Surrounding the Consequences of Watershed Disasters in the Periphery of the Indian Triangle[1]

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Abstract: The watershed of the 'Indian Triangle' is formed by the flow of two mighty rivers which emanate from the Himalaya. The Ganges and Brahmaputra embrace the lands and the peoples of Nepal*, India* and Bangladesh* before emptying into the Bay of Bengal. A recent monsoon submerged two thirds of the low-lying Bangladesh rendering 25 million people homeless. Can the future of these people be secured by lowering the water levels downstream? Are there alternative structural propositions and are they economically and politically feasible ? What effect will the excessive removal of natural barriers to rain in the upper catchments have on policy?

A major issue addressed in this paper is the sustainable development and ecological stability in these watershed regions. A majority of the environmental problems in the region's watersheds in the past have occurred mainly due to undesirable human interference in regional environmental flows and vegetation resources. Plausible solutions to on-going and future environmental crisis will largely depend on how broad the regional consensus is surrounding the conflicting water resource issues. Depending on how the dominant rural social base adjust to important dynamics of the problem, the paper concludes that sustainability will be an issue vulnerable to political interpretation.

Like most watershed regions in the world, the watershed region of the 'Indian triangle' is on its history's rapid growth track. A sudden progress of events on several interrelated fronts-the economic, the ecological and the political has combined to spur significant changes both in the relationships between peoples, policy-makers and governments and in the way these forces interact in the management-use and conservation-of the water and vegetation resources as a whole.

THE PEOPLE

The significance (percent) of rural population to the relevant South Asian nations is shown from the United Nations Population Studies (1989).

	Year			
Nation	1955	1965	1975	1985
India	82.4	81.2	78.5	74.5
B'desh	95.3	93.8	90.9	88.1
Nepal	97.3	96.5	95.2	92.3

The composition of the population in the triangle is not different from the respective national aggregates and thus it is based significantly in the rural areas. Agriculture is predominant and a large dependence on natural resources is common in the region. The importance of water resource to the people in the watershed is immense for their livelihood and so does the forestry resource (Ekanayake 1990).

THE PROBLEM

It is a regular feature in Bangladesh life to experience floods every year and it is not surprising to expect flooding with almost every monsoon followed up by a drought. A recent monsoon submerged two thirds of the low-lying areas of Bangladesh rendering 25 million people homeless. Destructions to crops and economic losses are insurmountable. The September 1988 floods inundated 2 million ha of farmland (FEER 1989).

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Like the river dispute involving the Euphrates-Tigris and Shatt al Arab in the Mediterranean, the long-running dispute between India, Bangladesh and Nepal on the control of waterways of Ganges and Brahmaputra has led to a sequence of uncontrolled floods and droughts in the region of the triangle.

Occurrence of heavy floods[3] in the triangle in the past have been;

Decade	1950	1960	1970	1980
Assam (India)	-	2	2	4
Bangladesh	3	3	3	4.

It is claimed that increasing population have added impetus on the watershed disasters by way of extra dimensions of human and economic costs.

Population[4] (to the closest million)

	1955	1967	1977	1987	Increase '77-'87(pct)
India	386	504	626	781	25
B'desh			83	103	24
Nepal	9	11	13	18	38

Consumer Prices Index (CPI) 1980=100

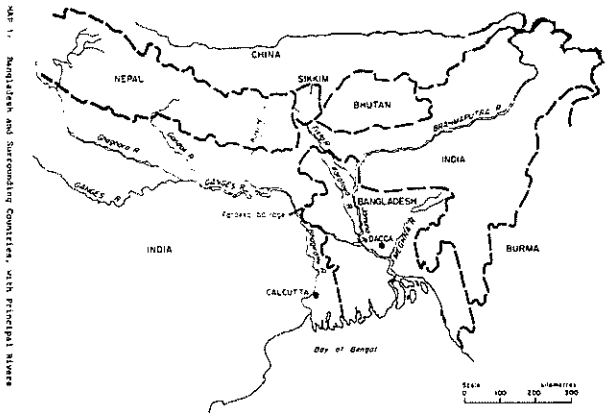
	Average 1964	1972	1980	1987
India	31.5	51.8	100.0	184.4
Bangladesh	12.6	24.9	100.0	212.7
Nepal	33.0	51.3	100.0	204.3

The extra burden of CPI increase on the economy as a result of population increase for the nations is evident from the above data as well as the rural dimension of the problem.

The Triangle

Agriculture accounts for nearly half of the national income of India and it supports about 70 percent of the country's population. But large parts of cultivated land usually experience the problem of insufficient rainfall for crop growth either in terms of precipitation or its distribution to match with crop water requirements. National Commission on Agriculture estimates India's utilisation of annual precipitation would improve in the early part of the next century from its current level of 25 percent.

Bangladesh has an area of 14.4 million ha lying in the delta of the region's three great rivers; the Ganges, the Brahmaputra and the Meghna of which 9.1 million ha (64 percent) are cultivated. About 80 percent of the population are engaged in agriculture (Map indicating Bangladesh and surrounding countries with principal rivers).



The mean annual rainfall in Bangladesh varies from about 1,300 mm in the western part to almost 5,000 mm in the northeast of the country and is characterised by wide seasonal fluctuations with about 90 percent of the rainfall occurring in the five month period of the monsoon (May to September). In spite of an overall abundance of rainfall, serious droughts do occur.

Nepal has an area of 141,000 sq km lies parallel to the main Himalaya range of mountains. About two thirds of land area is taken up by high mountains and the lower slopes, the remaining one third, a narrow strip to the south called the Terai, is the border-line of the Indo-Gangetic plains. About 10 percent of the population lives in the Himalaya region, 50 percent in the hills of the lower slopes and the remainder in the Terai.

[3] Information on flood occurrence in the region is from Centre for Science and Environment of India.

[4] Population and economic indicators are from International Financial Statistics (1988).

THEORY AND EMPIRICS

The triangle region like many regions in developing economies rely heavily on water resource development to foster economic growth. The nations in the region also have the potential to develop hydro power to ease burden of high import bills on fuel. In addition, flood mitigation is crucial for enhancing the productivity of low-lying lands.

Even with modern mechanisms of water resource management, it has not been able to control floods in the low lying areas of the triangle. None of the countries in the region have realised even half of their hydro power potential.

To sustain production, water and land use policies must be integrated. This is theory. In practice, the countries in the region lack overall water resource and vegetation management strategies. Deforestation in the catchments and excessive removal of natural barriers to rain in the region's highlands have further disturbed the ecological balance.

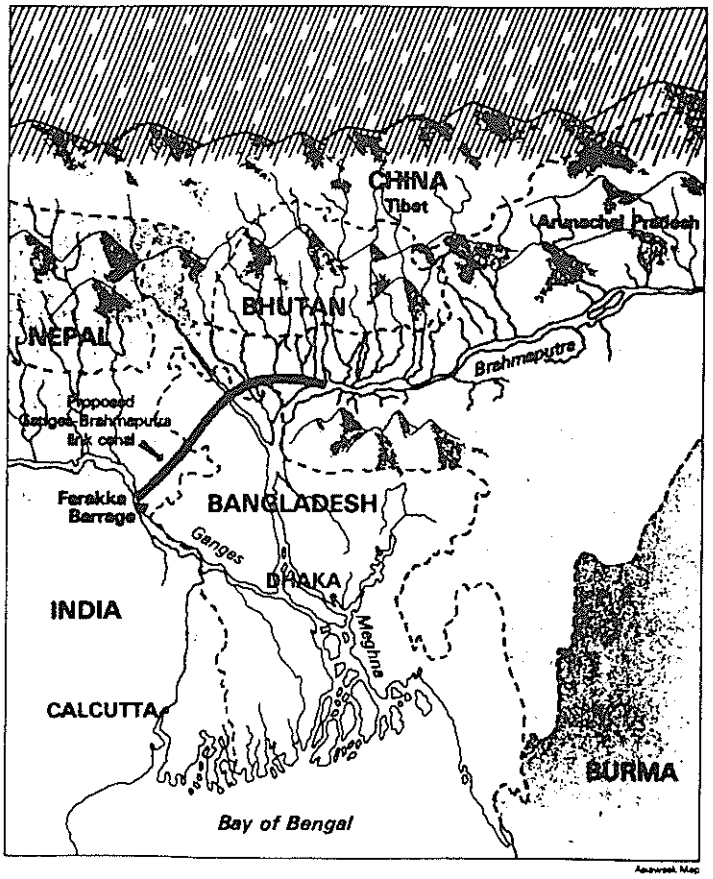
In summary, it is shown by environmental science that deforestation in highlands reduces the absorptive capacity of its watersheds. When this is related to the current topic, monsoonal rains run inhibited off the denuded slopes, causing erosion in the fertile soil. The sedimentation in downstreams causes floods. The tarnished groundwater retention levels calibrate droughts furthering the imbalance in agricultural production (see Ives and Messerli 1989. 'The Himalayan dilemma: reconciling development and conservation' for a contrasting but subtle *Himalayan Environmental Degradation Theory*).

POLICY

Water has become a diplomatic issue in the region. Bangladesh being a low-lying state is at a disadvantage in negotiations receiving nearly 90 percent of water from across the border. Nepal has an enormous capacity to develop its hydro energy having harnessed only 0.5 percent of its potential so far. Being a upstream state is to its advantage in water negotiations. India, according to Far Eastern Economic Review, by withholding hydrological and climatological information can effectively influence structural undertakings in the triangle region. Some of the most elementary data on hydrology and power generating capacity of North India remain classified as military secrets (ibid).

So far, the efforts to secure wider economic benefits for the region by providing for droughts in Ganges delta have failed. Similarly, finding a solution to annual flooding has been an equally intractable impasse.

While reservoirs in Nepal would relieve flooding in the Ganges, most of inundation is caused by the Brahmaputra-Meghna waterway, which carries twice the Ganges's volume of water (Asiaweek Map). Indian strong view is that the proposed Ganges-Brahmaputra link canal would greatly contain flooding in the delta. This is contrasted by Bangladesh on the lack of appreciable effect of lowering water levels downstream.



Constructing storage dams in the Indian territory with exclusive benefits to Bangladesh's downstream is not favoured by the cost bearing side. However, considering the northern Indian situation, where the world's highest mountains meet some of the world's flattest plains and the rainfall is concentrated in 90 short-days, it appears that the unrivalled trust for water resource management is contained in upland storage.

Some argue such policy as purely issue centred and brand them as 'makeshifts'. The conflict between energy and irrigation priorities becomes most acute during the dry season when there is more demand for water at farm-level while turbines need to maintain spill levels for energy generation.. The question is, who can suggest equity by displacing highland people in catering to energy needs of the city-dwellers?

Lack of political will in implementing far-reaching forestry oriented flood control measures in the triangle region have been the casualty of opting to more locally beneficial activity. Ignoring the best possible path-the less painful natural ways, and without any glimpse at seismic breaching and excessive melting of snow, the more localised suggestions are carved in small to medium scale intervention to prevent saturation of water-flows.

Bearable Waters

According to Myres (1989), in the cause of sustainable development environmental resource base makes a critical contribution as the ultimate support of much economic activity. Expanding on that, others have added that sustainability concept has major implications for intergenerational responsibility. This means, institutional arrangements should take into account of socially unjustified environmental degradation associated with intragenerational activity.

Economic justification of sustained water provision to any situation must take into account of climatic variability. This has important implications for both dry land water preservation as well as monsoonal-flush situations. The evidence from temperate regional water management initiatives as well as sub-temperate and monsoon regions are important in this respect.

As mentioned in Frederick and Gleick 1988, it is crucial to identify shortcomings in the capacity of the water resource region to adapt to large changes in water-flows in the absence of new infrastructure or institutional changes or technological developments.

This investigative approach with little economic or social strain will be proven useful to the region given future changes in water-flow patterns.

THE OUTCOME

Given the equity questions and sensitive decision making horizons in the region's polity, there is no guarantee to suggest that *sustainable* guide-lines will be easily constituted here. In the vast majority of these societies, subsistence is the main force that drives living beings further. Likewise, the policy makers are overwhelmed by domestic priorities and are unable to suggest any better sustenance. For example, even under a reasonable education system, a majority of the population would be uninterested in environmental problems as economics bite hard. Sri Lanka, with its very high educational attainment levels, is unable to respond to any environmental crisis and this is widely evident in its handling of high occurrence in pesticide contaminated deaths.

Therefore, even at the peril of a region's long-term economic viability, policy may not intervene for remedial action not merely because of their educational background and specific experience. Most environmental crisis are regionally based and need to be handled at regional levels.

The approach is to find tradeoffs to offset gains and losses until no one is worse off (or better off). Until such time that the policy makers are non-ignorant, then a possibility exists for cooperation. However, even at regional levels, sub regional bias engulfs the issue tables. At those levels, decisions based on household sensitivities have priority over the intergenerational issues. The pain of those decisions though is passed on to the *society* or possibly to the next generation for absorption. This is a resemblance of the current issue surrounding its ecology and future economic well-being.

CONCLUSION

The future of a harmonious relationship that the peoples of this region aspire, will largely hinge on the decision-makers' ability to grapple with real issues affecting the waters and forests of the region and their productivity. However, there is no guarantee that they will be sensitive to generational issues or wider benefits outside their horizons. Neither, they can be entrusted with the fullest confidence to handle dynamic issues that we are discussing in a way compatible with natural limitations. At the end of the day, the most respected notions we debate for policy may show vulnerability to the expediency and interpretation of the politician.

ACKNOWLEDGEMENT

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