss the feminist critiques of these theories. The section-2 discusses the components of the global economy and their impacts on women. This section focuses on women's location in both informal and formal labor force. In this context, I will discuss the role of policy planners of international agencies such as the World Bank (WB) and International Monetary Fund (IMF) in creating gendered global economy. The third section sheds lights on consequences of gendered global economy on women's status. I aim to discuss whether global economy empowers or dis-empowers women. In the fifth section, a framework is proposed which will provide future directions for further analyzing these topics. The sixth section provides some concluding remarks.

13.2 Theories on global economy and development: Gender included

Two approaches assess women's empowerment at both macro and micro levels one is about Women in Development (WID) perspective that emphasizes equal opportunities for women regarding access to education, training, property, credit, and better living (McMichael 2004); and the other is about Gender and Development (GAD) perspectives that argue that women's position in the society is affected by their material conditions of life, by the nature of patriarchal power in their societies, and by their positions in national and global economies (McMichael 2004). Women in Development (WID) perspective relys on the **modernization approach**. It focuses on women's access to jobs to define empowerment and overlooks the fact that the choices that women make about their work in the current labor market are not always based on "their choices," but rather they are force to choose such jobs. On the contrary, Gender and Development (GAD) perspectives acknowledge women's incorporation in the labor force, but focus on location, wage, and benefits which women receive relative to men. It relies on the **World-System approach** which was emerges in the 1970s as an extension of dependency and globalization theories.

In order to understand current debates and critiques of globalization, we need to glimpse at the mainstream theories of development, such as, modernization theory and World System theory.

a. Modernization Theory and Women In Development Perspective

Modernization theory arbitrarily distinguishes between traditional and modern societies taking into account "capitalism" as the standard motor of development (Scott 1995). Therefore, capitalist societies are viewed as modern and traditional societies are considered as underdeveloped. Accordingly, underdeveloped countries needed to adopt the western technology, institution, and belief systems to improve their economic conditions (Scott 1995; McMichael 2004). A number of assumptions dominate modernization theory, such as, (i) economic growth benefits all members of the society by trickle-down effects, (ii) access to cash and market improve conditions of people, (iii) macroeconomic policies are gender neutral and benefit all of the societies, and (iv) ethnic identity belong to traditional society and thus create barriers in the course of development (McMichael 2004; Scott 1995). Dependency theorist, Andre Gunder Frank (1969) has criticized modernization theory arguing that underdevelopment is not an original stage, but rather a created condition. He has cited the example of British de-industrialization of India, the destructive effect of the slave trade in Africa, and the destruction of native Indian culture in central and south America (Chase-Dunn 1998). Another criticism is that this view holds masculine and dualist views of tradition and modernity (Scott 2001). Women are either invisible or discussed with a dualistic view. More specifically, traditional societies are strictly patriarchal and modern societies allow women to take advantage of opportunities that are available outside the home. At the same time, modernization theorists (Inkles and Smith) have pointed out that liberating forces of modernization depend on men's attitude and inclination to accord women's status and rights (Mohanty 2003; Scott 2001). Mohanthyhas clarified the attitude of modernization theorists toward women is same as attitude towards third world. For example, third world women are described as "ignorant, poor, uneducated, domestic and docile" (Mohanty 2003). Mohanty has also argued that defining third world women as a problem in relation to the imagined free white liberated women, the first world essentially has ignored the history of third world women by freezing them in a particular space (Mohanty 2003). Despite all the criticisms, this theory has turned out to be the guideline for the World Bank, IMF, and USAID.

b. Addressing Women in Development

Influenced by the themes of the modernization theory, the World Bank, IMF, and USAID have developed and implemented programs in developing countries. Most of their projects are male biased and have provided opportunities for men only (Boserup 2007, Ward 1990). Reformers incorporated women's contribution in the economy and used the term "women in development" (WID), emphasizing equal opportunities for women regarding access to education, training, property, credit, and better living (McMichael 2004). Researchers have continued their

work on women in development, incorporating women in the development process (Boserup 200; Jackson and Pearson 1998; Ward 1993). However, WID has heavily relied on modernization approach, which has assumed that western institutions hold most of the answers and has often ignored the possible contribution of indigenous knowledge(Mohanty 2003).

c. World System Theory: From Development to Dependency to Globalization

Conversely, mainstream *World-system* theory explains how nation-states and regions interact with one another and how their socio-economic ties to industrial countries through unequal trade and aid relations have resulted in underdevelopment (Chase-Dunn 1998; Wallerstein 1995; Wallerstein 1998; Ward 1993).This theory has emerged with the critique of development by Wallerstein, who has considered the world system as a unit of analysis that has accommodated dialectic exchange between national and transnational actors (Portes, Castells, and Benton 1989; Wallerstein 1995). World system theorists contend that the appropriation of resources from third world countries by core countries as the root cause of underdevelopment (Wallerstein, 1974). World System envolved as a single system that identified phases of classical economic dependency (accumulation of raw material from periphery and sending back finished goods) dependent development (usage of foreign investment and transnational corporation's capital to produce goods, leads to underdevelopment as capital and profit flows to core nations), debt dependency (continuous borrowing from international banks and spend most of their export earning for repayment of loan) and their connection with the international division of labor (Bornschier, 1985; Ward, 1993). Thus, World System theory created a provision to discuss variations in development among different countries around the world.

Wallerstein (1974) has defined core and peripheral nations' activities as distinct characteristics of nodes on a commodity chain (Chase-Dunn, 1998; Wallerstein, 1974). A commodity chain is a series of interconnected linkages between production, distribution and consumption processes that cross the boundaries of nations and regions (Chase-Dunn, 1998; McMichael, 2004). World System theorists' have focused on the restructuring of the global economy that has occurred after the early 70's. The rise of newly industrialized countries in Asia, as well as debt crises in different parts of Asia and Latin America has brought about drastic changes in the entire global economy. Restructuring of the economy became a catchphrase for changing the world economy. World system theorists have pointed out that globalization did not actually referred to new methods of development. Rather, it has roots interwoven in Bretton wood and Cold War institutions (McMichael, 2004). World system theorists have explained how global managers, such as international organizations, governments of different countries, and transnational corporate elites, have redefined development using

new terms like, "world market", "global assembly line" and "flexible labor' (McMichael, 2004). Even though the transnational corporations have shifted jobs to developing countries, this shift has brought benefit to the corporations rather than the developing regions. The main reason for such mobility is cheap labor. Workers of core countries have strong trade unions. As a result, they are institutionally able to bargain their wages. As production increases in periphery countries, the price of the products goes down, which increases unemployment and decreases wages. Periphery workers have no institutional bargaining power (Chase-Dunn, 1998). As the labor cost has increased in core countries, more and more labor intensive farming and factories are shifted to periphery countries that produce cash crops, clothes, manufacturing goods and pharmaceutical products (Chase-Dunn, 1998; McMichael, 2004). While mainstream World System theorists have focused on reproduction of core periphery hierarchy in the labor force, other world system theorists, including Wehrolf (1984) and Ward (1984) focused on the economic status of women in the core and periphery (Chase-Dunn, 1998).

d. Emergence of Gender and Development Approach

Feminist theorists criticize World-system theorists for overlooking gender issues while discussing the oppression of periphery nations by metropole (Scott, 1995). Mainstream World System theorists, such as Wallerstein, assume that the incorporation of the domestic household into the analysis incorporated women automatically. Unlike other theories, World System theory, to some extent, has incorporated gender through the concept of "income pooling" within households, but this incorporation has assumed men's earning as "income" which primarily helped to run the household (Dunaway, 2001). As a result, women's work is analyzed as part of an informal economy, where workers have worked in exchange for wages, but is not protected by any organization (Standing 1989). However, the analysis does not include tasks executed outside of the home, primarily by women, such as garbage-picking, fuel-wood gathering or water collection. (Dunaway, 200). Therefore, feminist scholars through **Gender and Development** approach have incorporated all material and non-material, paid, unpaid, formal, and informal activities, within and outside the household, in order to redefine work (Dunaway, 2000; Ward, 1990; Dunaway, 2001).The radical feminists prefer the **Gender and Development (GAD)** approach. This approach argues that women's position in society is affected by their material conditions of life, by the nature of patriarchal power in their societies, and by their positions in national and global economies (Boserup, 1990; Boserup, 2007; Dunaway, 2001;Connelly, 2000; Ward, 1990). Feminists also argue that capitalist society has reinforced the subordination of women by creating job segregation and enforcing their economic dependence on men (Anker, 1998; England, 2005; Hartmann, 1990; Boserup, 1990; Ward, 1993). Reasons for keeping women in

subordinate position are: women give birth to a new labor force; women comprise an unpaid domestic workforce; and females' work creates downward pressure on wages (Hartmann, 1990). Hence, it is essential to have women-only projects, which aimed to protect poor women's interests. The radical feminists preferred the Gender and Development (GAD) approach. This approach argued that women's position in society was affected by their material conditions of life, by the nature of patriarchal power in their societies, and by their positions in national and global economies (Connelly, 2000).

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In summary, theories of development provide explanations for global economic activities. Feminist approaches such as WID and GAD, have emerged alongside the development theories, and examine women's positions in the global economy. These theories indicate the contribution of the global economy in creating unequal relationships between men and women. This paper attempts to establish a linkage between the global economy and women's position within it at the macro level through the concept used in the theory and with empirical evidence. The next section of the paper I discuss some impacts of these theories in the global economy.

13.3 Gender Blind Globalization: Evidence, Debate and Critique

This section discusses the impact of globalization on women, men and their gender relations in the labor market. It explores the assumptions of development and feminist scholarships regarding the informal sectors, as well as formal

sectors. Development scholarships have assumed that the restructuring of the global economy transforms traditional economy into a modern economy, subsequently causing the informal sector to decline ((Portes and Sassen-Koob 1987a). Informal economy refers to unprotected waged labor, or workers work without secure contracts, benefits or social protection(International Labour Office 2004; Portes and Sassen-Koob 1987a) Secondly, while discussing commodity/ production chain development, development scholarships provide an impression that women do not exist in the production nodes (Dunaway, 2001). Therefore, in addition to looking at the informal sector, this paper also explore women's position in the formal sector, where employment was legally regulated (Portes, 1987).

a. Informal Sector: Women's hidden Contribution Into the Global Economy

Three assumptions exist that are derived from Development scholars on the restructuring of the global economy and the appropriate utilization of resources of poor traditional economies. The first assumption states that informal economies are transitory and that these economies will disappear with the advance of industrialization. (International Labour Office 2004). The second assumption is that informal sector workers are actually a redundant reserve labor force, fitted into a small segment in the modern economy. The third hypothesis is that informal sectors are a primary feature of peripheral economies, and are largely absent in developed economies (Portes, 1987). However, empirical evidence has contradicted with these assumptions.

Informal employment comprises both self-employment in informal enterprises and waged employment in informal jobs. Informal economy comprises many types of activities, including subcontract industrial and service work, retail activities, construction work, domestic service, the sex trade and agricultural work (Ward, 1995; Carr, 2001; ILO, 2004). Informal employment is generally a larger source of employment for women than for men in the developing world, where more than 60% of all women are employed in informal economy (International Labour Office 2004). This expansion is a result of industrial development embarking upon different patterns in developing countries, through incorporating the expansion of the informal sector. In developing countries, extensive labor legislation, high demands for exporting goods within short periods of time, and an abundant labor supply, has provided a plethora of incentives for the firms to develop a mechanism for subcontracting that connected the formal and informal sector (Chan, 2007; Portes, 1987). Such a subcontracting mechanism has eliminated the substantial costs of maintaining a permanent work force. As a result, global investors have preferred to move to the countries that had informal employment arrangements (Chan, 2007; Carr 2001). These laborers have work under the illusion of self-employment but actually are a part of a

global production chain and work for large firms (Portes 1987; Carr, 2001). Women and men have entered into the informal sector for different reasons. For example, men have received more income from the informal economy as they are recruited as subcontractors, business owners, and mostly controlled women's homework. Consequently, they have opportunities for upward mobility (Carr, 2001; Chan, 2007; Ward 1995; Mies1986; Misra 2000). Informal entrepreneurs, subcontractors or middlemen who organized this labor, earn more than many formal sector workers (Carr 2001 ;Portes 1987) . On the contrary, laborers in the informal economy earn less than average formal workers. In many cases, these laborers are female who work at the bottom of the subcontracting pyramid (Chan, 2007; Portes and Sassen-Koob 1987b; Truelove 1990). Informal women workers work for their survival. Sometimes it is their only source of income; sometimes they work in addition to the formal labor and household work in order to bring more money to the family so that they can meet their end needs. This income is essential for the female headed household (Ward, 1995). Many of these women work at piece rate from home, which Misra coined "women working in living rooms as factories"(Misra, 2000 p.11). Subcontractors hire these women to work from their own home, and in most cases, subcontractors select women of color, recent migrant women, women with numbers of small children. In developing countries they hire poor women of all age groups (Enloe 1989; Mies 1986). These women have less bargaining capabilities, and in most cases the arrangement seem appealing to them as this approach blends motherhood, feminized respectability and income opportunity. These women are not treated as workers, but rather as housewives. Maria Mies has used the concept "housewifization", while discussing this new international division of workers. Over the years, women's informal services have expand to electronic parts, and clerical or telemarketing services from home. Women have provide input in insurance services, data entry for airline ticket companies and medical texts at piece rate for minimum wages (Ward 1995). As a result, we see that the informal economy is not only part of the modern global economy, but rather it has expanded into many other areas. These sectors have expanded to fulfill the needs of global productions. Because of the transitory nature of employment in Transnational Organizations (TNC), sometimes many women have lost jobs over the time, and many of them return to the informal sector. Because of the few options left for women, many women seek employments in the sex industry and huge numbers of women work as domestic workers (Enloe, 1989; Kempadoo, 1998; Parrenas, 2000).

The sex industry, which includes "prostitution, pornography, sexual media, materials, equipment and exotic dances," have always been a source of livelihood for women around the world (Nagel 2003). Sex tourism destinations are concentrated with these services and consumers travel to the destinations that offer these services. Sex tourism is developed with the expansion of the United States army bases in the Philippines, South Korea, Thailand and other countries,

where brothels and bars are established to entertain the military, commonly known as "rest and recreation" outlets (Nagel 2003; Enloe,1989). In 1970, the World Bank has recommended that Thailand needs to develop "mass tourism" as a means to pay off its various debts (Nagel 2003). Subsequently, Thailand's sex industry has developed with the blessing of both the World Bank and the IMF. Expansion of this sector did not benefit women but rather placed them in a vulnerable position. In the sex industry, women are targeted as an expoitable human resource (Mies, 1986).

In Philippines, for instance, the women in sex industry known as "overseas contract workers" as they are helping government to pay off the national debt by stimulating the economy. All the money they send home to their families improve the economy of the Philippines (Global Fund for Women, 1995). Expansion of this sector does not benefit women but rather situate them in a vulnerable position. In the sex industry, women are targeted as an exploitable human resource (Mies 1986). In Nepal carpet factories employ thousands of women and girls who are also forced to work as sex workers as night. Many carper factory workers work at piece rates from the brothel (Human Rights Watch, 1995).

Women entered into the global economy through another form of informal work called ***domestic work***. Women from Asian and Latin American countries migrated to the Middle East, European and North American countries in order to work as domestic workers. Domestic work has included a wide range of activities, including childcare, food preparation, household cleaning and shopping (Parrenas 2001; Ward 1995). Class, race, nationality and international politics determined their position in the society where they worked (Ward 1995). migrated domestic workers are incorporated into the labor market not only to serve the needs of highly specialized professional "global cities" but also to relieve upper class or middle class women from their household work. As a result of this arrangement, the latter group of women is free to work in the formal sector (Parrenas 2001). At the same time, poor women who cannot migrate to another country, work as domestic workers to assist other women in their own countries. At the same time, many with high school or more education migrat to other countries to work as domestic worker in the foreign countries and send money to their homes. Thus, the international division of labor has created three tiers of reproductive labor among women of different nations, coined by researchers as the "hierarchical chain of reproductive labor in globalization"(Parrenas 2001 p.249).

Marxist scholarship regards informal labor as a reserve pool of workers. This concept is applied where reserved workers hold down the wages of employed workers with the threat of easy replacement, reducing overall wages. On the contrary, informal sectors in the current global economy actually reduced the number of workers who were paid legally (Portes 1987). Global competition

among the production sectors tended to encourage the recruiting of informal workers who received piece rates (Carr 2001). This informal sector is highly gendered. With more men entered into the informal economy, women are pushed into the lowest income bracket of informal work. For example, societies where men work as vendors and petty traders, women workers could be located at home, working at piece rate (Carr 2001; ILO 2004). As many scholars argue that women become empowered when they are incorporated into the formal sector, this next section discusses the position of women in the formal global economy.

b. Women's Location in the Formal Production Chain

b.i. Trade: women invisible?

Since 1980, the definition of development has been shifted from national economic growth to "successful participation in the world economy" (McMichael 2004 p.115). One of the means of participation in the world economy is trade, through which goods, and capital, services flew from one region to another (McMichael 2004; Chase-Dunn 1998). Modernization theorists have assumed that, in the modern economy, traditional countries would have equal economic opportunity if they follow the path of industrial countries. However, in the current global economy, we can see the reflection of previous colonial trading systems. The nature and the extent of the flow of goods, capital, and services often differ between first world (core) and third world countries (periphery). Currently, the economies of the periphery are highly dependent on manufactured imports from and exports to the core, whereas core or world countries depend on peripheral countries (Chase-Dunn 1998).

World-system and dependency theorists have stated that trade dependence has negative impacts on periphery countries (Dunaway 2001; Enloe 1989; McMichael 2004, Wimberley and Bello 1992). Multinational corporations' investments, core nations, or the World Bank almost force periphery nations to depend on one or two export-oriented products: textile, agricultural products, electronics manufacturing, and other services. With the growing emphasis on cash cropping and non-food crops, subsistence farming suffers (Enloe 1989). Since almost all of these countries have received loans from international banks, organizations, the World Bank and IMF, as part of the financial package the governments of the periphery nations have opened up almost all lands for monocultures, to make up their trade imbalances and to pay off the debts (Mc Michael 2004). The expansion of export crop production limits the production of food for domestic consumption, and increases dependence on imported foods. Price fluctuations of foods in the global market create a vulnerable situation for the poor and contribute to malnutrition (Wimberley and Bello 1992).

The impact of trade is not same for all countries as well as for men and women. In Africa, the introduction of cash crop production and improved agricultural

equipment has brought drastic changes in their social structure. Promoting cash crops for the purpose of trade not only make women invisible from their economic role in the society but also bring negative consequences to domestic food security (Carr 2001; Dunaway 2001). Imported cheap ricebrings down the price of domestic grown rice (mostly grown by women) causing women's own crops to decrease in importance (Carr 2001). In addition to destroying domestic crops, the modern trade system has polarized distribution of the means of production (Dunaway 2001). In Asia, Africa and Latin America, commercial agriculture always hires mostly men into the work force, subsequently trains them in the use of new techniques, inputs, as well as machines, while women are left with subsistence agriculture and the responsibilities of feeding their families (Boserup 1990; Dunaway 2000). This creates gap in men's and women's production capacity, place men at the progressive end and women at the traditional end(Boserup 1990). Citing the example of banana plantation of Latin America, Enloe confirms that, while men are involved in banana plantation in Costa Rica, the Philippines, and various other parts of the world, women work as unpaid domestic and productive labor (Enloe 1989). As a result, women are removed from subsistence farm production and have shifted to home or to the plantation, in order to work as low paid seasonal workers(Boserup 1990). Women's hidden inputs subsidized the production process in the commodity chain (Dunaway, 2001).

Many developing countries have switched from "import substitution" (substituting goods produced domestically for imported products) to a model of "export promotion," or "export-led industries" for development and revenues (Ho, Powel, and Volpp 2000. Many developing countries have established export-processing zones (EPZ) with the hopes of earning foreign investment. In reality, these EPZs contribute very little to the host country's economy (Mc. Michael 2004). To lure foreign investors, host countries simplify importing and exporting restrictions by exempting labor regulations and domestic taxes, and promising pools of cheap labor (Ho, Powell, and Volpp 2000). The available supply of cheap labor depends on a "complex patriarchal and subcontracting hierarchy" (Mc. Michael 2004:91).

Evidence suggests that even though trade has increased women's access to the labor market, almost all women have remained confined in relatively low paid jobs in the export sector. This discrimination is due to a lack of laws that protect workers' rights. Neither the provisions of the General Agreement on Trade and Tariff (GATT) nor the mandate of the World Trade Organization (WTO) protect workers' rights explicitly. The GATT's and WTO's EPZs provisions overlook the practice of denying labor rights, which are applicable in export processing zones of countries (Ho, Powell, and Volpp 2000, Pyle and Ward 2003. Further, owing to unequal trade liberalization, imported products (i.e., imitation bags or

imported rice) become cheaper. This has destroyed many small enterprises owned by women (Carr and Chen 2001; McMichael 2004; Pyle and Ward 2003). For example, in Kenya many women who earned income from sisal bags are now out of business because of cheaper imitation bags imported from Southeast Asia (Carr and Chen 2001).

b.ii. ***Women's Work In Multinational Corporations***

Multinational corporations (MNCs) account for 70% of all foreign direct investments (UNCTAD 2002; UNDP 2002). These MNCs control most of the world's financial transactions, including technologies and industrial capacities such as oil, coal, gas, chemical, medicine, agriculture, mining, textile, electronics, processing food and more (UNCTAD 2002). Women are hired more than men in textile, agriculture, electronic, toys, and food processing industries. While the corporate chiefs of these MNCs are the richest people of the core nations, large proportions of the employees of these corporations are part-time and non-unionized workers, mostly from periphery and semi-periphery regions (McMichael 2004). These workers receive low wages, and in many cases do not receive their wages for months. They often work in very poor working conditions, work for long hours to meet deadlines, and experience various types of health hazards. Moreover, women are at the bottom of the production chainand hired only in periods of acute labor shortages or as seasonal labor (OXFAM 2004; Pyle and Ward 1995).

Agribusiness has been one of the fastest growing industries in the world. The green revolution has encouraged agribusiness to produce foods for urban consumers in peripheral and sometimes core countries. The production of new types of food requires hybrid seeds, chemical fertilizers, pesticides, growth-inducing chemical, and other high technologies. This has created social inequalities among people at the community, gender, and household levels (McMichael 2004). Agribusiness and international agencies require farmers to buy the green revolution package. Women have failed to do so, because of poverty, and also because of institutional barriers. Even though women put their labor into the land, men own most lands. The MNCs deal with male farmers and provide all the technologies and training to men. The assumption is that what benefits men will ultimately benefit their wives (Boserup 1990; Boserup 2005) .

Multinational industries also prefer to recruit women as temporary and low paid workers. Since many MNCs are labor-intensive in nature, they tend to hire women so that they can pay less and keep the production costs low. Countries that produce clothes, electronics, and toys have more women working in those industries than men. Women's restricted bargaining power lowers women's wages, which lowers the price and increases the consumptions for these products (Senguino 2000). Some experts hypothesize that the profits MNCs make from the

cheap wages have positive effects on countries' economic growth. Such profits provide resources to purchase sophisticated technologies and finally contribute to the economic growth of a country (Senguino 2000). In reality, nation-states that have achieved economic growth have developed policies for producing multiple products and promoting learning skills. This enables workers to utilize new imported technologies and produce diverse products (Boserup 2005). Sustainable growth depends on the existence of diverse economies and a skilled labor force capable of adapting to new technologies. Hence, educational attainment is one of the most crucial elements of economic development, economic growth, and gender equality.

b.iii. Service Sector: Pink Collar Jobs?

Intangible products are referred as services. Services are defined as "anything one could not drop on one's foot" (Juhasz cited in McMichael 2004:184). Like products, many services have shifted from the USA to Caribbean countries, and recently to India, commonly known as "outsourcing." These services include airline reservations, ticketing, transportation, telemarketing, data processing jobs in the health industries, magazine subscription renewal, technical support, and consumer credit and services (McMichael2004). Corporations can hire well educated, and in some cases, English-speaking workers at lower costs. The fast growing service sectors in periphery and semi periphery regions, where employers prefer to hire female labors, echo the feminization of labor (Joekes 1999). In many countries, for example, Barbados, Jamaica, and Trinidad, many women work in the service sector for long hours, and have only half an hour lunch break. Freeman refers to this type of work as " Pink Collar job(s)." Even though these jobs are "deskilled, demoted and gendered," women are attracted to such jobs because they are identified as office work and they receive benefits such as maternity leave, sick leave and paid vacations (McMichael 2004).

b.iv. Role of International Organizations and Financial Organizations in Gendered Global Economy

International Organizations such as International Monetary Fund (IMF) and World Bank prove to be the important agents of core and impose numbers of social policies on periphery countries (Bornschier and Chase-Dunn 1985). Globalization has increased both international loans, as well as foreign direct investment, through multinational banks and micro finance corporations. The IMF and the World Bank require that all countries in need of foreign loans must adopt certain programs, such as the Structure Adjustment Program (SAP), which has ensured foreign trade, investments and privatizing state owned industries (Pyle 2003; McMichael 2004). The main argument of these organizations is that all these activities reduce the costs of operating the government. Respective

governments able to earn more money to pay their debts (OXFAM 2002; Pyle 2003; McMichael 2004 ; Pyle 2003). SAP was first introduced in Latin America and in a large part of Africa in the 1980s (McMichael 2004). Now the question is what is the impact of SAP on the global economy and women?

To stabilize the economy of the debt burdened countries, the WB and the IMF have formulated policies, such as reduction of government subsidies, and slashing down social expenditures in order to reduce debt (McMichael 2004). These measures have felt hardest on the poor and least powerful people, including women and children. In Mexico, the IMF loan-rescheduling program in 1986 has eliminated food subsidies for basic foods such as bread, beans and rehydrated milk. This has brought great pressure upon the population and as a result of this rescheduling, malnourishment grew, poverty rose, and the infant mortality and morbidity rate rapidly rose as many people could not afford to visit their health care centers (McMichael 2004). In Africa, the IMF /WB's structural adjustment policies have expanded crop productions controlled by men at the expense of peanuts, a cash crop grown by women (McMichael 2004). When there has been a drastic cut in the public sector to promote free markets, governments of indebted countries have made huge cuts in government jobs. When there is a drastic cut in the public sector to promote free market, governments have to make huge cuts in labor. This has increased the unemployment of women, as women are always fired first, with an assumption that their wages pool income in the family (McMichael 2004). Financial crises often force households to bear adjustment costs, and these costs are borne disproportionately by women (Floro and Dymski 2000) . For example, when price of the product has increased, as observed in Mexico and Africa, the pressure felt directly upon women to pool resources for feeding the families.To make ends meet, women work in the informal sectors that require more labor and provide minimum wages or work at piece-rate at home and other places (Enloe 1989; Mies 1986; Misra 2000; Ward 1990).

Women who once had access to resources such as land lost their access. The choices that they made about their profession or work were not based on "power to choose," but rather upon "forced to choose" (Kabeer 2001). These influential agencies dis-empowered women in terms of resources and choice making (Kabeer 1999; Kabeer 2001).

13.4 Consequences of gendered global economy on women's status: empower or dis-empower women?

The main objective of this paper is to find out the impact of gendered economy on women's lives. The previous discussion explained women's position in the global economy. Even though the impacts of the gendered global economy vary by region, gender inequality is common in all contexts, primarily exclude women from mainstream opportunities and confine them to limited numbers of

occupations and activities (Kabeer, 2001). Regions where women once has provided subsistence through production and homework currently became regions where, women are now drawn into wage work both in the formal and informal sector. This subsequently reshape men's work and change gender relations at home (Truelove 1990; Misra 2000; Pyle 2003).

Empowerment is defined in many different ways. This paper has exemplified NailaKabeer's perspective, where empowerment refer to changes that expand people's ability to make life choices in contexts where this ability is previously denied to them (Kabeer 1999a; Kabeer 1999b). Kabeer (1999) views empowerment as a complex of agency (capacity to make decision), resources (material and non-material) and achievement (Kabeer 1999b).

Feminist scholarships argue that inequalities between men and women are not emerging phenomena of the capitalist system. Rather, evidence from history suggest that a patriarchal system underwent establishment before the advent of capitalism, with men controlling the labor of women and children (Hartmann 1990). The transformation of family subsistence production into large-scale capitalist enterprises created an increasing economic gap between men and women (Boserup 1990; Hartmann 1990). Patricia Draper (1960) has explained that the changes in modes of production and redefining nature of men's and women's work in the production sector has taken away women's rights on land and other material resources (Hartmann 1990). Thus, they became dis empowered as defined by NailaKabeer (Kabeer 1999a; Kabeer 2000)

NailaKabeer has explained that having access to and control over resources is the precondition of empowerment. The pre-industrial, capitalist, modern global economy systematically denies women's access to modern technology. Human capital investment in both the subsistence economy and the modern global economy ignore women (Boserup, 1990; Hartmann, 1990). By denying women training to operate modern mode of productions, men created a sexual division of labor, later nurtured by elites and policy planners of international agencies and transnational corporations.

In the previous discussion on the role of international agencies and policy planners I have discussed how strategies developed by policy makers of World Bank and IMF denied women's access to technologies. Patriarchy is reformulated to maintain its dominance by collaborating with the capitalist forms of global production, which maintain men's power over women (Feldman, 2001). When transnational corporations have expanded their large-scale business in agriculture, manufacturing, and service sector, corporation managers hire men first, and train them when required. With the further expansion of TNC, men are recruited for skilled and supervisory jobs while women are recruited as low waged labor. As

low skilled laborers, women's positions are perceived as secondary positions. (Boserup 1990; Enloe 1989).

Dependency/world-system theorists argue that in periphery regions, women have problems accessing educational institutions, because of the conflicting signals from the market regarding female education and parents' lesser interest in their daughters' education (Clark, W.Ramsbey, and Adler, 1991; Clarks 1992). For example, some factory work requires reading and writing skills, but at the same time MNCs create seasonal jobs for women. As a result, parents prefer to send their daughters to factories and plantations before they finish their primary education so that their daughters can contribute to the family economy before marriage (Clarks 1992). In many semi-periphery and periphery regions women's higher education does not always translate into more access to formal jobs. For example, in 1991, while 18 percent of illiterate women in India were hired as formal or core workers in agriculture and industry, 11% of the women with secondary education were recruited for the same type of jobs (Dunlop and Velkoff 1999). Furthermore, in South East Asia, marriage is highly valued and girls often marry at young ages. Subsequently, parents gain less benefit from investing money in their daughters' education; they prefer to earn as much possible from their daughters' work in the factories and invest in their son's education. Clark (1992) finds that MNC investments slow the entry of women into higher education in the periphery countries. Higher education and vocational training are often denied to women, but not always because of a lack of family or government resources. Not having access to education limits women's access to high status jobs in developing regions.

In developed countries, even though educational opportunities have expanded for women, these opportunities have not eroded unemployment among women or the income gap between men and women. Thus, both access and quality of education that has been provided to women need attention of policy planners. Critiques have also noted that women entering into the science based professions create a two tiered system, and women are often located in the less prestigious and less paid tier (Bourque 1990).

Some feminist scholars using women and development perspective argue that women's work in MNC increase family income and in some cases increase women's decision making capacity , delay their age at marriage and child bearing age (Lim, 2001). These researchers argue that the expansion of MNCs and trade create employment opportunity for women, in a limited way. Lim (2001) further argue that women who work in MNC earn more than women who worked at local factories. However, gender and development theoriests argue that WID perspective overlooks certain factors. For instance, women who continue to work in MNCs earn lower wages than their male counterparts (Oxfam, 2004). Knapp argues that women's socialization process in many parts of the world led them to

accept low salaried jobs and forced retirement upon their marriage (Knapp, 2000). Furthermore, relocation of certain MNCs such as the garment sector, fruits and vegetable plantation, flower business and service sectors, create seasonal jobs, not permanent jobs for women (Ward, 1995). There are many cases where women's share in labor force have increased up to 60 to 90 percent in last 20 years of trade liberization, but this led to "feminization of labor force" where jobs are created for women under certain volatile conditions, such as short term, insecure and low wage. Many sociologists have coined the term "feminization of labor" as an essential component of the global market job structure (Moghadam 1999a; Moghadam 1999b; Seguino 2000; Standing 1999). According to Standing (1999), the "feminization of labor arises because, available employment and labor options tend to characterize activities associated, rightly or wrongly, with women and because the pattern of employment tends to result in an increasing proportion of women occupying the job" (Standing, 1999 p.583). The feminization of labor is termed in a dual sense. First, there are an increasing number of women in the workforce. Second, women tend to experience a deterioration of their work conditions at relatively higher levels, including long hours harassment in the workplace, few breaks, constant pressure to finish work, and generally unhealthy workplaces (Ward 1990; McMichael 2004; Standing 1999; Pyle 2003). Examples from different countries around the world have reflected increase in feminization of labor. In Indonesia, use of short term contract has increased significantly. Findings from six factories in Java indicate that 95% of female workers are repeatedly hired for jobs in shoe and garments factories that are neither seasonal nor short termed (Oxfam, 2004). Same situation is observed in South Africa, Colombia and Honduras. In Bangladesh, garments workers work on average 80 hours of overtime per month and they received only 60-80% of their pay slip (Oxfam, 2004). Joseph Lim (2000) has found that the growth period in the second half of the 1980s in Asia has favored male employment more than female employment. The economic decline due to the East Asian crisis has reversed this process and increased male unemployment more than female unemployment, especially in urban areas. One contributing factor to this is the flexibility of female laborer. Increased female labor force participation and longer working hours for women relative to men during the crisis – has pointed to increased female employment and work hours in the labor market as a major coping mechanism during the crisis (Lim, 2000). Thus Lim's (2000) argument on positive impact of MNCs has contradicted with research findings. Rather women's participation in current global economy does not reduce gender differentials in earnings and women are not empowered. Instead, these changes reduce the harmonies among women in resisting patriarchy institutions (Elson 1995).

Women remain disadvantaged in the job market in terms of wages, training, and occupational segregation. At the same time, their responsibilities at home have

remained the same (Hartmann 1990; England, 2005; Parport, Rai, and Staudt, 2004). In Japan wives who work outside they are expected to spend minimum three hours thirty-one minutes on household chores while their husbands spend on average eight minutes. Thus women fail to exhibit high performance at work place (Knapp 2000). Employers often refer to women's incapability in performing work in management sectors thus prefer to hire women in the bottom of production sector, or office work where women are expected to do duties of women, such as copying, serving tea, and clerical work (Knapp 2000; Magnusson, 2010). Dividing men and women's role not only increase the pay gap between men and women but also reinforce sexual division of labor (Hartmann, 1990; Magnusson, 2010; Parport, Rai, and Staudt, 2004). Sexual division of labor is hierarchical and assures a set of task for a group and forbid that task for another. These factors contribute to what sociologists call "female proletarianization". Historically, men are benefited by sexual division of labor (Hartmann, 1990; Magnusson, 2010; Parport, Rai, and Staudt, 2004). Because of the widespread nature of these characteristics among various groups of women, the question has raised as to whether or not women are making a rational calculus choice to work as low waged labors (Kabeer, 2001).

From the discussion of Women in Development and Gender and Development scholars, I have proved my argument regarding globalization and its negative effect on women's status relative to men's. Global economy has reestablished sex segregated labor force both in formal and informal sectors. This reinforces unequal relationship between men and women. This unequal relationship is reflected through women's share in the formal and informal labor force and women's position in the global production chain. In current global economy, while making employment decisions, women, for the most part, try to fill the gap between resources and needs. As a result, the question of "choice" is less clear. In all parts of the world, there are large proportions of women working in the informal sector, or the low-waged formal sector. Subsequently, the decision to work appears to be a matter of survival (Kabeer, 2001). Using women in development perspective, Kabeer has argued that there is a fine distinction between working in formal sector and working in the informal sector. Even though women receive low wages in factories and in other parts of the formal sector, these women receive some material economic gain and intangible benefits that are included in their new identities as "proper" workers (Kabeer, 2001) . Some of these women, in certain cases, have gained purchasing power (Kabeer, 2001). In contrast, the work of women in the informal sector has remained invisible, and they are not recognized as "worker(s)". Consequently, at the household level, inequality between male and female members continued. This is reflected through the hierarchical distribution of resources and responsibilities, which has ensured women's reliance on men for economic and social protection (Kabeer, 2001; Hartmann, 1990; Boserup, 1990).

13.5 Conclusion

The primary objective of this research has been to examine the impacts of global economy on women's empowerment relative to men's. The findings from different research indicate that gender empowerment can be better understood if we include all the outlets where women and men compete to have access to resources, such as, education, formal and informal labor force and positions from where women and men can make decision for the entire society. Infact, one argument that is frequently made in favor of globalization, and trade liberalization in particular, is that it has brought about higher rates of employment in developing countries as the locus of manufacturing has shifted from the North to the South, and that within developing countries women have emerged unequivocally as the winners. Given the fact that poor women in many developing countries enjoy few social rights, "globalization" has not improved women's status in all aspects of their life by creating some job opportunities in the bottom tier of production chain. Rather the globalization process has taken the opportunities such deprivation and women's second class status of these societies and helped governments to develop various models of import substitution and industrialization (ISI) which essentially create jobs for a male 'labor aristocracy', and that the existing systems of social protection are frequently biased in favor of men who were assumed to be the 'breadwinners', while women were considered to be their 'dependents', even though they have been contributing in the labor market as well as in the household. The labor market that has been created under neo liberal economy has taken away women's option to choose their occupations. Feminization of labor force has proved that inclusion of women in the labor force is not enough. Women's incorporation in the labor force may not be perceived as empowerment, if they do not have better working environment, if they cannot bargain their wages and rights, and if other options have been taken away from them. In that case, women's work is stimulating a country's economic growth but not empowering them. These women are only fulfilling the gap between their existing resources and need. Thus, while exploring women's empowerment issue, we need to keep these things in view.

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Chapter 14: Does Higher Education Raise Income Inequality?

Gour Gobinda Goswami and Nazrin Khanom

Abstract: *This paper attempts to explore the effect of different levels of education on inequality, using a panel data of 155 countries over the time period of 1963 to 1999 and fixed-effects estimation method. It is found that higher spread of preprimary and primary education makes the income distribution less unequal. However, higher spread of tertiary education exacerbates the income disparity. While education is found to have a robust and significant effect on income, no evidence of Kuznets' hypothesis, of a curvilinear relationship between development and inequality, is found. The result holds even after controlling for trade openness and role of government.*

14.1 Introduction

Over the last few decades, a large number of papers have been written about inequality. The interest in inequality is primarily stirred up in the mid 1950s when Simon Kuznets postulates his theory of inequality and economic development, popularly known as "Kuznets' inverted-U hypothesis". According to Kuznets, inequality follows a curvilinear relationship with economic development, that is in the early stages of development, a country's inequality will rise with economic development and then it will stabilize and soon at higher levels of economic development inequality will start to fall (Kuznets 1955).

This theory is mostly based on conjecture, mathematical extrapolation, and partly based on his observation of a few developed countries of the time, namely, United States, Britain and Germany. In the same paper Kuznets admits to this and cautions his readers that at that time, there wasn't adequate empirical evidence to test his hypothesis. Despite the cautionary remarks by Kuznets, his hypothesis soon became 'the Iron law of development' (Srinivasan 1977) widely accepted and used by social scientists and policymakers (Fuchs 1992). Inequality is considered an inevitable consequence of growth. Sir Arthur Lewis (1976) just plainly stated that "inequality must be inegalitarian". One of the prime reasons of such wide acceptance is that Kuznets' hypothesis of rising inequality during the early stages of development went harmonious with its contemporary theories of the time. These theories propose that much of the income share should go to the capitalist, since they are the ones who could save and invest, i.e. considered the propellers of growth (Kalecki 1942, Lewis 1958), which is being translated into development during the 50s and 60s (Moran 2005). Kuznets' hypothesis is also useful to pacify uproars about widening of inequality, as it is considered a

necessary condition for growth and would eventually subside with more growth (Escobar 1995).

In his paper Kuznets emphasizes on the urgency for gathering data to test his theory on empirical grounds. And during the first two decades of his publication cross sectional data that were gathered supported his hypothesis, the richest countries had the lowest level of inequality followed by the poor countries, and the middle income countries had the highest level of inequality (Kravis 1960; Kuznets 1963; Cutright 1967; Ahuwalia 1976). It is assumed that each of these countries get to this point by following a curvilinear path of inequality and economic development (Fields 1980). With political support and what seems as strong empirical support the Kuznets' hypothesis became a cornerstone of policy making (Robinson 1976).

It wasn't until the 80s when longitudinal data was being collected that the Kuznets' hypothesis was challenged on empirical grounds (Moran 2005). When tested with longitudinal data or when minor changes were made to the data composition, the Kuznets' curve would disappear (Lecaillon *et al.* 1984) and some contested that the overwhelming support of Kuznets' curve in cross sectional data was because of measurement errors. These measurement errors arose because of differences in data collection methods in different countries (Gagliani, 1987; Nugent, 1983), inconsistencies in variable definition, lack of documentation on secondary sources, data based on non-representative subsets (like only urban population or only wage earning population) (Saith 1983, Fields 1984, Moran 2005). Some argue that the inverted U seen in cross sectional data is because of cross regional variation in inequality and per capita income structures and when imposed of cross national data it would result in an inverted U (Fields 1980, Papanek 1987).

Despite the demise of the Kuznets' hypothesis, the skewed income distribution that prevailed around the world remained a social, political and economic concern. Studies were carried on and are still being carried on to understand what causes inequality; what it brings along with it and whether it is conducive to economic growth or not.

Several factors are identified to have affected income inequality and in some cases subsequently economic growth. Some argue that democracy is necessary to reduce income inequality (Cutright 1967; Hewitt 1977; Muller 1989; Simpson 1990; Stewart). Deininger and Squire (1998) uses median voter theory to show that inequality is more likely to affect growth in democratic countries than in non-democratic ones. Barro (2000) also states that if the median voter theory holds and if the mean income is higher than the median income, that is majority of the people fall below the mean income, and there is egalitarian political power (that is one vote per person democracy), then there is likely to be redistribution of

resources from the rich to the poor either in the form of explicit payments or higher public expenditure. Jackman (1974) argues that democracy has a curvilinear relationship with inequality. At early stages of democracy, only few rich members of the society benefit increasing inequality. However, at later stages, as majority enjoys social democratic power, inequality starts to fall. Another group however found no link between democracy and inequality (Rubinson and Quinlan, 1977; Weede, 1982; Weede and Tiefenbach, 1981). Alesina and Rodrik (1994) find that inequality in assets and income leads to higher tax rates which they find to be detrimental to growth and that this is true for both democratic and autocratic economies and thus rendering democracy irrelevant. Since the 1970s inequality has been rising even in the most institutionalized democracies (Alderson and Nielsen 2002; Harrison and Bluestone 1988), again proving that democracy is not a sufficient condition for reducing inequality.

Another line of research deals with the association of favorable institutions and inequality. Barro (2000) also find law and enforcement to be better in countries with low levels of inequality. While Gupta and Davoodi(1998) show that corruption causes the distribution in asset ownership and human capital to be skewed and consequently results in higher levels of inequality and hampering growth, Bahmani-Oskooee, Goswami and Mebratu (2006) argue that countries with black markets for foreign exchange tend to have higher levels of inequality. Severe inequality and poverty causes the poor to commit crimes and stir up riots (Hibbs 1973; Venieris and Gupta 1986; Gupta 1990; Alesina and Perotti 1996; Benhabib and Rustichini 1998) which not only waste the time and energy of the poor that could have been spent on more productive activities, these also threaten political stability and deter economic progress.

Barro (2000) points out that the offsetting effect of such corruption on economic progress is education. Education is expected to reduce inequality (Lee 2005). Increased levels of education causes skill deepening which reduces the income differentials (Williamson 1991; Anderson and Neilsen 1999). Higher levels of education will increase the supply of skilled labor which will depress the wages of skilled labor and simultaneously reduce the wage differential between skilled and unskilled labor (Lecaillon *et al.* 1984). Jacobs (1985) suggests that it is rather the dispersion of education than average attainment of education that affects income distribution. Crenshaw and Ameen (1994) postulate that at higher levels of education, the relationship between inequality and education becomes positive.

The effect of globalization on income distribution has also received considerable amount of attention over the years. One of the major reasons why so much attention was drawn towards globalization is that many believe it to be the reason behind resurgence of inequality in the developed world, to what most refers to as the Great U turn (Harrison and Bluestone 1988; Green, Coder, and Ryscavage

1992; Freeman and Katz 1995; Ram 1997). Alderson and Neilson (2002) address this matter by looking into three different aspects of globalization that has affected the developed countries, namely, southern imports, direct investment outflow and migration. Wood (1994) shows that in the industrial countries, there has been an upswing in southern import of goods that are intensive in unskilled labor, which causes the demand for unskilled workers to fall relative to that of skilled workers. This induces wider wage dispersions and lead to higher levels of income inequality. Similarly, in less developed countries where unskilled labor is abundant, increased exports of products intensive in unskilled labor should boost the wages for unskilled labor and reduce income inequality (Wood 1994). Birdsall, Ross, and Sabot (1995) conclude that the export oriented growth path in the East Asian countries led to both growth and reduced inequality. Barro (2000) on the other hand found a positive and significant relationship between openness and inequality for both rich and poor countries. While Richardson (1995) and Slaughter and Swagel (1997) find international openness to have modest effect on inequality.

Social scientists have also looked into the public sector and the role of the government to see if there exists any relationship with inequality. Most studies find a negative relationship between the size of the government and inequality (Hicks and Swank 1984; Rubinson 1976). This is because the political party in power tries to please the majority and launches progressive taxes and generous transfers to the lower and middle class (Bradley et al. 2003; Esping-Andersen 1990). Lee (2005) on the other hand has shown the size of the government to have an inverted U relationship with inequality. As the public sector grows, inequality will rise and thereafter a certain threshold growth in the public sector will result in lower levels of inequality.

Several other variables are considered as factors influencing inequality, for instance the investment share of GDP (Barro 2000); fertility (Glomm and Ravikumar 1992, Croix and Deopke 2003; Kremer and Chen 2000); heterogeneity of the population (Barro 2000) among many others. The recent resurgence of inequality in the industrialized countries has caused researchers to look into new variables that also experienced drastic changes in the recent times, this includes increased female labor participation (Thurow 1987); rising proportion of households headed by women (Levy and Michel 1991; Ryscavage, Green, and Welniak 1992; and Nielsen and Alderson 1997); deindustrialization in the industrialized countries (Harrison and Bluestone 1988) and de-unionization (Freeman 1993; ILO 1996).

Although there is a wide array of variables that could have a possible effect on inequality, in this paper we focus primarily on the attainment of education on different levels (preprimary, primary, secondary and tertiary) and their effect on inequality unlike Crenshaw and Ameen (1994) that only tested for secondary

school enrollment. Maldonado (1976) examines the impact of education on inequality by using data of Puerto Rico for 1940, 1950, 1960, and 1970 by using a qualitative method and identifies that political-economic status of Puerto Rico relative to the United States plays important role other than the education itself. Cue (1988) examine same Kuznets' hypothesis for Puerto Rico again by using cross section data from the census of Puerto Rico for 1950, 1960, 1970, and 1980 where education level is considered as one determinant out of many of them and find that education is mostly significant in raising inequality at 10% level. Zandvakili (2002) conducts an exploratory study on the income inequality among young adults of US by using the data from National Longitudinal Survey of Youth (NLSY) containing individuals who were 14-21 years of age in 1979 in a panel data of 1984-1989 and finds that education, marital status and race are the significant contributors to the observed earnings inequality. Rahmah (2000) examines the inequality of Malysia by using the time series data and find that government is becoming successful in reducing poverty at the cost of income inequality and educational inequality is contributing towards overall income inequality over very long run.

This study is different from those already conducted because we use the Estimated Household Income Inequality Data Set (2008) for inequality and World Development Indicators (2010) for education whereas Barro (2000) uses Deininger and Squire's New Dataset Measuring Income Inequality (1996) for inequality and Barro and Lee (1996) for education. Unlike Barro (2000) the data is yearly data instead of five year averages. In addition, each of the education variables is being tested in separate models instead of being lumped in one model which could possibly lead to problems of multicollinearity. The Kuznets' hypothesis is also tested while controlling for trade openness and government size. Unlike the country studies conducted by Maldonado (1976), Cue (1988), Rahmah (2000) and Zandvakili (2002), this study uses one of the largest dataset covering the highest number of countries and longest time periods in a panel framework in examining the role of education on income inequality after controlling other important determinants. In section 2 the existing literature on each of the independent variables is discussed; which a model is introduced in section 3 along with the methodology of this study, followed by empirical results and conclusion with policy suggestion in section 4 and 5, respectively.

14.2 Literature View

14. 2.1 Kuznets' Curve

Almost all studies on income inequality begin by mentioning and citing Simon Kuznets'(1955) inverted U hypothesis. Kuznets uses a simple two sector dualistic model to explain his theory. The first sector is a rural agrarian sector with surplus labor and the other sector is an urban industrial sector. During the initial stages of

development, bulk of the population is in the rural sector which is characterized by low per capita income, surplus labor and minimal income differential among members (Anand and Kanbur 1993). As the industrial sector develops, the rural surplus labor starts migrating from the rural sector to the urban. The urban sector is characterized by high per capita income and high wage differentials; and the growth of the urban population causes the economy's income differential to widen. Eventually, the surplus labor in the rural sector disappears and the size of the agricultural sector diminishes causing the productivity of those in the rural sector to rise along with their income, at the same time continuing urbanization causes the bulk of the population to be in the high income urban sector. And those that were at the bottom of the industrial sector have moved up over the years. Thus, at later stages of development inequality falls. This was Kuznets' (1955) justification for his parabolic inequality and development relationship hypothesis. Kuznets (1955) used this conjecture along with some mathematical extrapolation and the historical trend of inequality of United States, Britain and Germany to make his case.

Studies conducted during the 60s and 70s to test Kuznets' hypothesis support it, mostly because of their questionable cross sectional datasets and statistical discrepancies (Moran 2005). But the introduction of longitudinal data and minor changes in the methodology made the Kuznets' curve almost disappear. The inegalitarian high growth of Brazil and India which left the poor even poorer (Fishlow 1973; Bardhan 1973) caused more people to question Kuznets' hypothesis.

The biggest hurdle for the Kuznets' hypothesis was the East Asian miracle (Fei *et al.*1979, Birdsall *et al.* 1995). The experience of these East Asian countries development was different from that of Kuznets' model in many ways, the initial rural-urban migration did not cause inequality to rise but instead it fell as the income in the rural sector grew; growth was not because of the sophisticated urban sector rather the labor intensive agricultural mix and expansion of rural non-agricultural sector (Fei *et al.* 1979;). Many factors were mentioned to be the reasons behind the success of the East Asian countries like equitable land ownership, land reform (Berry and Cline 1979), Green Revolution, expansion of the rural sector, limited taxation to the agricultural sector and education (Moran 2005); and none of these are resonated with the Kuznets' curve. The East Asian Miracle thus proved that growth need not be inegalitarian.

More recent pattern of inequality that contradicts the Kuznets' hypothesis is the Great U turn phenomenon that most industrialized countries have been experiencing since the 1970s (Harrison and Blustone 1988; Alderson and Neilsen 2002). This is the resurgence of income inequality in the developed societies after a long period of falling income inequality. Scholars have blamed increased globalization, changes in females' role in work area and households (Thurow

1987; Levy and Michel 1991; Ryscavage, Green, and Welniak 1992); the falling employment in the manufacturing sector (Harrison and Bluestone 1988) and the "de-unionization" (Freeman 1993; ILO 1996) of the labor unions as possible reasons for the upswing in inequality.

Despite all these Kuznets' curve still persists to be a recurring element of studies in the field of inequality, due to its empirical ambiguity. While some have found a curvilinear pattern in the distribution of income and development (Dovring 1991; Jha 1996; Bourguignon and Morrison 1990; Randolph and Lott 1993; ; Nielsen 1994; and Nielsen and Alderson 1995), others have found development to have a parabolic effect on inequality but unable to explain much of the variation in it (Barro 2000; Papanek and Kyn 1987). And finally there were those who could not find any systematic relationship between inequality and development and said that adding a country level fixed effect will cause the inverted U to disappear (Anand and Kanbur, 1993; Bruno *et al.*, 1998; Fields, 1994 Deininger and Squire, 1998; Ram, 1997).

The reason behind the variation in results is because of the differences in the way the Kuznets' hypothesis is tested, while some studies use the simple per capita income and its square to test the curvilinear relationship, others have used the functional approach to capture the dualistic development (Moran 2005).

14.2.2 Openness

With the recent upswing in inequality in the industrial countries much attention has been given to the greater degree of global integration that the world has been experiencing (Alderson and Neilsen, 2002; Vayrynen 1997), particularly the greater degree of capital mobility, international competition and migration. According to Alderson and Nielsen (1999) globalization has affected the industrial countries through three distinct aspects, the North South trade (trade between the industrial countries and the developing countries), foreign direct investment outflow of the industrial countries and migration. Among the three, North South trade is more widely recognized as a cause for the recent resurgence of inequality (Wood 1994).

Using standard factor endowment trade theory, one would expect the industrial countries that are endowed with physical and human capital, would mostly import goods that are intensive in unskilled labor and export goods intensive in physical and human capital. Trade liberalization for such countries will cause increased competition for unskilled labor and put downward pressure on their wages thus, widening the wage gap between skilled and unskilled labor (Messerlin, 1995). Wood (1994) has shown in his study, that North South trade has indeed been detrimental for the developed countries. He shows this is three steps, first he shows that the income gap between the skilled and unskilled labor have widened

since 1980s, he shows that this income differential was induced by trade. Finally he establishes that it was the Southern import penetration that caused the upswing in inequality.

There have also been studies that have shown that North South trade had negligible effect on labor markets of the developed countries (OECD Jobs study 1994; ILO World Employment 1996). Wood (1994) also pointed out such wide wage differentials is likely to be resisted in countries with strong labor unions, who would advocate for more egalitarian pay scale in the form of higher minimum wages. This could result in a surplus of unskilled labor, i.e. unemployment. Thus, there might be a tradeoff between inequality and unemployment in these countries. Alderson and Neilson (2002), Glyn and Salverda (2000), Schmitt and Mishel (2000), Bertola and Ichino (1995); Blank (1997) finds no such tradeoff between inequality and unemployment in their studies.

For developing countries that are endowed with unskilled labor one would expect greater openness to mitigate the wage differential between skilled and unskilled labor, by raising the demand of unskilled labor. However, other theories have been put forward that contradict such expectation. Barro (2000) for instance has said that international openness allows access to foreign technology and culture which is relatively sophisticated and that the rich are more likely to take advantage of such opportunities that openness brought along, thus in poor countries trade is likely to increase inequality. His findings showed a positive relationship between inequality and openness and it is more pronounced in developing countries. Another possible explanation that Barro (2000) provided was that increased global integration hinders a country's government's ability to mitigate market determinants of inequality.

14.2.3 Government Size

Rubinson (1976), and Hicks and Swank (1984) argues that larger the size of the government of a country, the lower is its inequality. This is because labor unions and other class linked institutions voice their social welfare needs that political party in power responds to, by launching progressive tax and social policies that call for large public sectors (Pampel and Williamson 1989; Wilensky (1975); Korpi 1983; Hewitt 1977). This is particularly true for social democratic governments who need the support of labor unions and allied parties, and to please them they impose higher taxes on the rich and makes generous transfers to the lower and middle classes (Bradley *et al.* 2003; Esping Andersen 1985) causing inequality to fall and the public sector to expand. Lee (2005), however believes that larger governments can only reduce inequality in countries where the democratic system has been fully institutionalized, where the government will be accountable to its citizens, in a country with limited democracy or no

democracy at all large public sectors can translate to increased income inequality; and that government size and inequality follows a curvilinear relationship.

Lee (2005) provides three distinct ways how a large public sector can be injurious to the country's income distribution. First, the expansion of the public sector increases both wage and non wage differential between those working in the public sector and those in the private/informal sector (Alavi 1972). Second, in order to speed the process of industrialization the state can provide targeted industries infrastructure, low interest loans, financial leverage, and help create new industrial forces instead of improving the overall society, this could further distort the income distribution in favor of the new industrial forces (Evans, Rueschemeyer, and Skocpol 1985; Weber 1968); while the agricultural and informal sector declines. Third the government can introduce social policies that favor only a segment of the population (Malloy 1979) that leads to higher inequality.

14.2.4 Education

The common belief is that education has a negative effect on inequality as shown by Williamson (1991), Alderson and Neilsen (1999) and Lecaillone *et al.* (1984). King *et al.* (1982) believes that equalizing access to education enables a country to reach its egalitarian goals; education expands the supply of skilled labor and thereby depresses their relative wages and the gap between skilled and unskilled labors' wages becomes narrower. Romaine (1992) has shown that there is an association between education and political power, which in turn is associated with income.

Romaine (1992) points out that education is only a problem when one segment is educated and another is not. Jacob (1985) too argues that it is not the level of education but rather the dispersion of education that affects inequality. And Croix and Deopke (2003) has shown that poor households tend to invest less in their children's education than most rich households because the cost of education is fixed and not subject to the parents' wages making education relatively more expensive for the poor household. Although richer families can afford more education they decide to have fewer children because of the opportunity cost of time required to nurture an additional child. Thus, when faced with quality-quantity trade-off richer households decide to have fewer children and invest more in education, while poorer households trade education for more children. This causes the disparity in the access to education to widen, as the poor have more children with less education and the rich have fewer children with more education. Another segment of population that is deprived of education is females; when parents decide whether to send a child to school they take into account costs both future and present (Caldwell, 1983), which include not only school fees but also labor that is used for household chores. And as girls

contribute to more household chores than boys, the cost of sending a boy to school is lower. Secondly, even with the same level of education males are more likely to be employed at better paid jobs. In terms of both costs and returns the chances of a male acquiring education are higher than a female's (Johnson 1993). Education is more accessible to urban dwellers than it is to rural dwellers (Stromquist 1989) particularly in developing countries, regardless of gender. Taking all these into account Johnson (1993) concludes that poor rural women have the least access to education.

Crenshaw and Ameen (1994) argue that higher levels of education expansion will cause inequality to rise; they propose a curvilinear relationship between secondary school attainment and inequality. In a study by Bray and Smith (1985), it has been seen that those with honors degree or higher earn seven times as those with no education, four times as those with a 6th grade education and twice as those with secondary education. A similar study conducted in Papua New Guinea showed that as the majority of the population was unemployed with no income, those that were most educated enjoyed 7000 kina per year. The literature on the link between education and inequality is not conclusive and it is sensible to explore the literature with more in-depth examination and empirical investigation.

The literature on determinants of inequality is enormous. One common pattern of the existing literature is that even though different papers have different focus income and income squared in the framework of inequality is common in most of the studies. Then they make an attempt to control for other possible determinants like openness, role of government etc. and focus on particular variable of their interest. We follow this procedure by introducing disaggregate education like pre-primary, primary, secondary, and tertiary level after controlling for other common determinants to examine the effect of education in general and higher education in particular on inequality.

14.3 Methodology

The models for this study is constructed to bring forth a better understanding of the impact of education on inequality on four different levels, preprimary, primary, secondary and tertiary. The model also incorporates the log of real per capita income and its square so that the Kuznets' hypothesis can be tested. And finally trade openness and government expenditures are added to the model as control variables. The models are presented below:

$$\textbf{Case 1: } I_{i,t} = a_o + a_1 \log Y_{i,t} + a_2(\log Y_{i,t})^2 + a_3 ppedu_{i,t} + a_4 exim_{i,t} + a_5 govt_{i,t} + \varepsilon_{i,t}$$

$$\textbf{Case 2 : } I_{i,t} = b_o + b_1 \log Y_{i,t} + b_2(\log Y_{i,t})^2 + b_3 pedu_{i,t} + b_4 exim_{i,t} + b_5 govt_{i,t} + \varepsilon_{i,t}$$

$$\textbf{Case 3 : } I_{i,t} = c_o + c_1 \log Y_{i,t} + c_2(\log Y_{i,t})^2 + c_3 sedu_{i,t} + c_4 exim_{i,t} + c_5 govt_{i,t} + \varepsilon_{i,t}$$

$$\textbf{Case 4 : } I_{i,t} = d_o + d_1 \log Y_{i,t} + d_2(\log Y_{i,t})^2 + d_3 tedu_{i,t} + d_4 exim_{i,t} + d_5 govt_{i,t} + \varepsilon_{i,t}$$

where $I_{i,t}$ is the gini coefficient, an indicator of inequality of country i at time t, log $Y_{i,t}$ and $(\log Y_{i,t})^2$ is the log of per capita income and its square, respectively, of country i at time t; $ppedu_{i,t}$, $pedu_{i,t}$, $sedu_{i,t}$ and $tpedu_{i,t}$ is the gross preprimary school enrollment, gross primary school enrollment, gross secondary school enrollment and gross tertiary school enrollment of country i at time t, respectively; $exim_{i,t}$ is the trade to GDP ratio and $govt_{i,t}$ is the government expenditure to GDP ratio of country i at time t; and $\varepsilon_{i,t}$ is the error term.

The Gini index is used as a measurement for inequality. Like all aggregate variables gini index lacks unique mapping that is a transfer from the top to the middle class will have the same effect on the gini coefficient as the transfer from middle to the bottom class (Deininger and Squire 1996). Although, income share of each quintile would allow us a better understanding of the changes in inequality, the data available is very sparse and would greatly shrink the sample size. Thus, we resorted to using Gini coefficients as an indicator of inequality.

Since, the mid 90s most studies have used Deininger and Squire's (1996) New Dataset on Income Inequality. Prior to this dataset most data on inequality suffered from measurement errors and studies that have used such data had less than reliable results. Moreover slight changes in methodology or data would significantly change the results (Saith 1983; Fields 1984). Previous data on inequality were not representative of the entire economy, some included only rural or urban population, just taxpayers or income earners, definitions were not clear, racial coverage was limited. Deininger and Squire's (1996) dataset has a panel structure, it is more comprehensive and has substantial coverage (geographic, population, racial), and secondary sources are clearly defined.

However, Deininger and Squire's dataset even has its own shortcomings. It has only 682 observations for 108 countries over the period of 1947 to 1995, and the average number of observations per country is 6.83. Number of observations for countries of Sub Saharan Africa is very scanty with 1 to 4 numbers of observations per country. Representation of the former USSR countries is also poor. The Estimated Household Income Inequality Data Set (2008) prepared by the University of Texas Inequality Project in collaboration with UNIDO on the other hand has 3513 observations for 155 countries, in a period of 1963 to 1999 and meets all the high quality standards of Deninger and Squire's set. And the representativeness is better for every region compared to that of Deininger and Squire's (1996) dataset. Hence, for this study, we'll use Estimated Household Income Inequality Dataset's (2008) gini coefficient index as a measurement of inequality.

In this study we use the log of real per capita income and its square to test if inequality and development follows a quadratic equation, since that is the premise of the Kuznets' curve. The real GDP per capita is gathered from World

Development Indicators (2010). The Kuznets' hypothesis will be supported if the coefficient of the quadratic term is negative, indicating an inverted U relationship between inequality and real per capita GDP.

This paper analyzes the effect of different levels of education (pre-primary, primary, secondary and tertiary) on inequality separately, to see whether each of the different levels of education help mitigate or exacerbate inequality, while controlling for openness and government size. To indicate openness like Barro (2000) in this study we'll use the ratio of exports plus imports to GDP. There are two ways that the size of the government can be measured, one is the revenue collected by the government/GDP and the other is the expenditure of the government/GDP. We use the government expenditure ratio for our model as we believe it to be a better representation of the government size than revenues. . The data for education, trade and government size are collected from World Development Indicators (2010).

The data used in this study have an unbalanced panel structure encompassing 155 countries over the period of 1963 to 1999. Most cross sectional studies of inequality suffer from two potential problems, measurement errors in inequality and omitted variables bias (Forbes 2000). Systematic measurement errors can arise due to differences in definitions of variables across countries; varying data collection method in different countries; etc. Measurement errors can either be unmeasured country specific and time invariant, that affect income inequality of a country in the same way over all time points; or it could be other time invariant unmeasured factors that differ across countries. These measurement errors can lead to positive or negative bias, depending on the correlation between the measurement error and other regressors, and decrease the significance of results. Another potential problem is omitted variable bias, a problem that arises when there is some unknown variable or variables that cannot be controlled for that affect the dependent variable. It is difficult to predict the bias that can be caused by the omission of a variable that has explanatory power; and it could be more significant and outweigh any multivariate effect.

Ordinary multiple regression techniques can be applied to a panel data, however it is usually not optimal particularly when the data might be subject to measurement errors or omitted variable bias. Systematic measurement errors in measuring income inequality across countries will be forced into the error term, causing the errors of the same country at multiple points in time to be correlated with each other due to the presence of unmeasured country specific, time invariant factors. This violates OLS assumption of uncorrelated errors causing heterogeneity bias in the OLS estimation and standard errors to be over or underestimated (Greene 1993; Hsiao 1986; Stimson 1985) and if the panel data is subject to heteroscedasticity the OLS estimator will neither be BLUE (Best Linear Unbiased Estimator) nor efficient.

Fixed-effects specification differs from OLS in its treatment of the intercept. While OLS restricts all countries under the same intercept, fixed-effects introduce n new variables, one for each of the n countries, to represent country specific intercepts. This eliminates unmeasured time invariant, country specific factors and removes heterogeneity bias (Hsiao 1986). Random-effects specification on the other hand, treats the country specific component as part of the error term. One drawback of the fixed-effects specification is that it cannot include time invariant indicators like geographic position, institutionalized democracy, world system position because these are perfectly collinear with country specific fixed-effect variables (Maddala, 2001). Moreover, fixed-effects reduce the degrees of freedom by one for each country, thus a lot of information is lost, and it also cannot explain variations between countries as it is discarded. This can cause coefficients to be insignificant despite strong theoretical power of explanatory variable. Fixed-effects can also be imposed on time period to capture global shocks that affect all countries in a similar way at a point in time. Thus, fixed-effects can be imposed on countries, on time, or on both (two-way fixed). Random-effects model can only be one way for unbalanced data either on time or on countries.

All the four cases presented above are estimated using ordinary pooled regression, and fixed-effects model using country-specific variables, fixed-effects model using period specific variables, two-way fixed-effects model, random-effects model using country-specific variables and random-effects model using time-specific variables.

To choose among the model specification various tests are run. This includes a Lagrange Multiplier test, designed by Breusch and Pagan (1980) based on OLS residuals, to test the null hypothesis that the variances of the groups are zero, and if the null is not rejected the pooled regression is appropriate, but if rejected one way random effect will be more appropriate. Then a Hausman specification test (1978) is conducted to see if the unmeasured time invariant, country-specific effects are correlated with the explanatory variables, where the null hypothesis is that random-effect is both consistent and efficient and the alternative is that it is inconsistent. Rejection of the null would imply that random-effects model should not be used as the country-specific effects are correlated with the explanatory variables, and to opt for fixed-effect model. Finally, a fixed-effects redundancy F-test is conducted to test the joint significance of fixed-effects estimator, this tests the joint significance of cross-section fixed-effects, period fixed-effects and two-way fixed-effects. The null hypothesis is that the fixed-effects is redundant. Thus, rejecting the null would imply that fixed-effects are not redundant. Results from these tests are used to decide which model specification is fit for each of the cases.

14.4 Empirical Findings

14.4.1 Descriptive Statistics

Let us start with descriptive statistics to have a clear idea about the dataset.

Table 1 Descriptive Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Gini Coefficient	3130	41.60	7.38	20.07	64.75
Logged GDP	7799	7.30	1.66	3.57	12.26
Preprimary Education	2704	48.17	34.07	0	150.75
Primary Education	3477	97.34	21.96	2.66	210.64
Secondary Education	3173	65.71	33.57	0.60	161.78
Tertiary Education	2509	24.05	22.29	0	121.51
Trade/GDP	6994	75.86	46.27	0.31	438.09
Govt. Expenditure/GDP	6756	15.82	6.83	1.38	83.16

Source: Own calculation from set data

From the table it can be observed that there exists wide variation in all the variables expected to be included in the model. Before we progress to the estimation, we have done a bivariate analysis of the four school enrollment tests to see if they move together. Adding explanatory variables that are highly correlated with each other will pose problems on the estimation, because of collinearity. Models that suffer from multicollinearity may suffer from overestimated variances and standard error of estimates that will inflate the principle diagonal items. This can cause null hypothesis of significance test not to be rejected. Thus, significant explanatory variables may appear to be insignificant. Multicollinearity can also cause estimation not to be precise as the sampling distribution gets wider in such cases; there is even a possibility of getting wrong sign of estimates. And more importantly, results become too sensitive to model specifications, it is difficult to find robust results.

Table 2 Sample Correlation Coefficient

	Preprimary	Primary	Secondary	Tertiary
Preprimary	--			
Primary	0.31**	--		
Secondary	0.70**	0.46**	--	
Tertiary	0.61**	0.25**	0.77**	--

Source: Own calculation, **represents 1% significance level

Collinearity between variables can be detected if the sample correlation between variables is high. Table 2 shows the sample correlation between the four school enrollment rates. Not surprisingly, they are all correlated at significance level of 1%. Preprimary and secondary school enrollment move together 70% of the time, correlation between secondary and tertiary is the highest, standing at 0.77. Primary school enrollment is the least correlated with the remaining enrollment rates. One plausible explanation is that primary education does not vary much with level of income; it is perceived as almost a necessity and in most cases is provided by the government. Preprimary, secondary and particularly tertiary education is obtained by those with higher levels of income. The proportion of students that will go to a university is higher in a secondary school than that in a primary school.

To avoid the problems of multicollinearity, each of the four school enrollment rates are examined separately. Case 1 examines the effect of preprimary education on inequality; case 2 examines the effect of primary education; case 3 examines the effect of secondary education; and case 4 examines the effect of tertiary or higher education. All the four cases are controlled for openness and government size. The results are presented in Table 3 along with results from Breusch and Pagan LM test, Hausman Specification Test, and Redundant Fixed-effects Tests.

Table 3 Two-way Fixed-effects Estimation with Model Specification Test Results
Dependent Variable: Inequality

	Case 1	Case 2	Case 3	Case 4
Constant	51.64 (13.75)**	57.19 (16.64)**	52.98 (16.68)**	57.15 (14.26)**
Log real per capita GDP	-1.20 (2.60)**	-1.49 (3.98)**	-1.37 (3.41)**	-2.31 (4.71)**
(Log real per capita GDP)^2	-0.00037 (0.07)	0.0015 (0.31)	0.0043 (0.86)	0.0033 (0.64)
Pre -primary School Enrollment	-0.03 (2.03)*	--	--	--
Primary School Enrollment	--	-0.04 (2.79)**	--	--
Secondary School Enrollment	--	--	-0.02 (1.21)	--
Tertiary School Enrollment	--	--	--	0.05 (2.02)*
Trade/GDP	0.01 (1.81)	0.01 (0.97)	0.01 (1.39)	0.01 (1.14)
Government expenditure/ GDP	-0.02 (0.05)	-0.01 (0.24)	0.00 (0.10)	0.04 (0.84)
LM Test	429.31**	549.18**	451.56**	441.74**
Hausman Test	108.19**	119.03**	147.25**	118.30**
F Test for Cross Section fixed-effects	284.93**	22.89**	21.34**	21.35**
F Test for Period fixed-effects	9.79**	9.84**	6.41**	6.41**
F Test for Two-fixed-effects	23.27**	23.79**	23.24**	23.24**
Adjusted R^2	0.88	0.88	0.88	0.89
No. of observations	541.00	686.00	645.00	548.00

Source: Own calculation

Note: ** represent significance at 1% and * represent significance at 5% level. Figures in the parentheses represent the absolute values of T ratios.

For all the cases Breush Godfrey's LM test rejected the null hypothesis, at all levels of significance, that the group variances are zero and that applying pooled OLS estimation is appropriate. The alternative to this hypothesis is to apply

random-effects method. However, Hausman specification test has rejected the null that random-effects model is consistent and efficient for all the four cases, it doesn't meet the independence assumption. Thus, there is unmeasured country specific or period specific effects that are correlated with the other explanatory variables and random-effects specification cannot be used.

Next fixed-effects redundancy tests are applied. First the cross section fixed-effects redundancy test is taken, and the null hypothesis that cross-section fixed-effects is redundant is rejected at all levels of significance for all the four cases. Thus, cross-section fixed-effects is needed. Next a similar test is taken to test the redundancy of period-specific fixed-effect; here too the null was rejected for all the cases, implying that a period-specific fixed-effects is also needed. Lastly, an F-test is taken to see if two-way fixed-effects (both cross section and period) is redundant, the null was rejected in this case as well, and both country specific fixed-effects and period specific fixed effects need to be incorporated in the model specification. After taking the results of all these tests into consideration the model specification chosen for all the four cases is a two-way fixed-effects specification. From the results of the tests it can be inferred that there are time invariant, country-specific effects as well as global shocks that have affected all the countries at some point in time, present in the data.

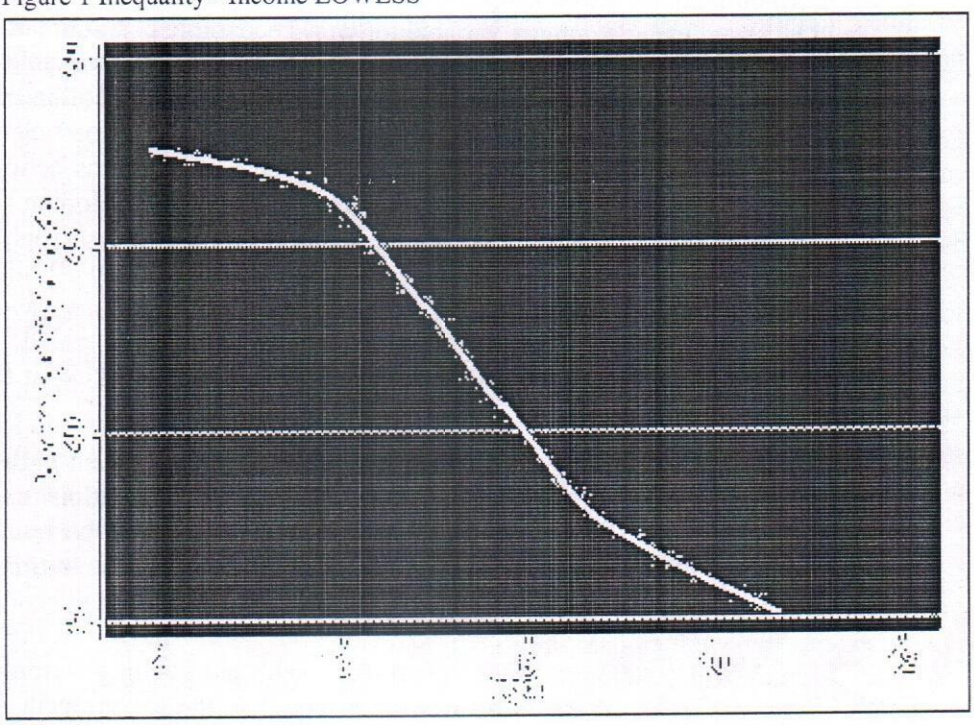
The school enrollment coefficients suggest that preprimary, primary and secondary education have a negative effect on inequality, whereas higher education has a positive effect on growth. The results are significant except for secondary education. Countries that have high levels of preprimary and primary school enrollment are likely to have lower levels of inequality while countries with high level of higher education (tertiary education) are likely to be more unequal, nothing conclusive can be said about secondary education from this study. Acquiring higher education increases ones income by many folds (Bray and Smith, 1985) this widens the gap between those that don't have higher education and those that do, resulting in more inequality. Preprimary, primary and secondary education on the other hand narrows the income gap by enabling those that are unskilled to acquire skills and earn wages similar to that which is being earned by an average skilled worker.

The results obtained in this study are similar to Barro (2000), even though the data used for inequality and education, model specification, control variables and time length are all different from this study. This proves the robustness of the results. Preprimary school enrollment and secondary has a significant negative effect in five out of six model specifications ran in this study, it showed a positive but insignificant effect only when a country specific fixed effect is taken. It is also consistent with Crenshaw and Ameen's (1994) argument that education has a positive relationship at lower levels of education but in higher levels of education the relationship reverses.

The Kuznets' hypothesis is largely dismissed in this study, not only are the coefficients for the quadratic term for income insignificant in all the four cases it is also positive in three of the case (2,3 and 4), suggesting rather a U shaped relationship. The coefficient for the quadratic term was almost always insignificant for all the model specifications in all the four cases. On the other hand, the linear association between income and inequality proved to be very strong, in per capita income, in all the cases for almost all model specification.

A LOWESS curve has been fitted to the inequality and per capita income, this is simply a locally weighted least square that produces a smooth scatterplot for the two variables by eliminating all the noise in the regular scatterplot. Once the noise is removed the in figure 1 the negative relationship between per capita income and inequality can be seen clearly.. Thus, higher levels of income are associated with less disparity.

Figure 1 Inequality - Income LOWESS



Source: Own calculation

The curve resembles the latter half of the Kuznets' curve of falling inequality with development, maybe if the study was extended to more historical data, the other half could have been captured, but such inferences cannot be made from this study without any empirical evidence.

Openness measured by trade/GDP ratio is positive and significant at a 10% level of significance for case 1 besides that the other models rendered it insignificant. It should be noted that when fixed effects are not applied openness mostly has a negative and significant effect on trade. Banerjee (2003) faces similar difficulties in his study when he adds the log(GDP/capita) variable to his fixed-effects specification. As the significant openness variable became insignificant he concludes that in fixed-effects specification income cannot explain how openness affects inequality. Fixed-effects specification discards information about variation across countries, which can cause variables with strong theoretical background appear to be insignificant.

Theoretical explanations as to why trade might become insignificant is that it affects poor countries and rich countries differently (Alderson and Neilson 2002; Wood 1994) by increasing the demand of unskilled labor in the developing countries openness reduces inequality and at the same time depresses the wages of unskilled labor in the developed countries and widen the wage disparity. This could be tested using a dummy variable for world economic position, but because of the time invariant, country specific nature of the dummy variable it'll be dropped out in fixed-effects specification due to perfect multicollinearity with country-specific variables. Another possible reason why trade coefficient might become insignificant is because of offsetting effects of openness acting at the same time. For instance openness might favor the rich in the developing countries as well by providing greater international opportunities that are so sophisticated that only the rich would be able to enjoy them (Barro, 2000). While in the developed countries where there are strong labor unions and other institutionalized groups inequality might be resisted and traded off for unemployment (Wood 1994). The opposite effects of trade working at the same time might nullify the effect of greater openness on inequality.

The effect of government's size on inequality was also insignificant in this study, and this was consistent in all the cases for all model specifications except for pooled OLS, which as mentioned before is most susceptible to be fraught with heterogeneity bias, omitted variable bias leading to imprecise estimate. Lee (2005) suggests that the effect of government size on inequality depends on the extent to which it is democratized. Countries with fully institutionalized democracy will face lower levels of inequality with increasing government size, as the strong political mechanism will ensure that the government in these economies be more responsive to the needs of the poor and provide better distributional outcome, it the form of high progressive taxes and generous transfers to the lower and middle class (Esping-Andersen 1985; Hewitt 1977). In countries with weak or no democracy, the government size will have a negative impact because the government might favor certain core industries in expense of agriculture and informal sector in the pursuit of industrialization and in the

process exacerbate the income disparity (Lee 2005). This could be tested by using a democracy dummy but like the world position dummy, this too would be dropped in a fixed-effects specification.

14.5 Conclusion

Studies on factors that influence the income distribution is vast and incorporate elements from all walks of life, ranging from household income to government expenditure; from democracy to corruption; from female labor participation to unemployment etc. As the income disparity persists, so does the pursuit of understanding its causes and effects. This paper is also a part of that pursuit. Few studies focus on the impact of education on inequality but it is difficult to examine the impact of education as a single entity because of its diverse nature and implication. That is why a comprehensive study by examining the disaggregate nature of education in terms of preprimary, primary, secondary, and tertiary showing the impact on them separately is essential. The motivation is that the impact of primary education, for instance, might have a different nature of dynamics from the secondary and tertiary level. This paper fills this gap in the existing literature by focusing on the impact of higher education on inequality.

Using an unbalanced panel data of 155 countries between the time period of 1963 to 1999, and a two-way fixed-effects specification, we make an attempt to understand the effect of different levels of education on inequality. We find that preprimary and primary level of education helps reducing inequality but higher education raises inequality and results from secondary education are inconclusive. This reconciles the differences between studies that show higher levels of education reduces inequality (Williamson ,1991; Alderson and Neilsen ,1999; and Lecaillone *et al.* 1984, King *et al.* ,1982) and studies that argue that the dispersion of education is what effects inequality (Romaine, 1992 and Jacob 1985). While higher levels of preprimary and primary education soothes inequality, higher spread of tertiary education exacerbates education, plausibly because the incremental increase in wages from additional year in college is disproportionately larger than an additional year in primary school.

Furthermore, the study finds no evidence of the Kuznets' curve but a strong negative linear relationship between per capita income and inequality is found, which resembles the latter half of the Kuznets' curve. It remains unclear if the extension of the data to include earlier years would produce the Kuznets' curve or not. The impact of trade openness and government size on inequality has been found insignificant. .

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Chapter 15: A New Paradigm of Human Resource Management Practices in South Asia

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Abstract: *The purpose of this study is to explore and understand the contemporary Human Resource Management (HRM) practices in the selected countries in South Asia. It is identifying the existing elements in South Asian HRM practices and examining new elements adopted into the existing HRM practices under the influence of United States, Europe, China and Japan. The study is based on the changes in historical development, economic emergence of South Asia, impact of colonial rule, and the cultural changes in the region. When there is a transitional crisis, economic upbeat and any major macro economic upheaval, then changes in HRM practices emerge. It is a new HRM paradigm in the process of shaping up towards mixed HRM practices in South Asia. For example, there are multiple factors, such as foreign influence, foreign direct investment (FDI), and bilateral relations amongst the SAARC members, the government influence, the stage of social and economic development, and organizational and national historical path, shaping the outcome of reformation of HRM practices in South Asia. The experience of South Asian countries is allowing them to adopt a hybrid HRM practices and it could be a lesson for the other regions. The study could open a new theoretical debate for further research on HRM practices in South Asia.*

1.0 Introduction: Human resources management is a synonymous terminology for personal management since 1950s (Rudman, 2002). The concept of HRM was developed originally in the US in the 1960s and 1970s (Brewster, 1995).However, the formation of HRM concept is gradually influenced by the increasing competition of manufacturing production, especially in East and South Asia. In South Asian countries the economic growth has been maintaining its trends are doing well. This economic growth has steered the companies to modernize their HRM practices in South Asia. Some practical aspects of HRM are mostly originated in South Asia. However, it is now adapting to global HRM practices.

American and European MNCs are here to ensure their business interest in the region. By adopting to new management initiatives, the US firms are likely to develop certain competitive advantages in order to survive in the face of global competition (Porter, 1990; Edwards 2007). To balance with local aspects of HRM

practices, MNCs may embrace hybrid patterns of HRM practices. Some of the aspects of HRM paradigm were based on the Japanese management practices that had a profound influence in Japan and South Asia. The elements of cohesiveness and collectiveness, such as synchronization, information sharing, devotion, on-job-training, and teamwork etc. were key dimensions of the new HRM model have practice in Asian organizations for a long time (Zhu et al,. 2007). The individualistic elements of management practices with East Asian management practices, the HRM paradigm was expected to develop the competitiveness of organizations and the safety of both individuals and organizations (Schuler and Jackson, 1987). The collectivistic attitude, team work, achievement orientation, network, power distance, aversion towards uncertainty, male dominance, amicability of people of South Asia adds a broader insight in the current global HRM practices (Cateora and Graham, 2005).

Under the authority of the universalistic model of 'best practices' of HRM in the US, there has been a tendency for organizations external the US to try to adopt these so-called 'best practices'. Two problems occur from following this trend. First, the 'best practices' in the US may not be the superlative practices in other nation, given that the cultural and value systems as well as institutional and structural factors are very different between countries and organizations (Aycan, 2005). Second, the idea of adoption is about taking on something new. However, given the milieu of the configuration of the HRM idea in the US, some of the key dimensions already existed in organizations in South Asia. Then, it is ambiguous to declare that, for example, the Japanese organizations adopt these HRM dimensions, but in fact they had institutionalized many of these dimensions before the formation of the 'new' HRM paradigm in the US. Therefore, there is confusion among many researchers regarding which elements of HRM belong to the South Asian tradition and which elements are adopted from the West (Anton 2010).

The crucial reasons of conceptualizing HRM in Asian characteristics are: (a) to contrast and dissimilarity the current paradigm of HRM in the U.S. Europe, Japan and China ; (b) to use the same logic to demonstrate the similarity and difference of HRM systems among the key players in South Asia; (c) to portray theoretical explanations can be drawn through comparing and contrasting the uniqueness of HRM transformation and practices in South Asia and in the other part of the worlds; and (d) to demonstrate the affiliation between HRM systems and the factors and processes that determine the expansion of these systems in South Asia.

This article is consisting of the following sections. *Section 2* compares and contrasts the leading paradigm of HRM in the U. S. and Europe. The selected models applied are 'Harvard Model', the 'Contextual Model', the '5-P Model', and the 'European Model' (Budhwar and Debrah, 2001). By using the result of

these comparisons, we can recognize the key aspects of HRM in South Asia by reviewing the historical evolution and current practices of HRM in Japan, China, India, Pakistan, Sri Lanka, Afghanistan, Bangladesh, Bhutan, Maldives and Nepal. *Section 4* discusses the factors that influence the evolution processes. Finally, *Section 5* highlights the finding by emergent the perception of HRM with 'Asian' characteristics in comparison with Chinese, Japanese, European and US systems.

2. Dominant Paradigm of HRM in the USA

The primitive approach of HRM is 'resource' based that leads to harmonic balance in business strategy and organizational objectives (Fombrun *et al.,* 1984). The contemporary HRM is much people oriented and subject to change with macro-economic indicators. The dominant HRM models are discussed at this point elaborately from the context of people management practices in US, Europe, China and Japan. However, to break down the historical configuration of HRM in US, analysis of some models is critically important. A few models are explained below.

2.1 The Matching Model (Fombrun et al., 1984): The 'Matching Model' links different human resources functions to a managerial strategy and formation (Galbraith and Nathanson, 1978). It is a mathematical agenda attempting to illustrate the configuration of equally useful relationships over time (Matching Theory, 2012).

Human resource system and organizational structure should match with its organizational strategy. Matching model emphasizes a 'tight fit' association between organizational strategy, organizational structure, and HRM system (Figure 1). The notion of 'fit' between an external competitive strategy and an internal HRM strategy is a central tenet of the HRM model. This model is used to be exercised by many US corporations before the emergence of other concurrent models. The success of this model underlies in the conformity between different organizational strategies and on its requirements of different 'role behaviors' on the part of employees. This model typically represents distinctive U.S. oriented unitary approach towards people-management system, which emphasizes managerial sovereignty and legitimizes managerial control over employees (Boxall, 1992). Nevertheless, such type of system is robustly challenged by both pluralists and more extreme critics who exert priority on 'labor process' (Hyman, 2001).

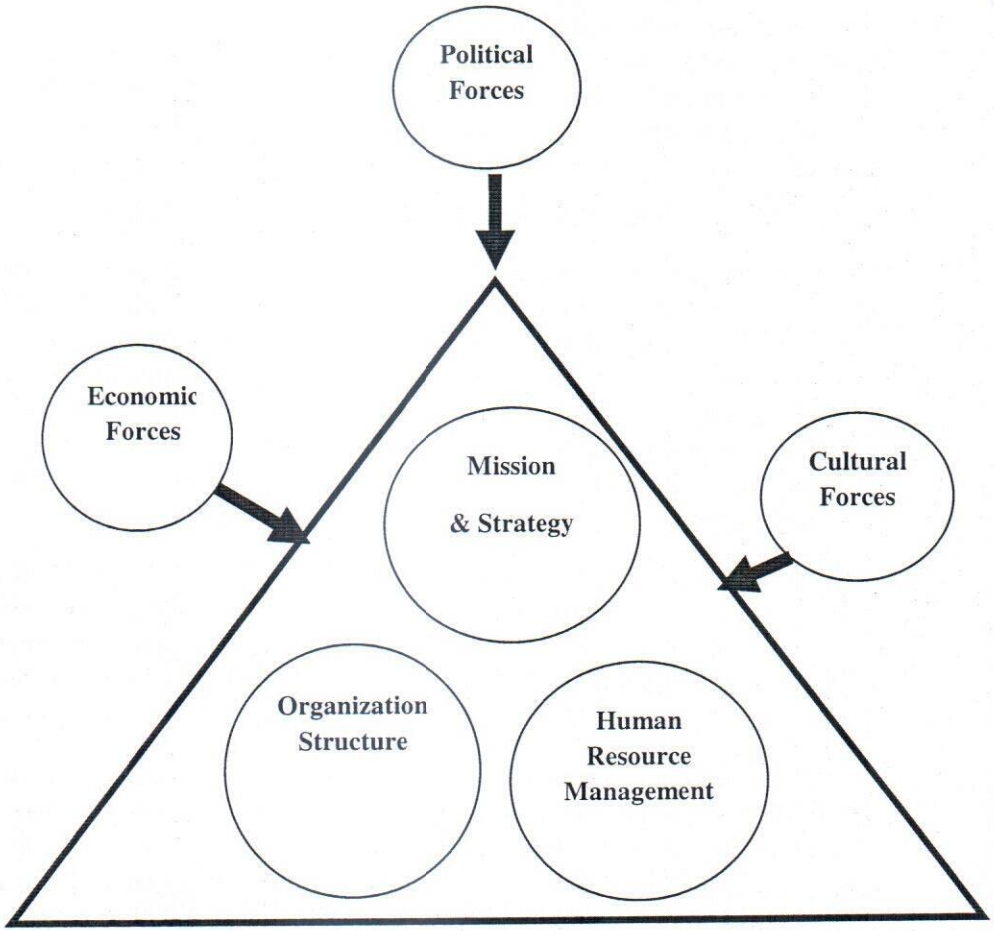


Figure 1: Strategic Human Resource Management and Environmental Pressures
Source: Devanna et al., (1984)

2.2 The Harvard Model (Beer et al., 1984):

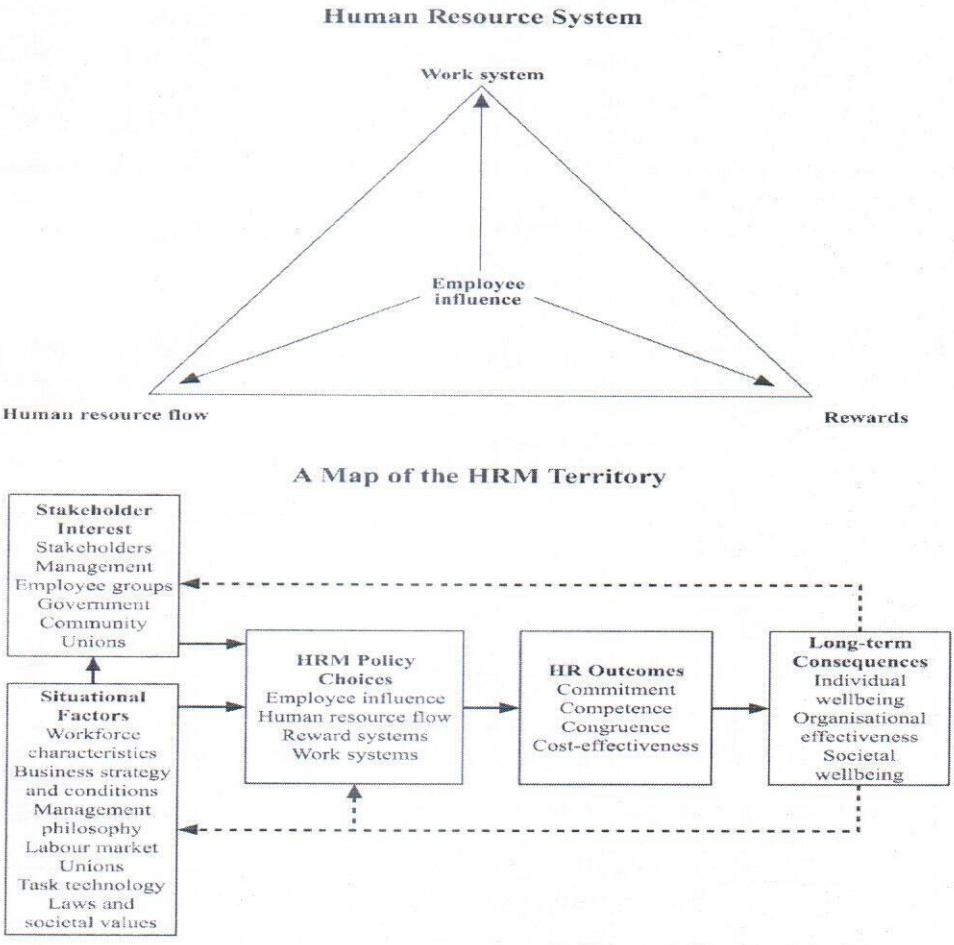


Figure 2: Harvard Model of HR (Cakar et al., 2003)

While the matching model emphasizes on resources, Harvard model concentrates on employee-management relationship, individual performance, and human intention to do things better (Figure 2). Top management establishes a viewpoint of how they want to see their employees and a sound HRM system to reach their cherished goals (Armstrong 2006). According to Harvard Business School, line managers are going to ensure the alignment of competitive strategy and personnel policies. At the same time personnel department will set policies to govern personnel activities and its subsequent implications. The Harvard approach is, in fact based on the mutual understanding of all the elements of businesses.

2.3 The Contextual Model (Hendry et al., 1988; Hendry and Pettigrew, 1992): The Contextual Model is another manifestation of 'Harvard Model'. It shows a guideline of strategy-making in competitive and overly difficult complex organizational environment and it relates this to the ability to transform HRM practices (Budhwar and Debrah, 2001). There are two core parts of Contextual Model: the external environmental context and the internal organizational context (Tayeb, 2005).

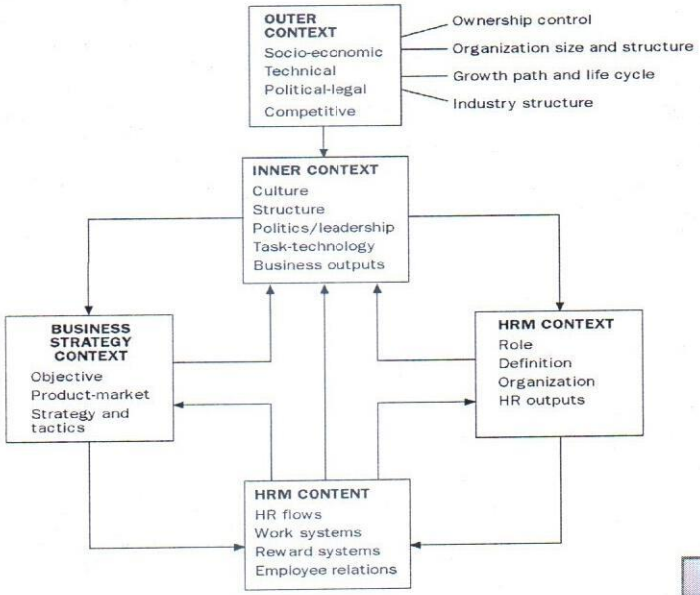


Figure 3: The contextual model (Sparrow and Hiltrop, 1994)

Organizations can follow many ways to make sure positive outcomes in the presence of different internal and external factors (Figure 3). The linkages of these factors form the context of an organization's HRM are necessary to formulate a sound HRM practices (Sparrow and Hiltrop, 1994; Sparrow 2007). It means interconnection and interdependency between these two contexts define the contents of an organization's HRM practices. Moreover, the contextual model of HRM are comprised of international aspect of HRM, which is considering the similarities and differences of various geographic locations, where people management practices are extensively followed (Martín-Alcázar *et. al.*, 2005).

2.4 The 5-P Model of SHRM (Schuler, 1992): The association between strategic management and HRM is the outcome of theoretical debates in the academic in early 1990s (Boxall, 1992; Guest, 1991). Strategic Human Resource Management

(SHRM) a new knowledge opens up the path for HRM to business strategy, developed by Schuler in 1992). Strategic needs of an organization are depending on five human resource activities: Philosophies, Policies, Programs, Practices and Processes. This 5-P model becomes the major components to attain organization's strategic goals (Budhwar and Debrah, 2001; Price 2011).

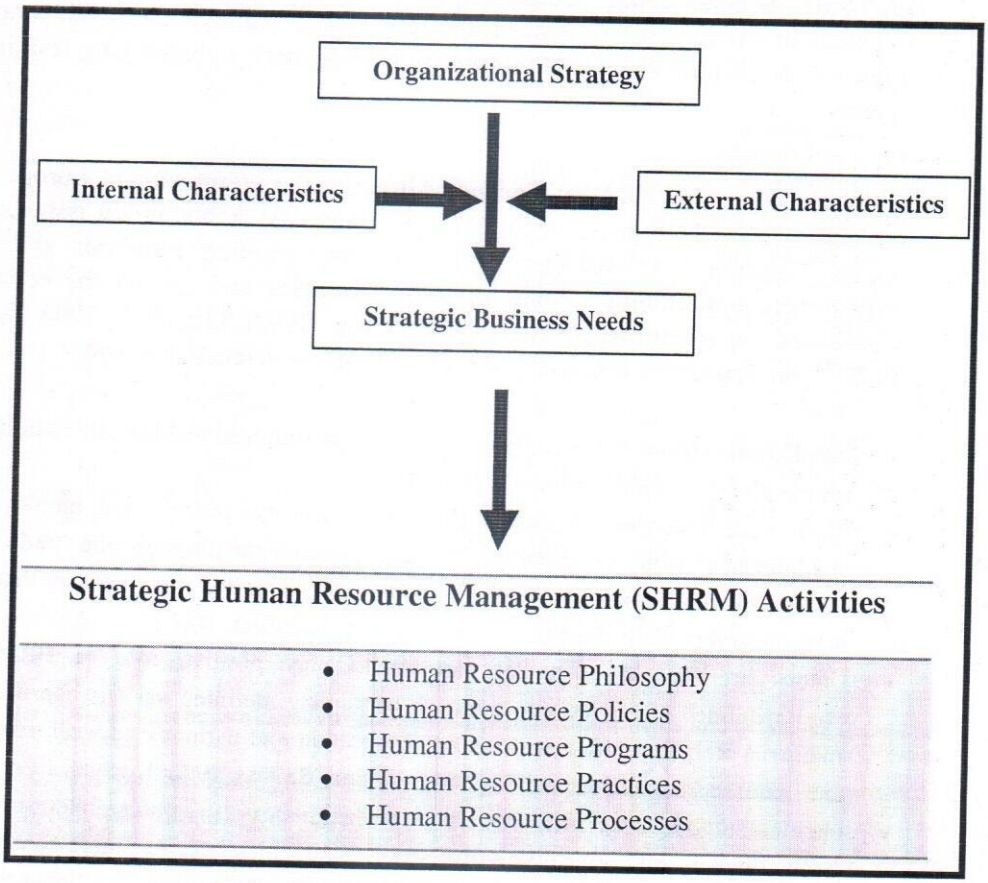


Figure 4: 5-P Model (Source: Mello, 2007)

It demonstrates the influence of both internal and external characteristics of the strategic business needs of an organization. It explains the importance of all five HRM activities in achieving the organization's strategic need, and shows the interrelationship of these activities in a solely developed structure of SHRM (Budhwar and Khatri, 2001). There are some drawbacks in the model, which lessens the applicability of this model. It has too many assumptions and is a bit difficult to point into practices.

3. Dominant Paradigm of HRM in Europe

Aging workforces, steep competition in the European Union (EU) region and global market, economic crisis, global war for talents, and mutual understanding between employers and employees are crucial HRM issues in Europe (Janssens *et al.*, 2003; Scholz, 2003; Aselstine and Alletson, 2006). The scope of HRM practices in EU is vast and is not restricted to the organizational level. Strategic approach of HRM policies and uniformity is absolutely a challenging task in EU agenda.

3.1 Core Aspects of HRM in Europe: All national governments in Europe have HRM policies, which cover unemployment, employee rights, union issues, labor policy, flexibility in working practices, raising training standards and local employment opportunities. Some of these strategies had invited the economic success of organizations (Porter, 1990; Sorge, 1991; Lundvall, 1992; Kogut, 1993). Core aspects of HRM practices in Europe are discussed below:

- People management in US is, however unitary. Institutional and legislative influences are more common phenomenon in Europe.
- Widespread presence of unions throughout Europe propels the employers to communicate with the management and government through the trade union influenced consultation structures. Employees play a pivotal role to ensure that HRM is an integral issue in strategic decision making (Brewster, 2007).
- Unions are viewed as social partners to play positive role in HRM. The responsibilities of unions are collective bargaining, defining various approaches of Industrial Relations (IR), establishing cooperation and harmony between employers and union representatives and dispute resolution (Strauss, 1992; Kochan, 1999).
- Institutional pressures including the state, regulatory structures, interest groups, public opinion and norms give a diverse snapshot which becomes more conspicuous, (Amable, 2003; Djelic and Quack., 2003; Guillén, 2001; Hall and Soskice, 2001; Whitley, 1999).That is what happing with people management practices in most European countries with akin territorial presence.
- Variety of national and regional cultures resembles substantial differences in norms and values of people living in Europe (Hofstede, 2001; House *et al.*, 2004). Managers in Europe operate within a national institutional context and a shared set of cultural assumptions and try to keep pace with others market players in home and abroad.

Table 5: The summary of factors influence HRM policies and practices in Europe

3.2 European Model (Brewster, 1995): European organizations operate within a restricted autonomy. According to Tayeb (2005) European model deals with all constraints and challenges set on international, national, organizational and HRM level. These constraints and challenges are also described as "outer" and "internal" catalysts. The European model shows an interaction between HR strategies, business strategy and HRM practices, and their interaction with an external environment constituting national culture, power system, legislation, education, and employee representation. These features suggest that HRM strategies are strongly related to the organizational strategy and external environment in European business environment (Budhwar and Khatri, 2001).

4. Dominant Paradigm of HRM in Japan

Until the 1980s, Japanese firms were mostly following their aboriginal style of people oriented HRM, which was then a favorite business environment. During the 1990s, due to increasing global competition, however, Japanese corporations are forced to modify their HRM systems to performance oriented system (Kishita, 2006). Three widely documented facets of Japanese HRM model are lifetime employment, seniority-based wage system and promotion, and enterprise labor unions (Sano, 1995).The core management style in post-war Japan can be defined as paternalist. Employees treated the company as a family with harmony, hierarchy, and group-orientation (Zhu and Warner, 2004).

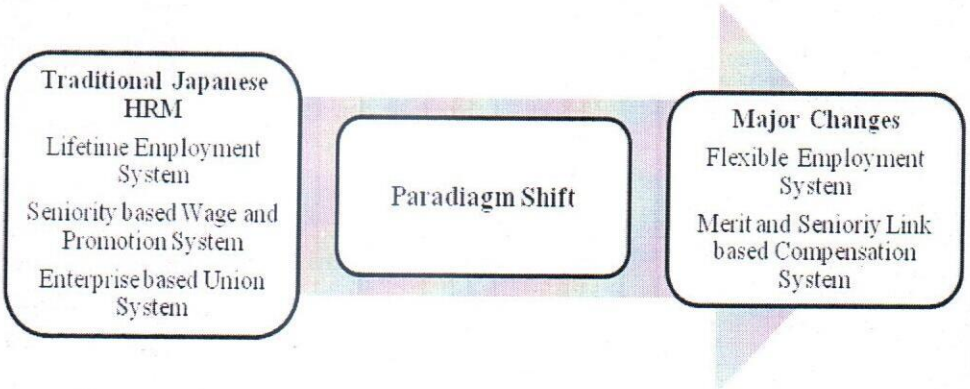


Figure 6: Paradigm shift of Japanese HRM model

In modern enterprise system, Confucianism and mutual obligation have become the deep rooted nature of these management characteristic (Koizumi, 1989). Management mostly takes into account the long-term economic and social welfare of the employees and their family members. In return, the employees are expected to devote their maximum effort to enrich the company they work for (Moore, 1987). However, fierce global competition, declining Japanese economic momentum, gradually aging workforce spurs radical changes in Japanese HRM practices (Benson and Debroux, 2004). The major paradigm shift of HRM in Japan (Zhu, 2004) is shown in figure 6.

4.1 Core Aspects of Traditional HRM in Japan: A trait of Japanese firms throughout the successful three decades (1960 to 1980) was the 'people oriented' HRM systems (Kishita, 2006). That time Japanese companies were quite successful in terms of accruing robust corporate revenue. During this period, the management style of the Japanese companies was highly appreciated and the overseas researchers and practitioners referred to it as 'The Japanese Management

Style'. Many practitioners pointed out that lifetime employment and seniority based wage system are the masterminds of high-quality performance of the Japanese companies during that era (Ouchi, 1981; Abegglen and Stak, 1985). Some of the core aspects of traditional HRM in Japan are mentioned below:

- The employers emphasized on employees' lifelong welfare and invested in education and training to enhance employees technical skill and productivity
- Employees are paid and promoted on a seniority basis. Seniors usually got the priority in every sphere of organizational affairs
- Most Japanese employers paid a basic wage based on the employees ability to perform in their jobs
- The incentive system of Japanese firms in the period of 1960 to 1980 had the appearance of an ability oriented system
- The lifetime employment system was another mechanism to get more employees committed to their work

4.2 HRM of Japanese Companies in the Global Competition: Recent economic crises and increasing competition have compelled Japanese companies to restructure their businesses and reengineer their management systems and practices. For this reason, they were bound to embrace more synchronized people management system. Major aspects of changing HRM in Japan are listed below:

- The slowdown of the economy has changed the concept of lifetime employment and tremendous pressure on labor market and changed incentive system.
- Survival is the major objective of many corporations and that crying need, forced Japanese companies to reduce employee welfare expenditure to be therein competitive in the global market
- Japanese legislation has also promoted the business to performance oriented HRM in order to compete in the global market and ensure sustainable existence.

5. Dominant Paradigm of HRM in China

Confucianism and Daoism philosophies are originated in China. These philosophies have long influence in some part of Asia (Zhu and Warner, 2004). The Liberation of China in 1949 imposed an ideology of Marxist-Leninism, which had continued until Mao Zedong died in 1976. This led to strict control of all processes of enterprise: structure of the enterprise, selection of products, definition of prices, selection of high-level personnel, etc. In 1978, Deng Xiao-

ping introduced an economic reform as the central task for the Party/State and people. People management system and employment relations were the integral part of the reform agenda since the early 1980s (Warner *et al.,* 2005). Some aspects of management practices that control Chinese economy are listed below:

- State was the ultimate decision maker on enterprise strategy or personnel strategy
- Enterprise leaders were selected by the institutions of government.
- Every employee received the *"Iron Rice Bowl"* (tie fan wan) meaning lifetime employment with full benefits.
- Payment used to be decided externally in an egalitarian way

5.1 Transition in the Chinese Economy (Nissen, 2004):

Central committee in December 1978 undertaken measures to restructuring the planned economy and created a socialist market economy. More emphasis was put on industry, agriculture, defense and science. Four special economic zones were established. Steady reduction of tariffs on trade. A new labor law was introduced in 1997.GDP growth continuing. Government established open door policy for foreign firms to enter into China and undertaking massive measure to improve infrastructure.

5.2 WTO Entry: China has formally signed a trade agreement with World Trade Organization (WTO) in December 2001. This agreement has affected the transitional state of Chinese economy badly. An unprecedented change occurred in quality of employees, work hours, and conditions, training methods, employee compensation. Foreign companies started to ensure their presence in huge Chinese market. Competition amongst the companies in Chinese market took a new leap and that led to a concentration on increasing productivity. Unemployment rate for low skilled workers increased and for high skilled workers faces (Xu and Zou, 2000). Importance of strategic human resource management became ubiquitous.

5.3. Labor Law and Minimum Wage: The new labor law, which was introducing in 1997, has brought a huge change in the Chinese labor market. Employees can be hired on a permanent or temporary basis. An employee can terminate employment with a 30 days written notice. Employer may terminate an employee with a 30 days written notice under certain conditions. Employers must maintain safety standards of the employees. The average working hour is limited to 40 hours a week. Overtime hours must be negotiated with the labor unions. Overtime pay is 150% of normal wages, on rest of the days 200% of normal wages, and 300% on holidays. Workers receive 10 paid holidays per year. Maternity leave is granted for 90 days only. Legally required benefits that employers have to pay are retirement pension, medical support, unemployment insurance, disability

insurance, and maternity fund. Local government agencies do specify the minimum wages which are paid monthly at the end of each calendar month. New regulations on minimum wages include rules for part-time workers. For example, the current minimum wage for full time workers in Beijing is RMB[1] 545 per month. However, foreign employers are expected to pay more than the minimum wages (Nissen, 2004).

5.4 HRM Practice in Transitional Chinese Economy: Lifetime employment, secured compensation, and long-tem employee welfare programs are prevalent today. In China the reform era took dynamic initiatives to face inefficiency, high expenditure and inadequate competition. Special Economic Zones (SEZ) were created to ensure tax reform for foreign investors and provide access to advanced technology. The results of the observations led to the creation of new laws. To cope with the critical situations, Chinese organizations started to pursue competitive and dynamic human resource management practices to ensure their long term sustainability. The important steps are:

Recruitment and Selection: Companies operating in China are looking for highly qualified people, dynamic enough to cope with fiercely competitive business environment.

Training and Development: Training and development has become so important in China. Chinese higher education system is still in a transitional phase, not fully ready to cope with the required training and demand, such as producing business graduates.

Compensation and Benefits: Commonly used compensation and benefit schemes in China are listed below:

Monetary Methods	Non-Monetary Methods
• **Bonus for number of years inside the company**	• Performance oriented promotion based on objective numbers
• **Real estate,** • **Property loans**	• Cross culturally balanced leadership style
• **Stock options,** • **Travel expenses**	• Good working conditions • Job Rotation
• **Face giving** • **status symbols**	• Training • Effective communication
• **Due payment for festival**	• Corporate Identity • Recurrent feedback interviews

[1] 545 RMB Yuan equals 86.67 $ at April 15th, 2012

- ***Performance Appraisal:*** After meth of trading with the WTO, performance measurements has become a widely used factor Chinese companies in order to survive in the increasingly competitive global market.

6. The Development and Transformation of HRM in South Asia

This portion of the report is primarily demonstrating the history, development, and transformation of HRM practices in South Asia. The SAARC region is divided into two common categories-India, Pakistan and Sri Lanka as *semi-industrialized economies* and Afghanistan, Bangladesh, Bhutan, Maldives and Nepal as *least developed economies.* Market size, labor force and gradual improvement in the economic indicators have made this region a competitive place for investment and business opportunities. Increasing presence of MNCs in South Asia has become a common phenomenon. As a result, different sort of HRM paradigms have been emerging in this region. Various well appreciated HRM practices from USA, Europe, China and Japan has been shifting its way into this region and the management practitioners embracing are those in order to get competitive edge in the market.

6.1 India: The Indus Valley civilization is the base of Indian subcontinent. It is considered as one of the world's ancient civilization. The infiltration of Aryan tribes and Dravidian inhabitants created a classical Indian culture here in the subcontinent. Emperor Ashoka's Maurya Empire and Emperor Babur's Mughal Dynasty ruled this multi-ethnic subcontinent at different times. European establishments put their footholds in India during the sixteenth century. Later on, British had gained the power here by the nineteenth century. Nonviolent resistance movement led by Mohandas to Gandhi brought much desired independence of this region in 1947. Subsequently, communal violence and continuous dispute resulted in the creation of two separate states- India and Pakistan. Despite many socio-economic problems, India has gradually been becoming an economic power house in this region (CIA Fact book, 2012/13).

6.1.1 Economic Prospect: India has been developing into an open-market economy since early 1990s. Economic liberalization, industrial deregulation, privatization of state-owned enterprises, and reduced controls on foreign trade and investment is resulting into a consistent real GDP growth (see the table below). The major sources of booming Indian economy are modern agriculture, handicrafts, RMG, broad range of new industries, and a multitude of services industries. Large educated English-speaking population of India gained

worldwide reputation as a major exporter of information technology services and software workers. India has been a one of the largest scientist producing country in the world, which has been driving the economic engine at a different pace. Due to rising middle class, MNCs are increasingly coming into India to capture the share of the regional market. Many Indian companies have already established themselves as major global business leaders. As one of the biggest economy in the world, Indian is also facing some long-term challenges like widespread poverty, inadequate physical and social infrastructure, limited non-agricultural employment opportunities, scarce access to quality basic and higher education, and accommodating rural-to-urban migration. However, a hope is there that India would be able to take care of many of those problems soon.

GDP-real growth rate	5 % (2013 est.)	4.7% (2013 est.)
Labor force	487.6 million (2011 est.)	487.3 million (2013 est.)
Unemployment rate	9.8% (2011 est.)	8.8% (2013 est.)
Inflation rate (consumer prices)	6.8% (2011 est.)	9.6% (2013 est.)

Source: CIA Factbook-2013 (India)

6.1.2 Management Practice and Core HR Issues: Indian business primarily differs from their western counterparts in corporate goals and strategies that reflect company's core values (Capelli *et al.*, 2010). Indian corporations are comparatively less concerned with shareholder interests than Western businesses. They prefer concentrating on the long term prosperity of the company, wellbeing of the employees and wellbeing development of the surrounding communities.

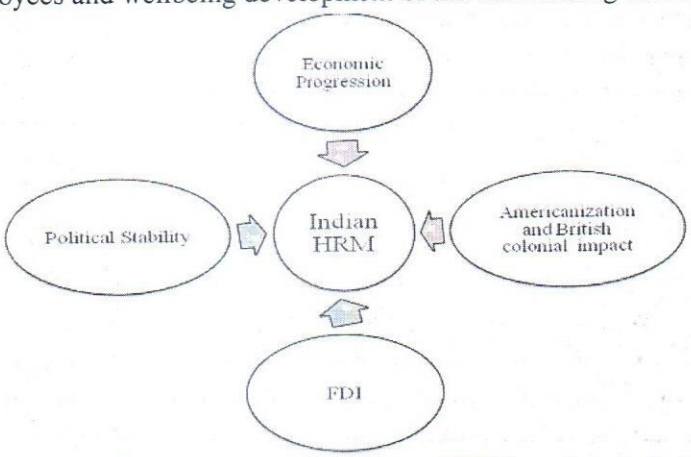


Figure 7: Major forces of transition of HRM practices in India

Indian management is used to motivate their employees with the performance of the larger company and social goals. They incur significantly higher level of trust and respect from their workforce and communities in comparison with their western counterparts. Things are, however changing rapidly due to the fact of globalization and the changes in the consumer behavior in India. India has experienced a significant increase in FDI inflows. This has contributed to a growing presence of foreign companies in India and created an urgent need for a better understanding of India's corporate culture and management practices. Form British Colonial impacts to Americanization of management practice and increasing presence of different Chinese and Japanese companies have played a tremendous role to alter HRM practices in India over time (see the figure above). Indians usually appreciate a paternalistic style of leadership. Top-down communication system is generally followed. In performance evaluation, Indians prefer qualitative indicators over quantitative indicators. Indian negotiation practices reflect their cultural mindset. A mapping of traditional Indian human resource management practices reveals more similarities with the Japanese. Today, Americanization of management style/studies slowly propels the trend towards unitary management approach. Therefore, Indian HRM system can be defined as a hybrid system. The major initiatives undertaken to develop new HRM system in India are listed below:

- Appropriate "Federal Employment Laws" to maintain sustainable development
- Increasing strengths of Indian HRM Associations
- Suitable Affirmative Action laws to remove the affect of cast system in HRM
- Dynamic staffing practices to acquire the best talent pools
- Increasing emphasize on training and development to nurture talent and skill
- Performance appraisal to motivate and retain employees

For the sake of miraculous economic momentum, Indian administration has taken appropriate initiatives whenever needed, update the new management system and formulate policy. It may be concluded that, with the entry of MNCs from various developed countries and the infusion of HRM practices from around the world, the HRM practices in India are likely to develop much faster in the coming years.

6.2 PAKISTAN:

6.2.1 Economic Prospect: Pakistan has been facing major challenges in managing the economy since 1970. The problems are internal political disputes, poor law and order situation, lower level of foreign investment, dependence on foreign donors, poor governance, energy security, and, poor land management system. Balance of payment crisis, gradual currency depreciation, and poor land

management system. All of these factors are leading to lower GDP growth in the country (see the table below). As a result social and political stability is remaining a distant hope for the country.

GDP-real growth rate	2.4% (2011 est.)	3.6% (2013 est.)
Labor force	58.41 million (2011 est.)	59.21 million (2013 est.)
Unemployment rate	5.6% (2011 est.)	6.6% (2013 est.)
Inflation rate (consumer prices)	13.7% (2011 est.)	7.7% (2013 est.)

Source: CIA Factbook-2013 (Pakistan)

Approximately 22.3 percent of the people live below the poverty line. Unemployment rate is 6.6% in Pakistan. Agriculture sector accounts for more than one-fifth of output and two-fifths of employment. Textiles are the biggest export sector of the country. Labor remittance from the Middle East is the major input for economic sustainability.

6.2.2 Management Practice and Core HR Issues: Pakistan inherited colonial legacies in its legal frameworks, civil administrations, and military structures. The impact of colonial legacy is mostly seen on national character and management practices in both government and private organizations (Alavi, 1972, 1990; Khilji, 2002). Following its independence 1947, the impact of civil-military elites became conspicuous in directorial management system especially in public sector enterprises and private organizations (Alavi, 1972; Islam, 2004; Khilji, 2003). Additionally the US support of military regimes in Pakistan has tremendous impact on HRM practices in both private and public institutions and enterprises. The factors that the bureaucratic HRM system of Pakistan are mainly: the origin of the nation, religious values, Muslim rules and regulations, British colonial legacy, American influence, national culture of Pakistan (Kazi, 2003; Khilji, 2003).

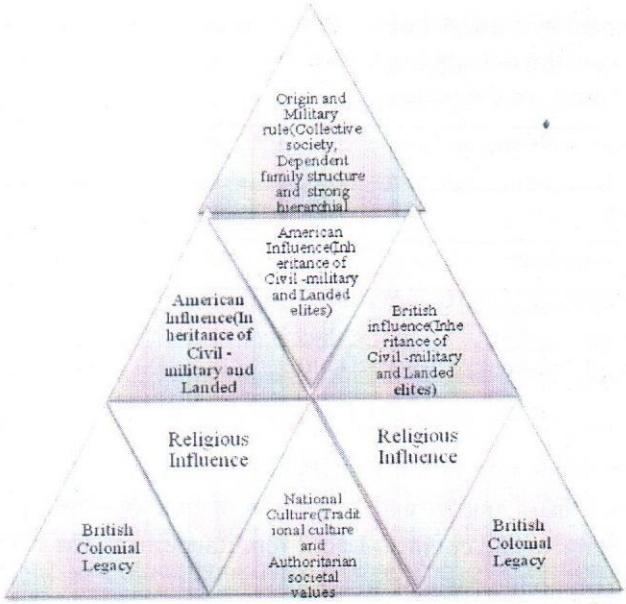


Figure 8: Conceptual framework of HRM development and transition in Pakistan

The above figure is to conceptualize the framework of HRM development and transition in Pakistan.

6.3 SRI LANKA:

6.3.1 Economic Prospect: Sri Lankan macro-economic factors are quite better in the region (see the table below). Sri Lanka continues to experience strong economic growth, driven by large-scale reconstruction and development initiatives. Government has undertaken a set of ambitious programs to improve the socio-economic prospect of the country. The major challenges of Sri Lankan economy are high debt interest payments, a bloated civil service, and historically high budget deficits. Now that civil war and political conflicts are in control, national economic outlook is looking promising.

GDP-real growth rate	8% (2011 est.)	6.3% (2013 est.)
Labor force	8.307 million (2011 est.)	8.528 million (2013 est.)
Unemployment rate	4.2% (2011 est.)	5.1% (2013 est.)
Population below poverty line	8.9% (2009 est.)	8.9% (2010 est.)
Inflation rate (consumer prices)	6.9% (2011 est.)	4.7% (2013 est.)

Source: CIA Factbook-2013 (Sri Lanka)

6.3.2 Management Practice and Core HR Issues: Sri Lanka has done a good job in managing robust macroeconomic indicators. To cope with domestic and overseas competition, Sri Lankan companies are gradually embracing dynamic management approaches. Companies are concerned with issues like customers, employees, efficiencies, effectiveness, operation research, strategic planning, research and development, and human resources (Nanayakkara, 1999). Some core features of Sri Lankan management style are listed below:

- Long term client relationships
- Equity and consideration in managing people
- A growing passion for quality
- Results-based controls
- Task before structure

The roles of HR professionals in corporations are gradually changing from operational to strategic, qualitative to quantitative, policing to partnering, short term to long term orientation, administrative to consultative, and functional to business oriented approach (Ulrich, 1997).

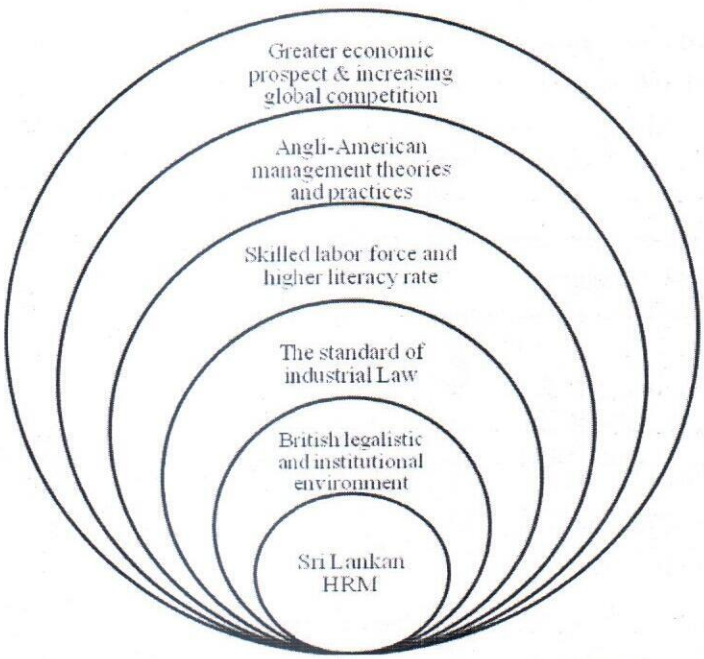


Figure 9: Forces that changes HRM over time in Sri Lanka

Greater economic prospect and gradually increasing global competition, presence of Western, Japanese and Chinese corporations, skilled labor force and higher literacy rate, British legalistic and institutional environment, the rise of Industrial

Law, Anglo-American management theories and practices are the major forces which are contributing to a radical change in Sri Lankan HRM practices (see the figure above). Sri Lankan corporations become more global oriented and competing globally, importantly they are realizing the need to embrace more strategically sound state standard management practices. Human resource management becomes one of the strategically crucial parts of the corporations to get competitive edge over other firms in regional and global market places. Sri Lankan firms are aware of it and taking timely measures.

Sri Lankan political condition is very much stable now and the corporations are undertaking systematic approach in a robust and sound HRM practices. HRM is increasingly viewed as a source of competitive advantage and an integral part of Business Management (Serasinghe and Opatha, 2007). Selecting and nurturing the best talent pools has become the ultimate goal. China, Japan and India are contributing in the gradual transition of sound HRM practices in Sri Lanka. Academic collaboration among institutions, political and bilateral relationship with the developed countries and their subsequent impact on Sri Lankan HRM practices is much visible.

6.4 BANGLADESH:

6.4.1 Economic Prospect and Manpower Issue: Given political chaos and instability, poor infrastructure, administrative corruption, energy crisis, and lethargic economic reforms, the economy of Bangladesh has grown 5.8% per year in last one and a half decade. Ironically, however, this country still remains a poor, overpopulated, and inefficiently governed nation in the world. Almost 31.5% of people live below the poverty line although government statistics indicate that unemployment rate is only 5%.

GDP-real growth rate	6.3% (2011 est.)	5.8% (2013 est.)
Labor force	75.42 million (2011 est.)	78.62 million (2013 est.)
Unemployment rate	5% (2011 est.)	5% (2013 est.)
Population below poverty line	31.5% (2010 est.)	31.5% (2010 est.)
Inflation rate (consumer prices)	10.7% (2011 est.)	7.6% (2013 est.)

Source: CIA Factbook-2012/13 (Bangladesh)

Readymade garment is the largest export sector of the country, which contributes 25% of total GDP. Regulatory control and constraints have been reduced marginally. Now, Bangladesh is pursuing a liberal market economy. The liberalization has encouraged increased participation of private sector (Ernest &Young and MCCI, 2006/1013).

6.4.2 Management Practice and Core HR Issues: With the economy of Bangladesh at the threshold of quantum growth, it would be critical to understand and appreciate the importance of investing in people management practices (Ernest &Young and MCCI, 2006). Factors, for what HRM take versatile leap in Bangladesh over the years, are drawn below:

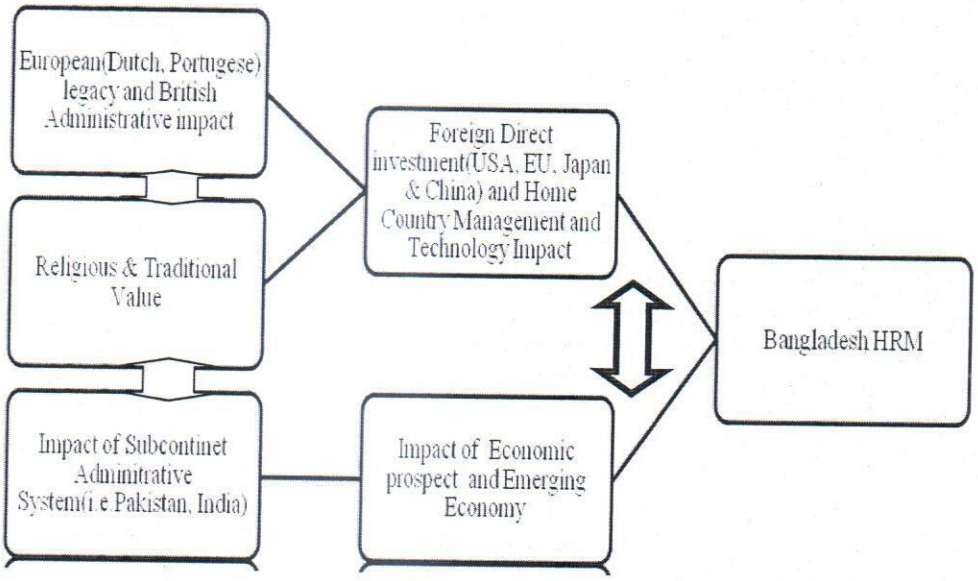


Figure 10: Forces that changes HRM over time in Bangladesh

European (Dutch, Portuguese) legacies, British institutional impact, Impact of neighboring countries (i.e. Pakistan, India), gradual economic growth and prospect; foreign direct investment (USA, Japan & China) or foreign companies' influence have periodic impact on sub- standard management practice in Bangladesh.HR Practices Survey, Bangladesh, 2006 and Miah and Bird 2007; Miah and Siddique 2014" conducted by Earnest & Young-Human capital and MCC&I bring forth the following observations on traditional and concurrent HR practices in Bangladesh:

a) ***Talent Acquisition:***

- "Extended family" culture in Bangladesh influences recruitment
- Newspapers is commonly used source of recruitment
- The process of succession planning is still in dismal state
- Employer branding is used at some extent.

b) ***Performance Management:***

- Competency based assessment is a recent practice
- Transparency in performance management is not common
- Performance rating is used for increment and promotion
- Performance appraisals are not linked to other key elements of the HR value chain

c) ***People Development:***

- Organizations have a formal system of training needs identifications
- Organizations recognize the critical importance of calculating ROI on training

d) ***Compensation & Benefits:***

- Most organizations have in house payroll processing
- Inflation, cost of living and individual performance are the salary determinants
- Sales incentive and variable pay based on individual performance
- Growing recognition of the criticality of regular compensation benchmarking

e) ***HR Strategy and Processes:***

- HR is slowly evolving into the role of a business partner
- HR head is now a part of the business planning process
- Critical linking of standardize HR polices to business unit is increasing
- The need to incorporate best industry practices in HR is an emerging trend

f) ***Organization Culture:***

- Leadership is a top down approach
- High respect for the senior
- Power distance between boss and subordinates
- Top brass has a low confidence in the decision making abilities of the middle layers
- Most companies have established communication systems
- Most of the employees feel uncomfortable in sharing their problems with their superiors
- Majority of the organizations less trust the accuracy of upward communication
- Win loss mentality in negotiation table

6.5 NEPAL: In 1951, the Nepali monarch terminated hereditary premiers and instituted a cabinet system of government. Multiparty democracy within the agenda of a constitutional monarchy was launched in 1990s. A decade long civil war between Maoists and government forces severely threatened the entire state mechanism. Now Maoist is governing the country.

6.5.1 Economic Prospect: Nepal is a landlocked nation. 25.2% of the Nepalese live below the poverty line. Living standard did not improve much, 25.2%. It is one of the poorest country in the world with an average annual per capita income of only $1300 (2011 estimate, CIA, 2012/13). Agriculture contributes to one-third of the national GDP. Approximately three-fourths of the population depends on agriculture for their livelihood. However, Nepal is famous for utilizing efficiently its potential hydropower. The lack of political development is the major constraint in the country for economy to grow.

GDP-real growth rate	3.5% (2011 est.)	3.6% (2013 est.)
Labor force	18 million (2011 est.)	16 million (2013 est.)
Unemployment rate	46% (2008 est.)	46% (2008 est.)
Population below poverty line	30.9% (2011)	25.2% (2011 est.)
Inflation rate (consumer prices)	7.8% (2011 est.)	9.6% (2013 est.)

Source: CIA Factbook-2013 (Nepal)

6.5.2 Management Practice and Core HR Issues: Nepal has been pursuing a market economy since 1990. One of the major reforms undertaken by Nepali authorities is new industrial policy of 1992. It has played a pivotal role to promote manufacturing industries. This initiative has played a subsequent role to emphasize deregulation, competition and market for FDI (IIDS, 1996).

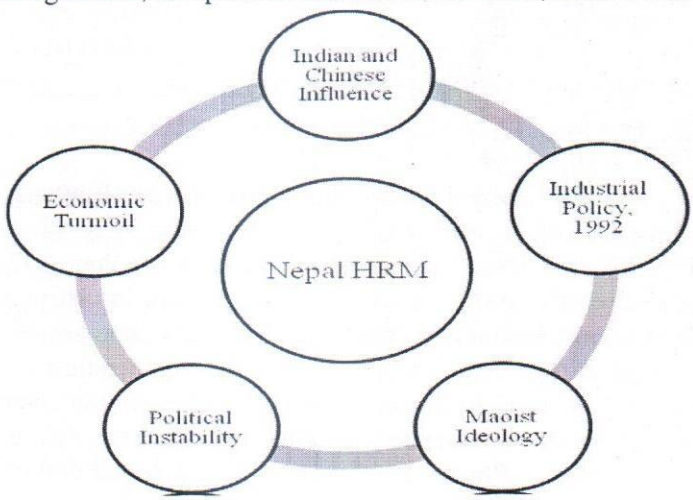


Figure 11: Paradigm shift of HRM in Nepal over time

To enrich a skilled human capital, management education got utmost importance (Adhikari, 2004). Nepal is historically hierarchical (Savada, 1991) and bureaucratic (Pant et al., 1996), as a result, responsibility of line managers is likely to be limited both by the customary power structures and the inadequate skills (Adhikari and Mueler, 2001).The overall shape of historical, cultural and industrial development indicate that strategic amalgamation of HRM is very essential in Nepal. Implementation of it remains very much problematic (CRANET, 2006). Importance of HRM to the top management is still in dismal state. Absence of human resource managers in the board of directors or its equivalent positions, indifference toward separate HRM department, inadequate personnel strategy, infrequent involvement of HRM in business strategy, joint responsibility of HR activities among other departments represent the factual scenario of HRM in Nepal.(CRANET 2006, p13; Adhikari and Gautam, 2006).

6.6 BHUTAN: Bhutan is a constitutional monarchy. It is located in Southern Asia, between China and India. It is a landlocked country. In 1865, Britain and Bhutan signed the Treaty of Sinchulu. Under the provision of the treaty, Bhutan had received an annual subsidy in exchange for ceding some border land to British India. In 1907, a monarchy was set up to rule the country. In the concurrent period, a treaty was signed with Britain to set free Bhutan from any sort of foreign influence. However, after the termination of British regime, Indian influence in Bhutan becomes an apparent issue (CIA Fact book, 2012/13).

GDP-real growth rate	8.1% (2011 est.)	5.8% (2013 est.)
Labor force	299,900 (2008)	336,400(2013 est.)
Unemployment rate	4% (2009)	2.1% (2013)
Population below poverty line	23.2% (2008)	12% (2012)
Inflation rate (consumer prices)	6.8% (2011 est.)	11% (2013 est.)

Source: CIA Factbook-2012/13 (Bhutan)

6.6.1 Economic Prospect and Management Trend: Bhutanese economy is one of the smallest and least developed. It is based on agriculture and forestry. These two sectors contribute to the livelihood of more than 60% of its people. The economy is closely aligned with India in terms of infrastructure development and trade relations. Model education, social, and environment programs are underway with support from multilateral development organizations. Complicated controls and uncertain policies hamper foreign investment in the country. Due to a narrow economic prospect, concrete traditional management style and HRM prospect is still not visible in Bhutan. Long term British colonial dominance has influencing institutional legacy in the management practices. Management education model is growing in the country. Indian influenced in national and international affairs and

policy formulation is prone to derive western type "so-called" best management practices in the coming years.

6.7 MALDIVES: The Republic of Maldives is also referred as the Maldive Islands, an island nation in the Indian Ocean. Maldives is the smallest Asian country in terms of population and land area. It's located just 1.5 meters (4 ft 11 in) above the sea level. It is the lowest country on the planet. It is also the country with the lowest natural highest point in the world, at 2.4 meters' (7 ft 10 in). The Maldives' forecast inundation is a great concern for the Maldivian people (Wikipedia, 2012/13).

GDP-real growth rate	6.5% (2011 est.)	3.5% (2013 est.)
Labor force	110,000 (2010)	159,700 (2012)
Unemployment rate	14.5% (2010 est.)	28% (2012 est.)
Population below poverty line	16% (2008)	16% (2008)
Inflation rate (consumer prices)	6% (2010 est.)	5.1% (2012 est.)

Source: CIA Factbook-2012/13 (Maldives)

6.7.1 Economic Prospect: Tourism sector is the largest contributor in Maldives' economy. National economy is based on tourism as over 90% of government tax revenue comes from this sector. It accounts for 28% of the GDP. More than 60% of foreign currency comes from this sector. Fishing is the second leading sector of the country. Agriculture and manufacturing have minimal contribution because of limited cultivable land and shortage of domestic labor. Privatization has become a new forward looking initiative undertaken by government. Unemployment rate is a little bit high (the table above). Climate change, poverty, reforming public finance and increasing employment opportunities are major economic challenges of government.

Human Capital and Management Trend: In January 2011, a new Goods and Services Tax on Tourism (GST) was introduced to stimulate tourism sector. A new Business Profit Tax is likely to be introduced recently. These taxes are expected to increase government revenue by about 25%.Country's current labor force is almost 110,000. Significant portion of this human capital is employed in service sector. That's why service based HRM practice is very much common in Maldives. Factors that influence economy and management in Maldives are shown below:

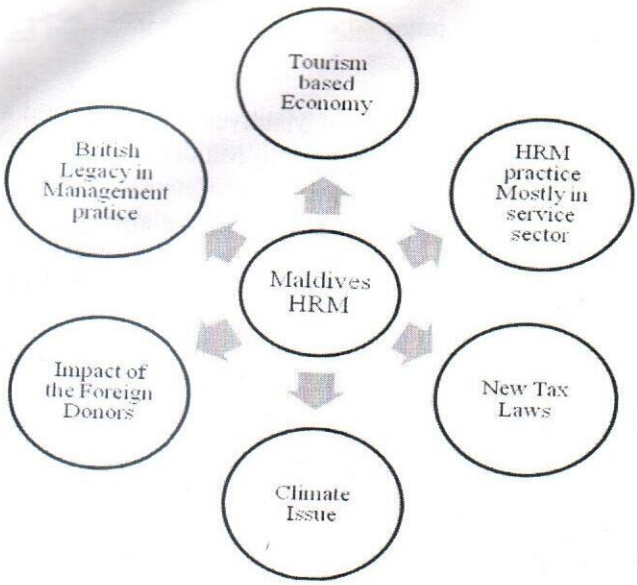


Figure 12: Economy & Management Issues in Maldives

Historical British Legacy in management practice from the colonial period is the most notable issue. As mentioned earlier, tourism sector of the country mainly nurtures HRM practice in Maldives. New tax law, global climate issue and policy manipulation of overseas donors have affecting the transition and development of new pattern HRM practice in Maldives over time.

6.8 AFGHANISTAN: Ahmad Shah Durrani fused the Pashtun tribes and founded Afghanistan in 1747. The country was a buffer state between the British and Russia. It won independence from British control in 1919. Political instability is a very common phenomenon in Afghanistan. Short-term democracy, coup, and counter-coup are core nature of the ruling regime. Soviet Union invasion in 1979, US invasion in 2001, hard-line Pakistani-sponsored movement, civil war, and anarchy make this country a war-torn nation. The economy is likely to come on its shape soon as people are resilient and hard working.

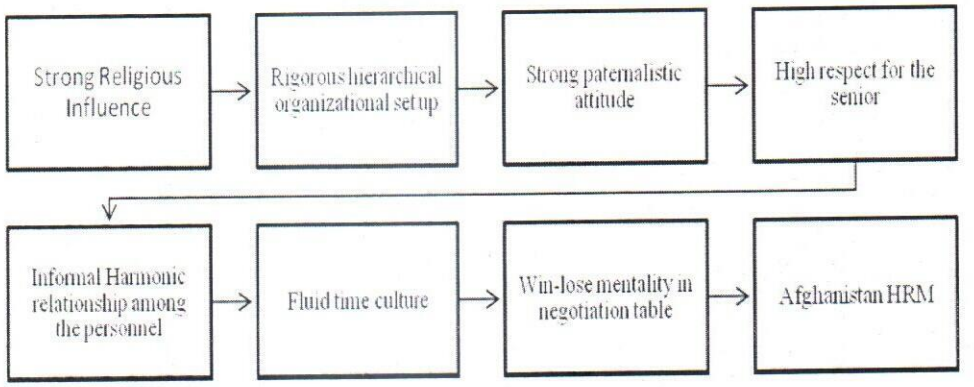
6.8.1 Economic Prospect: Afghanistan economy is recovering slowly from decades of conflict. Agriculture and service sector are experiencing a tremendous growth. Despite this progress Afghanistan is still an extremely poor nation. Approximately 36% people live below the poverty line. It is a landlocked country and uses port facilities of Pakistan some times. Unemployment rate is almost 35%. Afghanistan's living standard is among the lowest in the world. Political instability is the major restraint to establish good governance and rule of law in the country.

GDP-real growth rate	7.1% (2011 est.)	3.1% (2013 est.)
Labor force	15 million (2004 est.)	7.512 million (2012 est.)
Unemployment rate	35% (2008 est.)	35% (2008 est.)
Population below poverty line	36% (FY08/09)	36% (FY08/09)
Inflation rate (consumer prices)	7.7% (2011 est.)	6.8% (2012 est.)

Source: CIA Factbook-2012/13 (Afghanistan)

6.8.2 Management Practice and Core HR Issues: The business set up in Afghanistan is extremely hierarchical. Managers are often very paternalistic. Personal relationship is often got the importance above other things. Managers always assist the employees even in family problems – loaning out money, for example, where it is considered necessary. Mutual respect is extremely important and managers are very cautious to protect the honor of their employees. As managers in Afghanistan are often fairly paternalistic, their attachment with employees may extend outside of the workplace into the personal lives. The concept of personal strength is imperative to managers. It is the key that anybody does not express any weaknesses in any situation. Some core features of Afghan management style (Kwintessential, 2012) are described below:

a) *Approach to Change:* Managers in Afghanistan are averse to change. They like to maintain status quo as prioritize group harmony.
b) *Decision Making:* Managers in Afghanistan are selected on the basis of the technical and broader business knowledge. That is why discussing with subordinates is considered as an inappropriate behavior.



c) *Approach to Time and Priorities:* Afghanistan is a fluid time culture. As with many fluid time cultures, personnel in Afghanistan are very relationship-oriented.
d) *Boss or Team Player:* In Afghanistan organizational set up is very much hierarchical. Mangers usually do not take any approach that may endanger their respect to the employees.

e) *Communication and Negotiation Styles:* The concept of strength is very important in Afghanistan. The win-lose mentality is prevalent in the negotiation table. Many managers consider compromise as a weakness.

7. Discussion

One of the central themes of this article is to illustrate the similarity and difference of HRM systems amongst the major players in South Asian countries. Table 1 identifies the key cultural characteristics of people in South Asian economies and four influential global economies, US, EU, China and Japan, from HRM perspective. Subsequently, Table 2-6 identifies the key characteristics of HRM in South Asia reviewed in the previous sections. Table 2 presents these cases by dividing the issues into five sub-categories, namely existing dimensions, the U.S. influence, the European influence, the Chinese influence and the Japanese influence.

Table 1: Index Scores of Countries (Source: Greet Hofstede, Culture's Consequences, 2nd edition. Thousand Oaks, CA: Sage, 2001)

Country	Power Distance	Uncertainty Avoidance	Individualism / Collectivism	Masculinity/ Femininity	Long-Short Term Orientation
Afghanistan	N/A	N/A	N/A	N/A	N/A
Bangladesh	80	60	20	55	40
Bhutan	N/A	N/A	N/A	N/A	N/A
China	80	30	20	66	118
France	68	86	71	43	39
Sri Lanka	N/A	N/A	N/A	N/A	N/A
Germany	35	65	67	66	31
UK	35	35	89	66	25
India	77	40	48	56	61
Maldives	N/A	N/A	N/A	N/A	N/A
Japan	54	92	46	95	80
Nepal	N/A	N/A	N/A	N/A	N/A
Pakistan	55	70	14	50	0
USA	40	46	91	62	29

These indexes are critically important to illustrate transition and development of HRM in South Asia. The core dimensions of culture have tremendous impact on policy frame of HR and the gradual shift of HRM paradigms. In terms of power distance, Bangladesh scored the top place in the region. Other neighboring countries of Bangladesh are on the same plane of higher score in power distance which has apparent influence in HRM related issues in this region. Even though, Western countries scored comparatively low Index number, their impact in this region did not change the scenario markedly. In terms of the uncertainty

avoidance, Japanese are risk averse. Japanese management styles are apparently prevalent in Bangladesh, Pakistan, and India because of its economic presence in the region. Regarding collectivism, South Asians are very much open and collective efforts are seen amongst them. Women empowerments in HRM hierarchy, Westerns are different compared to South Asian countries. Scenario is gradually changing because of the pressure from the investors and donors as women are promoted to HRM hierarchy.

Table 2: The Characteristics of South Asian HRM Practices

Items	Ind	Pak	Sri	Ban	Nep	Bhu	Afg	Mal	Total
EXISTING FEATURES									
Group orientation									
Common goal & value	4	3	4	4	3	2	4	3	27
Group-based performance evaluation	5	5	5	4	4	3	3	4	33
Group-based incentive	5	5	5	4	4	3	3	4	33
Teamwork	5	4	5	5	4	3	5	3	35
Others									
Harmony	4	3	4	4	4	4	4	4	31
Hierarchy	5	5	5	5	4	4	5	4	37
Information sharing	4	3	4	4	4	3	3	3	28
Multi-skilling	4	3	5	3	3	2	3	2	25
Paternalism	4	4	4	4	3	3	5	4	31
The Strong role of state	5	3	5	4	3	5	3	4	32
Training & Development	5	3	4	3	3	1	2	4	25
Unions' Influence	5	4	4	4	3	2	1	1	24
Sub Total	55	45	54	48	42	35	41	40	

Organizations have different approaches to manage their human capital. There are some uniform features, however, that all organizations follow. First, commonly followed HRM dimensions in South Asian corporations are organizational hierarchy, group-based performance evaluation, group-based incentive and paternalism. Secondly, South Asian companies generally having common goals and values, training and development, information sharing procedures. Lastly, the least commonly practiced dimensions of HRM in south Asia are multi-tasking to enhance efficiency and effectiveness, individual contract, and individual performance.

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Teamwork	5	4	5	5	4	3	5	3	35
Others									
Harmony	4	3	4	4	4	4	4	4	31
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Information sharing	4	3	4	4	4	3	3	3	28
Multi-skilling	4	3	5	3	3	2	3	2	25
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The Strong role of state	5	3	5	4	3	5	3	4	32
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Table 3: The degree of Importance Characteristics of South Asian HRM Practices based on USA influence

Items	Ind	Pak	Sri	Ban	Nep	Bhu	Afg	Mal	Total
THE US INFLUENCE									
Individual orientation									
Individual contract	4	3	3	3	2	1	2	1	19
Individual goal & value	3	2	2	2	1	1	1	2	14
Individual performance evaluation	5	3	4	3	2	2	3	2	24
Individual pay & incentives	5	3	4	3	3	2	2	2	24
Individual career development	4	3	3	3	2	2	2	2	21
Others									
Downsizing and retrenchment	4	3	4	3	3	3	3	2	25
Fixed-term contract	5	5	5	5	3	3	3	3	32
Freedom to hire & fire	5	4	4	4	3	2	4	2	28
Strategic role of HRM	5	4	4	4	3	2	3	2	27
Unitary labor management approach	4	4	3	3	3	2	2	3	24
Sub Total	44	34	37	33	25	20	25	21	

The important HR practices in US are fixed term contract and freedom to recruit and terminate. It is embraced by the South Asian HR professionals' recent up gradation of management practices and huge flux of tourists propels a hybrid people management system in this region. The other influential dimensions are individual performance evaluation, individual pay and incentives, downsizing and retrenchment, unitary labor management approach etc. The least influential dimensions are individual goal and value, individual career development and individual labor contract.

The South Asian countries that significantly adopted American Style of HRM practices are India, Sri Lanka, Pakistan and Bangladesh. In other South Asian countries American style HRM did not flourish significantly. American management studies create a tremendous influence in this region. Academic collaboration with the US management schools is growing. Indigenous people are also receiving training in the orientation of American management style.

American political impact, bilateral and trade relationship have also influenced the HRM practices in South Asia over time.

One of the major reasons of European influence in South Asia is colonization effect. European system of HRM emerged into this region gradually. British influence in management practice is more common than any other country because of the tenure they have had here. The most common practices of British management style that have infringed in South Asia are legalistic environment, collective negotiation and agreement and institution building. Different dimensions of European influence in South Asian people management system are listed below:

Table 4: The degree of Importance Characteristics of South Asian HRM Practices based on European influence

THE EUROPEAN INFLUENCE									
Co-determination/partnership									
Collective negotiation & agreement	5	4	4	4	3	2	3	3	28
Workers' participation	4	4	4	3	3	2	3	2	25
Work council/congress at firm level	4	4	4	3	2	1	2	2	22
Others									
Institutional building	4	4	4	4	3	3	3	2	27
Legalistic environment	5	5	4	5	3	4	3	3	32
Regional/international labor standardization	4	3	4	4	2	2	2	1	22
Sub Total	26	24	24	23	16	14	16	13	

Table 5: The degree of Importance Characteristics of South Asian HRM Practices based on Chinese influence

THE CHINESE INFLUENCE	Ind	Pak	Sri	Ban	Nep	Bhu	Afg	Mal	Total
Features of HRM over time									
Individual labor contract	3	3	3	3	2	2	3	2	21

with fixed terms									
Collective bargaining (western style)	5	5	5	5	5	3	3	2	33
Trade unions (for signing collective contract)	4	4	4	3	3	3	3	2	26
Inward looking management	4	3	4	3	2	2	5	2	25
Adopting western management style(i.e. USA, EU, Japan)	5	4	4	5	4	3	4	3	32
Sub Total	27	25	27	24	21	17	23	14	

With the transition of political standpoint and global economic changes, the people management systems in China experienced a dramatic change in the last couple of decades. Chinese organizations started to clinch dynamic human capital management practices, which are mainly originated from the Western World. Chinese HRM practices can be described as the combination of western and native practices. The HRM practices in South Asia, which are derived from Europe, are also observed in China. As a result, Individual labor contract, collective bargaining, and trade unions have become a common practice in China now. Table (5) illustrates Chinese influence in South Asian HRM practices:
Lifetime employment, seniority based waged system and promotion, treating company as a family with harmony and hierarchy, mutual obligation of both employees and employers and group orientation are the core characteristics of HRM in Japan. These unique management practices propel Japan to attain a biggest boom in the global economy. Many countries all over the world are inspired to follow this type of people management practices to achieve economic success.

To keep themselves competitive and meet the long term goal and sustainability, Japanese companies are compelled to practice some western pattern of management style as

Table 6: The degree of importance Characteristics of South Asian HRM Practices based on Japanese influence

Items	Ind	Pak	Sri	Ban	Nep	Bhu	Afg	Mal	Total
THE JAPANESE INFLUENCE									
Features of HRM over time									
Lifetime employment	3	3	3	3	2	2	3	2	21
Seniority based waged system and promotion	5	5	5	5	5	3	3	2	33
Enterprise labor union	4	4	4	3	3	3	3	2	26
Paternalist	4	3	4	3	2	2	5	2	25
Group orientation	5	4	4	5	4	3	4	3	32
Mutual obligation of both employees and employers	3	3	3	3	3	2	3	2	22
Treating company as a family with harmony and hierarchy	3	3	4	2	2	2	2	1	19
Sub Total	27	25	27	24	21	17	23	14	

well, such as flexible employment system, merit-based appraisal system etc. But, the earlier indigenous deep-rooted Japanese management features like paternalistic attitude, taking care of employees security and long term welfare by the employers and in return employees firm commitment towards the organizations and the employers etc did not change that much. Table 6 shows the people management practices of Japan, embraced by South Asian countries. These are seniority based waged system and promotion, group orientation and enterprise labor union. The least commonly adopted practices are lifetime employment and mutual obligation of both employees and employers.

The new HRM system in South Asia has some distinctive and unique characteristics. First, the process of the formation and transformation has been marked by some self-determined factors related to the traditional cultural/value systems, historical evolution, macroeconomic factors, colonization, political aspects, bilateral relationship etc. Represented with group-orientation, key people management dimensions such as common goal and value, teamwork, harmony, information sharing, training and development, and so on are part of the so-called new HRM paradigm. However, with increasing global competition and influence of MNC management practices, the US oriented individualistic HRM dimensions

have also been gradually adopted by the majority of South Asian countries. Key aspects such as individual fixed-term contracts, individual performance evaluation, individual career development, downsizing and retrenchment, freedom in recruitment, strategic role of HRM and soon have become increasingly important in South Asian traditional administrative HRM system. The European influences of social partnership, institutional building and legalistic environment has been playing a positive role in the society's transformation towards the 'rule of law' and institutionalization. Individual labor contract with fixed terms, collective bargaining (Western style), trade unions (for signing collective contract), inward looking management, adopting Western HRM style and transitional Chinese practices are also having impact on people management system in South Asia.

Table 7: Summary of South Asian HRM Practices: Changes and Factors

Cases	Changes	Factors
India	Increasing use of SHRM Flexible HRM system Merit based approach High emphasize on training and development Federal Employment Laws	Economic progression Political stability Boom in FDI British colonial impact Americanization of management study Chinese and Japanese companies
Pakistan	Flexible HRM system Mixed people management practices Emphasize on competency	British colonial legacy, American influences, Religion, Origin, National culture
Sri Lanka	Long term client relationships Equity and consideration in managing people Results-based controls A growing passion for quality	Skilled labor forces Economic prospects Industrial law British legalistic environment Anglo-American management
Bangladesh	Trying to recruit the best talent Competency based assessment Formal system of training Compensation benchmarking	British institutional impact Emerging economy FDI (USA, China, Japan) European (Dutch, Portuguese) legacy Impact of neighboring countries
Nepal	Embracing sound HRM policy Emphasize on core management studies and competent manpower	Indian and Chinese influence Industrial policy,1992 Maoist ideology Political instability Economic turmoil

Bhutan	Presence of newly established business houses Yet to flourish core HRM	Current economic standpoint Lack of socio-economic progression over time
Maldives	More emphasize is on service based HRM Practice New Tax Laws Emerging labor force	Tourism based economy British legacy in management practice Climate Issue Impact of the foreign donors
Afghanistan	Paternalistic attitude Hierarchical organizational set up Harmonic relationship High respect for the seniors	Rigorous religious orientation Distinct indigenous value system Exotic influence Innate fraternity among the people Historical evolution

The next challenge for South Asian economies is not only embracing the trend of practicing sound HRM system, but also building strong social and institutional framework that enables them to achieve sustainable development. Respective country's effort could be weak and a regional-based approach towards 'labor market regulation' and 'labor-right standardization', the approaches are undertaken by the South Asian Association of Regional Cooperation (SAARC), may be the eventual outcome for the entire regional development.

5=Very high; 4=High; 3=Medium; 2=Low; 1=Very Low
Ind=India; Pak=Pakistan; Sri=Sri Lanka; Ban=Bangladesh; Nep=Nepal; Bhu=Bhutan; Afg=Afghanistan; Mal=Maldives.
Table Sources: Baniya, 2004; Benson and Debroux, 2004; Ding *et al*, 2002; Ernest &Young and MCCI, 2006; Miah, 2006; Quresh *et al*, 2010; Safa, 2006; Serasinghe and Opatha, 2007; Singh, 2010; Zafarullah and Khan, 2006; Zhu *et al*, 2007.
N.B. Some of the dimensions and degrees that are put on the above tables assumed on the basis of different empirical study which are referred throughout the report.

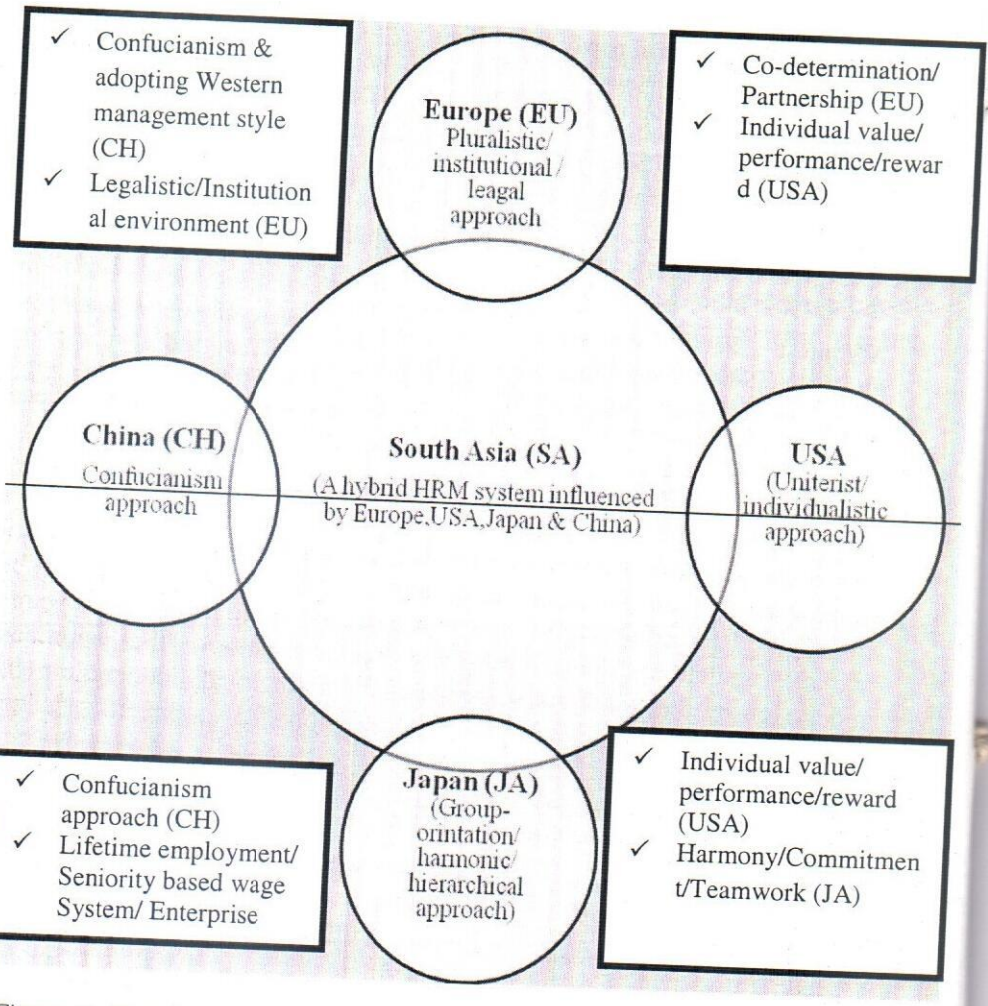

Figure 13: Circular influence of Europe, USA, Japan & China on the South Asian HRM Practices

Figure 13 demonstrates the current circular-influence of people-management system amongst South Asia, US, Europe, China and Japan. The Europe and US are the dominant powers both in 'hard' as well as 'soft' approaches towards traditional management system. FDI activities and the developing of business education in South Asia, Europe and US are playing the so-called leadership role on influencing and forming South Asian Subcontinent HRM philosophies, policies, programs, practices and processes (5-P). China and Japan are also asserting similar influences in HRM practices in South Asia.

8.0 Conclusion: South Asian countries have some influence on one another as well as on the US, Europe, China and Japan with their respective unique characteristics. For example, the South Asian HRM practices emphasize

collective approach, informal and lenient organizational top bottom hierarchy structure and relationship-based business operation (i.e. informal social network approach). The factors shaping the development of a new paradigm of HRM system in South Asia can be summarized in the following points. First, there is a strong foreign influence. The depending on foreign capital and MNCs operating activities (*i.e.* Pakistan, India, Sri Lanka, and Bangladesh, Nepal, Bhutan, Maldives and Afghanistan) are going to pursue to adopt to a traditional hybrid HRM practices. Second, there is a strong state-influence. All the cases in this study show that the influence from the state is strong. The sub-continental HRM system is also strongly linked with the state policy and industrial relations and labor market regulations. Third, the over-all social and economic development stage influences the traditional business system related to informal functional, social and institutional framework in South Asia. The evidence shows that more developed economies have more advanced social and institutional framework and better-established legalistic environment. Fourth, the history is an important factor determining both individual and organizational behavior. Adopting and implementing certain HRM policies and practices are related to a 'fit' with the historical path and norm in a particular organization. Throughout the study the given theoretical evidence show a widespread overview of the development and transition of a new paradigm of HRM system in South Asia. It would be premature to define it as a solid South Asian HRM model. But its implication may have far reaching outcome. More extensive and much broader country specific study can assist to draw superior conclusion. And to make that possible in the near future, this study might play a pivotal guiding role in shaping the advanced subcontinent-based HRM practices in the emerging economy in South Asian business environment.

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