

THE POLITICS AND TECHNOLOGY  
OF SHARING THE GANGES

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## ABSTRACT

This thesis is a study of the international conflict over the sharing of the waters of the River Ganges: its origins, conduct and consequences. In Part I the proximate cause of the conflict - the Farakka Barrage Project - is investigated; some uncertainties about the project's technical rationale and misrepresentations about support for the project are investigated. A history of the political dispute which accompanied the construction and operation of the barrage is presented in Part II. Periods when the conflict might have been resolved are identified and examined and the governmental strategies underlying the events are inferred. An assessment is made, in Part III, of the physical consequences for Bangladesh of operation of the Farakka Barrage during the dry seasons of 1976 and 1977. It is concluded that Bangladesh suffered serious economic disruption as a result of the reduced flows in the River Ganges. Part IV is an analysis of the major engineering projects which India and Bangladesh have proposed as means of increasing the dry season flow in the Ganges, and, therefore, removing the conflict of interest at the centre of the dispute. The analysis shows that the projects are not simply technical responses to the water shortage but they embody wider political objectives of the two nations. A comparison, in Part V, with water disputes elsewhere casts an unfavourable light on India's conduct of this conflict.

## DECLARATION

I declare that this thesis has been composed by myself and that the work contained within it is my own.

*Ben Crow*

### A note on river names

For simplicity, international usage and spelling have been adopted for the main rivers in South Asia. Thus, the GANGES has been referred to by that name throughout, even though it is known as the GANGA in India, and the PADMA or PUDDAH in Bangladesh. The BRAHMAPUTRA is only known by that name in the plains of Assam; in Tibet it is the TSANGPO, and in Bangladesh the JAMUNA.

Similar problems arise with most rivers in South Asia. Names are localised and often repeated for different rivers (thus the Bhagirathi in West Bengal is sometimes known as the Ganga, and one of the Himalayan sources of the Ganga is called the Bhagirathi). The HOOGHLY was the HUGLI in the C19th. This century it has generally been the HOOGHLY, but most recently has come to be known again as the HUGLI. Although the latter spelling is nearest to the phonetic, I have chosen HOOGHLY because it is most widely recognised.

## Glossary

Cusecs	Cubic feet per second. This is the unit of instantaneous river flow most widely known and used in South Asia. It has therefore been used in this thesis. (For conversion factors to metric SI units, see the following table.)
Cumecs	Cubic metres per second. The correct SI symbol would be $m^3/s$ , but water engineers sometimes use this formulation.
Discharge	The volume of water in a river flowing past a particular point in a given time.
Ebb tide	The outgoing, seaward flowing, falling tide.
Flood tide	The incoming, rising tide (also sometimes known as the flow tide).
Flow	The volume of water flowing in a river (see also discharge).
Freshets	The spill of the Ganges into the Bhagirathi-Hooghly during the flood season is sometimes known by this term.
Khal	A river channel.
Lok Sabha	The lower, or people's house of the Indian parliament.
MAF	Million acre-feet. A measure of volume used for reservoirs.
Riparian rights	The rights over a river of the river bank owner, extended by analogy to the rights of a nation to utilise the waters of a river flowing through its territory.
Stage	A river stage is the height or level of the water surface.

### A note on units

The principal units used in this thesis are shown below, with their conversion factors to metric SI equivalents.

	Imperial unit	Conversion factor	SI Unit
Length	1 ft	= 0.305	metre (m)
	1 mile	= 1.609	kilometre (km)
Area	1 acre	= 0.405	hectare (ha)
Volume	1 cubic foot	= 0.028	cubic metres ( $m^3$ )
	1 MAF	= $1.233 \times 10^9$	cubic metres ( $m^3$ )
Volume of flow	1 cusec	= 0.028	$m^3/s$
Weight	1 ton	= 1.016	tonne
		= 1016	kilogramme (kg)
Electrical conductivity	1 micromho	= 1	micro Siemens ( $\mu S$ )

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## INTRODUCTION

This thesis tells a complicated story. It is the story of an international dispute, of the engineering project which gave rise to that dispute, and of several engineering proposals intended to resolve the conflict. It is an investigation into the politics and technology of the sharing of the River Ganges.

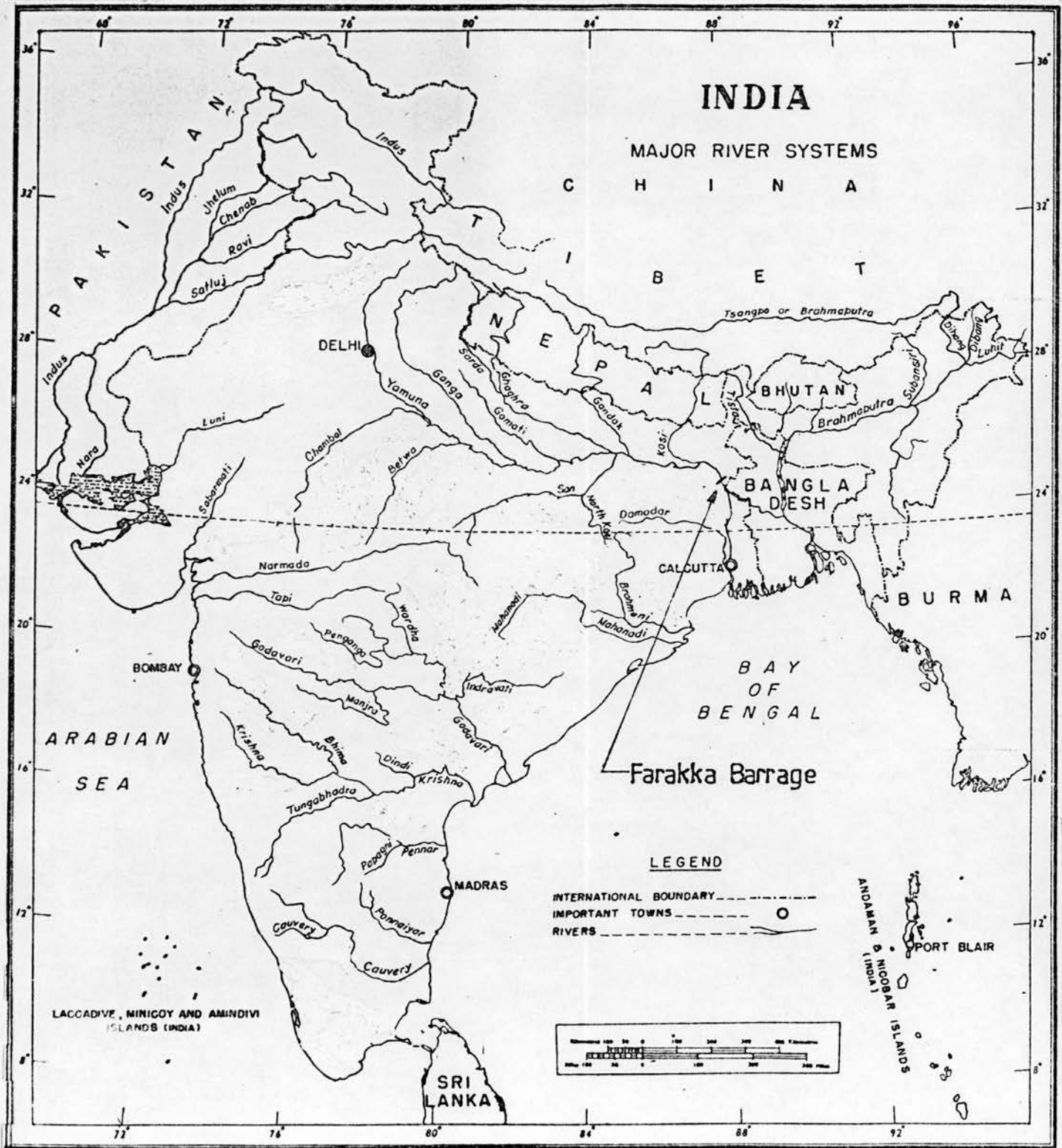
For more than 350 million people living in the basins of the rivers Ganges and Brahmaputra, the water in those rivers is a major resource. Equitable and full utilisation of the water for irrigation, power generation and flood control could increase the prosperity of the region significantly. One reason why the resource has not been developed is that there has been disagreement over the sharing of the river and the direction development should take. This thesis is an attempt to understand that disagreement.

### The Ganges Basin

The River Ganges is the largest and most sacred river of India. It drains the Southern Himalayas and flows across the North Indian plain to fall into the Bay of Bengal after a course of about 1,600 miles (2,500 km) (see Figure 1). The Ganges Basin includes more than a quarter of India, almost all of Nepal, the Western areas of Bangladesh and parts of China. At its junction with the sea, the river has created a delta. The apex of this delta falls on the India-Bangladesh border. At this point the first of a series of spill channels, or distributaries, branches off the main river. This is the River Bhagirathi-Hooghly on which Calcutta is situated. In Bangladesh only one major channel, the Gorai River, branches off before the Ganges joins the Brahmaputra.

The fundamental problem of land and water development in the Ganges Basin arises from the highly seasonal nature of the flow in the Ganges. Not only does 84% of the rainfall in the Ganges plain occur between June and September, but 80% of the annual flow of the Ganges

Figure 1: South Asia - major rivers



also passes through the plain in the four months from July to October (1).

### The significance of the Farakka Barrage Project

At Farakka, close to the apex of the Ganges delta, the Government of India has constructed a barrage (2) with the object of diverting a proportion of the flow of the Ganges down the Bhagirathi-Hooghly. It was this project which provoked dispute between Pakistan and India.

The increased flow in the River Hooghly was intended, by the Government of India, to 'flush' siltation from the lower reaches of the river. These lower, estuarine reaches provide access from the Port of Calcutta to the sea and siltation of the river was hampering the trade of the port.

The Government of Pakistan anticipated that the flow in the Bhagirathi-Hooghly would be increased at the expense of the flow in the main channel of the Ganges. Pakistan expected that only a reduced quantity of water would flow on into East Bengal, an insufficient quantity for the maintenance of the agriculture, ecology and economy of the province.

Thus, the Farakka Barrage Project gave rise to disagreement, dispute and eventually discussion about the sharing of the waters of the River Ganges.

### Outline of events

The Indian Government announced that it was constructing the Farakka Barrage in 1961, and the project was completed in 1975, but anxiety about the decline of the River Hooghly can be traced back to the middle of the Nineteenth Century. From 1853 until 1952, a series of inquiries and investigations were made into the condition of the River Hooghly. Simultaneously the concept of 'flushing' the Hooghly with water from the Ganges was being discussed and it was this method which the Indian Government chose in 1961.



The construction of the Farakka Barrage was accompanied by frequent protests from the Government of Pakistan. Pakistan argued that there was not enough water to meet the needs of both countries. When, however, at the end of the 1971 independence struggle, the Government of Bangladesh took power that government accepted that India's project was a fait accompli. Nevertheless, negotiations to share the waters of the Ganges did not progress far. In 1975 only a brief, temporary understanding, unsatisfactory for both sides, could be reached. On the basis of that understanding, a small fraction of the flow of the Ganges was diverted by the Farakka Barrage for forty days in April and May 1975.

Later in the year, however, the Government of Bangladesh changed three times, and in 1976 and 1977 the right of India to divert water from the Ganges was vociferously contested by Bangladesh. This period of open dispute reached a climax when Bangladesh raised India's 'unilateral diversion' of the Ganges in the United Nations, in 1976. But the following year the two governments reached agreement on the sharing of the Ganges. This 1977 agreement was a considerable advance upon the 1975 understanding: it covered a five year period, rather than one of only forty days. Nevertheless it was also a relatively short term agreement and it was founded upon an arrangement for continuing discussions intended to lead to a long term treaty for the augmentation of the dry season flow of the Ganges.

#### Augmentation of the Ganges

During the discussions between India and Bangladesh, the focus of the negotiations gradually moved from the division, or sharing, of the existing dry season flow of the Ganges, to consideration of increasing the flow so that there might be more water to be shared between the two countries.

The 1977 agreement resolved the immediate question of sharing the existing flow, leaving the negotiations to concentrate upon the long term issue of augmentation. By the middle of 1980, these negotiations were continuing, each government having proposed a scheme by which the Ganges flow might be increased. The Indian

Government had proposed building a canal from the Brahmaputra to the Ganges to carry surplus Brahmaputra waters into the Ganges Basin. The government of Bangladesh had argued that such inter-basin transfer was unnecessary, the dry season demand for water within the Ganges Basin could be met by storing the flood waters in Himalayan reservoirs and releasing the stored water as needed during the dry season.

### Conflicts of interest

The principal conflict in the Ganges dispute is over the dry season flow of the Ganges. The seasonal fluctuation in the flow leaves water scarce for the months from January to May. In this period, India's rising needs for water to flush the Hooghly and for irrigation are in conflict with East Bengal's demand for water to maintain the ecology of the Ganges delta and to promote irrigation, industry and navigation.

India, as the upper riparian state, had the power to implement projects which would provide for her needs. East Pakistan and its successor Bangladesh suffered the consequences of Indian decisions but had only limited power to influence them. The dispute over the sharing of the Ganges is about the attempts by Pakistan and Bangladesh to influence Indian policy.

Out of the first conflict, over the division of the Ganges, has arisen a second, about the alternative ways of augmenting the flow of the Ganges and of developing both the Ganges and Brahmaputra. Some research has suggested that cooperative, multinational development of the two rivers is more likely to maximise overall benefits than policies of independent national development (3). Whether or not this is the case, it has been assumed throughout this thesis that equitable utilisation of the waters is desirable.

In brief outline, these are the events, and the conflicts of interest, with which this thesis is concerned. The questions that the thesis seeks to answer are outlined in the following section.

## Questions

A number of questions were posed at the start of this study, others arose during the course of research. These questions have provided lines of enquiry, shaping and directing the research. They include:

- a) Who initiated the Farakka Barrage Project and with what motives?  
What alternatives were available?
- b) What influenced the responses of the Pakistan and Bangladesh Governments?  
Were opportunities for a cooperative settlement of the dispute overlooked? If so, why?
- c) Why are India and Bangladesh proposing different means for increasing the dry season flow of the Ganges?
- d) How does this dispute compare with other water sharing disputes?
- e) What can this case study tell us about the role played by technical experts, and the use made of expertise, in international political disputes about technological innovation and resource sharing?

## Theoretical concerns

The subject of this thesis does not fall easily within any one academic discipline. Engineering and politics are the primary disciplines into which the study ventures, but it could not sensibly be confined to them. Inevitably, it also makes incursions into history and international relations. Therefore it touches upon a wide range of theoretical issues.

The primary intention of the thesis is to provide a documented, descriptive response to the questions outlined above, and not to

make a weighty contribution to theoretical debate. However, two features of the events under investigation merit consideration within a more general context. The first is the interaction between technical expertise and politics, and the second is the analysis of governmental decision making.

### Politics and expertise

Governmental decisions about the sharing of the Ganges have taken place amidst a series of controversies about technical questions. In this section, the main features of some of these controversies are outlined and some of the concepts which will be used to explore the interaction between expertise and politics are introduced.

From at least the middle of the last century until the present, the consequences of human intervention in the hydrology of the Ganges Basin have been the subject of often heated disagreement. Scientists and engineers have played authoritative roles in this conflict but it has taken place in the context of, and has been influenced by, the political aspirations of different communities.

Four principal technical debates can be identified in the history of the sharing of the Ganges:

- o From the middle of the Nineteenth Century until the middle of the Twentieth, there was disagreement about the condition of the River Hooghly. Expert opinion was divided on the question of whether or not the river was progressively deteriorating as a result of siltation. On this question turned the fate of Calcutta Port: if the deterioration of the channel providing access to the port was temporary or cyclical, then it need cause only inconvenience; if, however, the deterioration proved to be progressive, then the future prosperity of the port would be in danger.

- o Running parallel with this controversy was a discussion of the methods by which the Hooghly's deterioration might be halted or reversed. The discussion evolved into conflict, in the 1950s and 1960s, over the efficacy of India's preferred remedy of 'flushing' the Hooghly with additional water from the Ganges. Some experts thought the diversion water from the Ganges would improve the channel of the lower Hooghly, others disagreed. This is the second technical dispute to be documented in this thesis.
  
- o The third concerns the consequences of diversion or withdrawal of water from the Ganges for areas dependent on the Ganges for water. This technical dispute is a central issue in the political conflict between India and Pakistan and India and Bangladesh over the division of the Ganges. We shall see that the Government of India, and experts in its employ, considered that the withdrawals of water at Farakka would not have and did not have important effects upon the economy and ecology of downstream areas. The Governments of Pakistan and Bangladesh and their experts were and are of the opposite opinion.
  
- o The fourth principal technical controversy is one which commenced in the first half of the 1970s and which is, at the time of writing, only in its early stages. It is a debate amongst experts about the best way to increase the dry season flow of the River Ganges.

The common factor linking these four disputes is that they concern questions requiring governmental decisions informed by an assessment both of political aspects, that is the aspirations of communities or nations, and of technical aspects, the opinions of those thought to be expert in the matter. Such disputes within national boundaries have frequently been studied. This research has a small claim to

originality because it is one of the first investigations of technical controversies occurring within a larger international political conflict. One object of the thesis will be to compare the experience of national technical disputes with these international examples.

From a study of two North American controversies, Nelkin (4) has suggested six propositions which may be of general applicability:

- (i) Developers seek expertise to legitimise their plans and they use their command of technical knowledge to justify their autonomy.
- (ii) While expert advice can help to clarify technical constraints, it is also likely to increase conflicts.
- (iii) The extent to which technical advice is accepted depends less on its validity and the competence of the expert, than on the extent to which it reinforces existing positions.
- (iv) Those opposing a decision need not muster equal evidence.
- (v) Conflict among experts reduces their political impact.
- (vi) The role of experts appears to be similar regardless of whether they are hard or soft scientists.

We shall see in this thesis that many of these propositions apply to the technical disputes associated with the sharing of the Ganges. The confirmation which this case study provides for these points, will be discussed in Chapter 16.

Two concepts in the relationship between expertise and political decisions should be introduced at this point. These are the idea of technical ambiguity or uncertainty, and the concept (mentioned by Nelkin, in (i) above) that experts and science are used to legitimize specific courses of action.

Mazur, in his 'Disputes between experts' (5), has drawn attention to the importance of ambiguity:

'Even with perfect communication, and eschewing rhetorical devices...experts may disagree on ambiguous observations and assessments which cannot be resolved by available objective means.'

(6)

The phrase 'technical ambiguity' will be used in this thesis to describe circumstances in which the same body of data can be used to support two or more explanations of a phenomenon. It will be seen that an ambiguity of this type played an important part in the second of the technical controversies enumerated earlier, over the usefulness of diversions from the Ganges. More general uncertainties about the value of, or 'weight' to be given to, technical assessments or estimates arise in each of the other technical controversies.

Turning to the second concept, regarding the use of science to authorise political action, Ezrahi has written:

'The capacity of science to authorise and certify facts and pictures of reality [ is ] a potent source of political influence.'

(7)

He was writing about America. The circumstances of South Asia are hardly the same but the increasing dominance of Western values and Westward oriented governments grants scientific and technical expertise a similar legitimizing role. Throughout the narrative of this thesis examples will be found of this use of expertise.

Dickson locates the power of science to authorise technical choices in the 'apparently neutral interpretative scheme of positivist science' (8). The authority of scientific expertise rests on the supposed neutrality, objectivity and rationality of science. We shall see (particularly in Part IV of this thesis), however, that technical data and technical choices are frequently not neutral, they contain political aspirations clothed in technical language.

For the same reasons that scientific expertise is used to legitimize essentially political choices, science can also provide a language for preliminary political contacts between hostile nations. This depoliticising role of science or expertise will be seen in the

willingness of the governments of South Asia to instigate 'technical' discussions, and a corresponding reluctance to enter into negotiations defined as political. The pitfalls associated with this use of technical negotiation in lieu of political negotiation may be obvious. Although the technical language may depoliticise, and hence partially defuse, the negotiations, at the same time any claim to objectivity may be compromised and, more important, crucial political questions may be overlooked. We shall see that these pitfalls do occur in practice.

To summarise, two key concepts about the relation between political choice and technical expertise have been introduced. The first, technical ambiguity, is the idea that there are areas of understanding where two explanations may appear to offer equally valid interpretations of a phenomenon. The second concept relates to the implicit objectivity of science. This confers upon technical experts the power to authenticate political decisions and also the ability to depoliticise decisions or negotiation.

### Decision making

At the outset of this study, I hoped that it would be possible to investigate some of the governmental decisions associated with the sharing of the Ganges, notably the Indian decision to build the Farakka Barrage, using the three models of decision making suggested by Allison in his Essence of Decision (9). In practice it has not been possible to accumulate the wealth of detail necessary for such an analysis. As a minimum, an Allisonian analysis requires participant's accounts from several vantage points within the government bureaucracy. The events under consideration here are too recent, and the Indian, Pakistani and Bangladeshi bureaucrats too reticent, for adequate accounts to be available. Nevertheless, at various moments during the research Allison's models provided useful guidance. Therefore, a brief outline of his three models, and some criticism of them, is presented in the following paragraphs.

Allison labelled his three models: I Rational Actor, II Organisational Process and III Governmental (Bureaucratic) Politics. The essence



of the first model, which he asserted was the classical model, is an assumption that governments are monolithic and rational in their responses to the strategic problems they face. As alternatives to this oversimplification, Allison suggested models II and III. The Organisational Process model he summarised as follows:

'At any given time, a government consists of existing organisations, each with a fixed set of standard operating procedures and programs. The behaviour of these organisations - and consequently of the government - relevant to an issue in any particular instance is, therefore, primarily determined by routines established in these organisations prior to that instance.' (10)

In a subsequent joint article, with Halperin, Allison has combined this model with model III (11). With its emphasis on routine, model II could provide only partial explanations of change. The third, preferred, model is described by Allison in these terms:

'In contrast with model I, [ this model ] sees no unitary actor but rather many actors as players - players who focus not on a single strategic issue but on many diverse intra-national problems as well; players who act in terms of no consistent set of strategic objectives but rather according to various conceptions of national, organisational and personal goals; players who make government decisions not by a single rational choice but by the pulling and hauling that is politics.' (12)

Freedman (13) has criticised Allison's conception of decision making on three grounds. First, Freedman argues, the sharp distinction between model I and model III (the remaining alternatives) can only be maintained if a false dichotomy between logic and politics is accepted:

'Particular policy judgements that stem from any given bureaucratic perspective ought not to be dismissed a priori as being merely the product of a political interest, and therefore in some way 'non-rational'.' (14)

Secondly, Freedman disagrees with Allison's view that the Bureaucratic Politics model is the only model able to identify and examine internal political factors. This view, says Freedman, 'is unjustified and

depends on a narrow view of politics' (15). Finally, Freedman argues that model III reflects the concerns of former bureaucratic practitioners by 'concentrating attention on the immediate, fragmentary bureaucratic battles rather than the underlying power structure' (16).

From this critique it can be seen that models I and III are not distinct and incompatible alternatives, but two ends of a continuum (17). Allison's approach suggests lines of enquiry for investigating the bureaucratic constituent of a decision; there may be other constituents, such as the structure of state power, which the approach overlooks.

In this thesis, Allison's method is used overtly only in Chapter Seven, where a congruence is noted between Allison's models and the explanations of a participant. However, during the study, the three models were kept in mind when questioning participants.

Although it was not possible to use the bureaucratic politics approach in the analysis of decision making, one aspect of the relation between different issues in an international dispute did emerge in the course of discussions with participants. This is not a rigorous theoretical contribution, more a useful pointer toward areas for future research on this case study. The aspect which arose was an indication of what I have called 'missed opportunities'.

#### Missed opportunities

For much of the period of dispute over the sharing of the Ganges, relations between the nations concerned have been either unfriendly, overtly hostile, or even on several occasions characterised by war. For most of this time, the hostility cannot be attributed solely, or even primarily, to the existence of dispute over the Ganges. That dispute was generally a minor concern within a range of disagreements.

During periods of 'cold war' or war, the Ganges conflict was a subsidiary issue, the conduct of which was generally tied to the state of diplomatic relations. Progress toward an agreed sharing of the Ganges was unlikely, and did not take place, during such spells

of hostility. Occasionally, however, there were interludes of cordiality. It was during these interludes when progress might have been possible. Other causes of disagreement were quiescent and diplomatic contact during these interludes was often fruitful. The predominant irritants were set aside leaving the sharing of the Ganges at or near the centre of the stage.

These interludes I have called 'windows' in the relations between the states in dispute. One concern of this thesis (particularly Part II) has been to identify such windows and investigate why, despite propitious circumstances, progress toward an agreed sharing of the Ganges did not take place.

The state of relations between two nations is a difficult concept to define with precision. So, too, is the idea of interludes, or windows, of cordiality. As a rough guide, a window has been defined as a period when circumstances appear to be or to have been auspicious for a settlement of the Ganges dispute. Even in those interludes, progress in that dispute is not independent of other factors. It is however slightly less determined by other matters.

In Part II, a number of windows are identified and briefly explored. I have not managed conclusively to identify the obstacles which stood in the way of progress during these spells, but I have focussed attention on periods which would, I think, repay more detailed investigation.

#### The law of international rivers

Whilst this thesis does not focus on the legal aspects of the Ganges conflict, some knowledge of the different positions states have held to be the 'law' is helpful in understanding the strategies the parties have followed in this dispute. The main principles relating to the sharing of international rivers have been categorised as follows:

- (i) Absolute territorial sovereignty: a state may dispose freely of the waters flowing or located in its territory without concern for the damage which such acts may cause to another state;

- (ii) Absolute territorial integrity: a state has the right to demand the natural flow of water from another state;
- (iii) Positivistic theory: where no binding agreement exists, a state is free to utilize water in accordance with (i). This is the principle frequently upheld by upper riparian states;
- (iv) Jusnaturalistic theory: even where binding agreements do not exist, a state is entitled to receive from an upper riparian state an amount of water corresponding to historical or acquired rights. This principle is often followed by lower riparian states;
- (v) Equitable utilisation theory: each basin state is entitled to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin. This principle of joint cooperation was evolved in detail by the International Law Association. (18)

In Part II the different legal stances adopted by the parties at different phases in the dispute will be identified. In Chapter 16 the conduct of this conflict will be compared with the conduct of contemporary river disputes elsewhere, as indicated by the consensus on the relevant principles of international law.

#### Methods of investigation

Having outlined and introduced the theoretical concerns of this thesis, I turn to a description of the methods of investigation which have been used in the study.

The research of current affairs cannot readily be made systematic. The topic of this research is of importance to the governments of two countries. Research of such a topic cannot be independent of the topic itself. The governments concerned are aware that comment upon the dispute - particularly comment which may appear to bear the imprimatur of scientific expertise or of an established university - may have some influence on the dispute itself. Information and comment are not, in these circumstances free; they are resources to be used. In consequence, publications are classified and sometimes suppressed altogether, other written material is subject to conscious and unconscious bias, and the researcher may find he or she is the

subject of unwelcome attention. These circumstances do not permit a very sophisticated methodology: vigilant cross-checking and sceptical questioning constitute the mainstays of the research.

Four sets of data have been used in this investigation: (i) interviews with participants, (ii) academic and technical articles, (iii) newspaper reports, and (iv) government reports and documents. Each of these sources has traps for the unwary. I have attempted as far as possible to circumvent them.

Participants were defined as senior government officials, politicians, academics and advisers involved in the events under consideration. Participant interviews were conducted as discussions structured by a list of topics to be covered and general questions to be explored. Long-hand notes were taken during interviews and a typed record prepared within 24 hours. Three principal categories of information were sought in these discussions:

- (1) Oral accounts of the progress made and obstacles encountered in the negotiations over the sharing of the waters, and of the reasons for particular government decisions and policies.
- (2) The participant's perspective on these events.
- (3) Factual data about physical conditions and engineering proposals, and the participant's guidance on publications to be consulted for such information.

Only rarely were participants willing and able to give oral accounts of events. They were either reticent about sensitive areas of government policy or else ignorant of the main course of events (for example, crucial phases in the negotiations took place at heads of state level, advisors and officials could not be expected to know what occurred in those phases). All but the most outspoken participants also steered discussion away from questions of politics, particularly when international policy might have been influenced by national policy.

Factual data obtained from interviews, and particularly quantitative data, were considered to be unreliable unless supported by other, preferably published, sources. Generally the trust accorded to information obtained from interviews depended upon the extent to which occasional cross references tallied with previously obtained information. Academic and technical articles and government reports have been used wherever possible to provide detailed factual accounts and quantitative data. In most cases these sources have accorded with other references. The author's or government's perspective is usually less overt than in an interview with a participant; however such 'bias' can generally be identified in any comment upon events or interpretation of information.

A large number of newspaper reports have been consulted in newspaper libraries and cuttings libraries in London and in South Asia. These reports have proved to be very useful in constructing an account of the progress of the negotiations. When sifting a large number of reports, it is possible to select the more reliable correspondents, newspapers and newspaper informants. Inevitably, journalists are the recipients of much government propaganda and the picture is further complicated by the 'news values' which a journalist uses to select what is printed. Nevertheless, the processes of cross-checking, searching for plausible detail, and noting the reliability of the writer, the time lapse between event and publication, and the source used by the journalist, appear to select reliable information.

The conclusions of this study might have had greater strength if access had been granted to the large quantity of documentation held by each government, from cabinet minutes through to unpublished technical reports. It is one of the frustrations of current affairs research that such information is rarely available.

With assistance from officials and others sympathetic to this study, I have been able to obtain a number of unpublished official documents. These form the basic documentation for Parts III and IV of this thesis. Other important documents have remained inaccessible.

The inaccessibility of some information relevant to the study could cast doubt upon the validity of this thesis and its conclusions. Where I am aware that information is seriously incomplete, I shall call attention to this lack. And, in the concluding chapter, Chapter 16, the importance of this inaccessibility will be discussed. I shall argue that the non-availability of some documents and information does not seriously detract from the strength of my conclusions.

### Structure of the thesis

This thesis is divided into four parts and a concluding discussion. Part I, containing Chapters One to Four, presents an account of the circumstances which led to the decision to build the Farakka Barrage Project. This part corresponds to the questions labelled a) above; that is, it is a response to the general question: why was the Farakka Barrage built?

Part II, Chapters Five to Nine, is a chronological account of the dispute which was initiated by the Farakka Barrage Project. It provides a history of the Ganges water sharing dispute. The distinct phases and different issues involved in this conflict are identified, and the opportunities for settlement which may have been missed are explored.

Part III, Chapters Ten to Thirteen, is an attempt to quantify and assess the physical consequences of the operation of the Farakka Barrage in 1976 and 1977. During a tempestuous period of political dispute, large diversions were made from the Ganges into the Hooghly. At the time, the two governments involved, India and Bangladesh, assessed the consequences of the diversions very differently: Bangladesh claimed that its economy was seriously damaged, India said the effect was insignificant. These chapters set out the claims of the two governments and compare them with the best available measurements of what happened.

Part IV, Chapters Fourteen and Fifteen, presents a description and comparison of the alternative projects that have been suggested for the resolution of the Ganges water sharing dispute. This conflict is over the shortage of dry season water. The projects described are intended to increase the amount of water available in the period of scarcity and hence remove the source of the dispute.

Finally, Part V contains a chapter of conclusions. There is a discussion of the theoretical concerns introduced above, and comparisons of the Ganges water sharing dispute with water sharing disputes within India and elsewhere in the world.



I

A DIVERSION

'On April 8 1960 representatives of foreign shipping companies publicly expressed the view that if the deterioration continued for another two years the Port of Calcutta would be lost.'

## INTRODUCTION

The decision to build the Farakka Barrage provoked a dispute between India and, at first, Pakistan, subsequently Bangladesh. This dispute set the stage and chose the cast for the subsequent discussions on the development of the Ganges. If the origins of the dispute are to be understood, the reasons for the construction of the barrage must be investigated.

This part of the thesis is about the Farakka Barrage Project, its history, the alternatives to it, and the immediate circumstances leading to its construction.

The first chapter is entitled 'The problem of the Hooghly'. The problem with which it is concerned is the increasing difficulty of navigating the River Hooghly which forms the approach to the Port of Calcutta. The solution of this problem, according to documents published by the Government of India, is the primary function of the Farakka Barrage. The chapter charts the development of understanding of the siltation of the Hooghly and investigates some of the technical controversies associated with this development.

The second chapter chronicles the rise of the idea of diverting water from the Ganges to counter the Hooghly's deterioration. It shows that the man generally cited as the originator of the idea was concerned with a different problem and a different solution.

In Chapter Three some alternative ways of providing adequate access to Calcutta Port are described, and also the reasons why they were rejected by the Indian Government. In addition, some opposition to the Farakka Project is documented, and a technical ambiguity which casts some light upon that opposition is identified.

The fourth and last chapter in this part describes the immediate

political and economic circumstances influencing the Indian Government's decision to sanction the Farakka Project.

Since the primary function of the project is the improvement of the River Hooghly an introductory description of that river is required. It is followed by an explanation of the main details and functions of the Farakka Barrage Project.

### The River Hooghly

The River Hooghly is the tidal reach of a combined river, the Bhagirathi-Hooghly. From its junction with the Ganges to Nabadwip, the river is known as the Bhagirathi. From Nabadwip to the sea the river is tidal and is known as the Hooghly (see map, Figure I.1). The Bhagirathi is the principal river in a group of three spill channels known as the Nadia Rivers.

The Bhagirathi-Hooghly is a complex river. It is on the one hand, a spill channel for the floods of the River Ganges, getting no water from that source for some 275 days each year; on the other hand, it is a large tidal estuary fed by silt-laden rivers draining about 8,700 square miles of catchment to the West of the river. (Figure I.2 shows the hydrographs for some of the main tributaries of the Hooghly.) The weight of geological and historical evidence suggests that the Bhagirathi-Hooghly was once the main channel through which the waters of the Ganges flowed to the sea (1).

The Hooghly is not uniformly shallow, but navigation is obstructed by a series of bars or shifting sands shown here in Figure I.3.

### The Farakka Barrage Project

The Farakka Barrage Project consists of two barrages, one at Farakka and a much smaller one across the Bhagirathi at Jangipur, and a 26 mile long feeder canal (see map, Figure I.4). The barrage at Farakka is the world's longest (2) with a length between abutments of nearly 1.4 miles. The purpose of the barrage is to raise the level of the Ganges so that water can be diverted under the force of

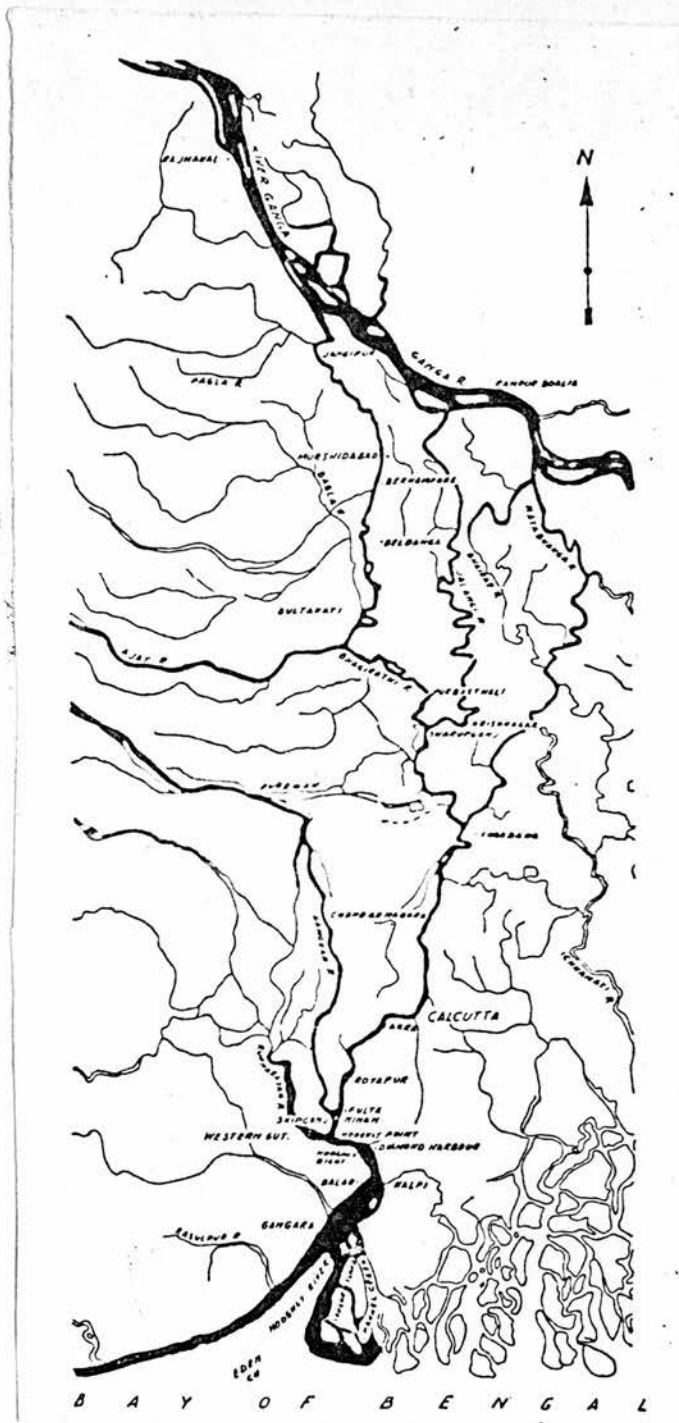
gravity, via the feeder canal, into the Bhagirathi and thence into the Hooghly. The feeder canal is constructed to carry a volume of up to 40,000 cubic feet per second (cusecs). The barrage at Jangipur controls the spill from the Ganges during the monsoon season and also prevents water flowing out of the feeder canal and back into the Ganges.

The structure of the Farakka Barrage is supported by a 7 ft thick concrete raft which rests on the sand bed of the river. The flow and level in the Ganges can be controlled by the operation of the barrage's 108, 60 ft wide steel gates. Navigation locks were designed for both ends of the feeder canal but they have not yet been constructed.

Although the primary purpose of the Farakka Barrage Project is the rejuvenation of the Hooghly, the project also brings a number of secondary benefits. These are as follows:

- (1) Communications. The barrage provides a rail and road bridge at a strategically useful point for crossing the Ganges.
- (2) Drainage. The main controllable cause of floods in West Bengal is thought by the government to be the reduced carrying capacity of the Bhagirathi-Hooghly. This capacity will be increased by the project.
- (3) Salinity. In the years between 1936 and 1959, the salinity of the water at the main Hooghly intake for Calcutta's water supply rose from 400 to 2,460 parts per million. The project is intended to reduce this salinity.
- (4) Inland navigation. The project includes provision for navigation between Calcutta and the Ganges for ships of up to 6 ft draught.

FIGURE I.1 The Bhagirathi-Hooghly River system and the Nādia Rivers.



Source: Joglekar et al. "Hydraulic Model Investigations of the River Hooghly."

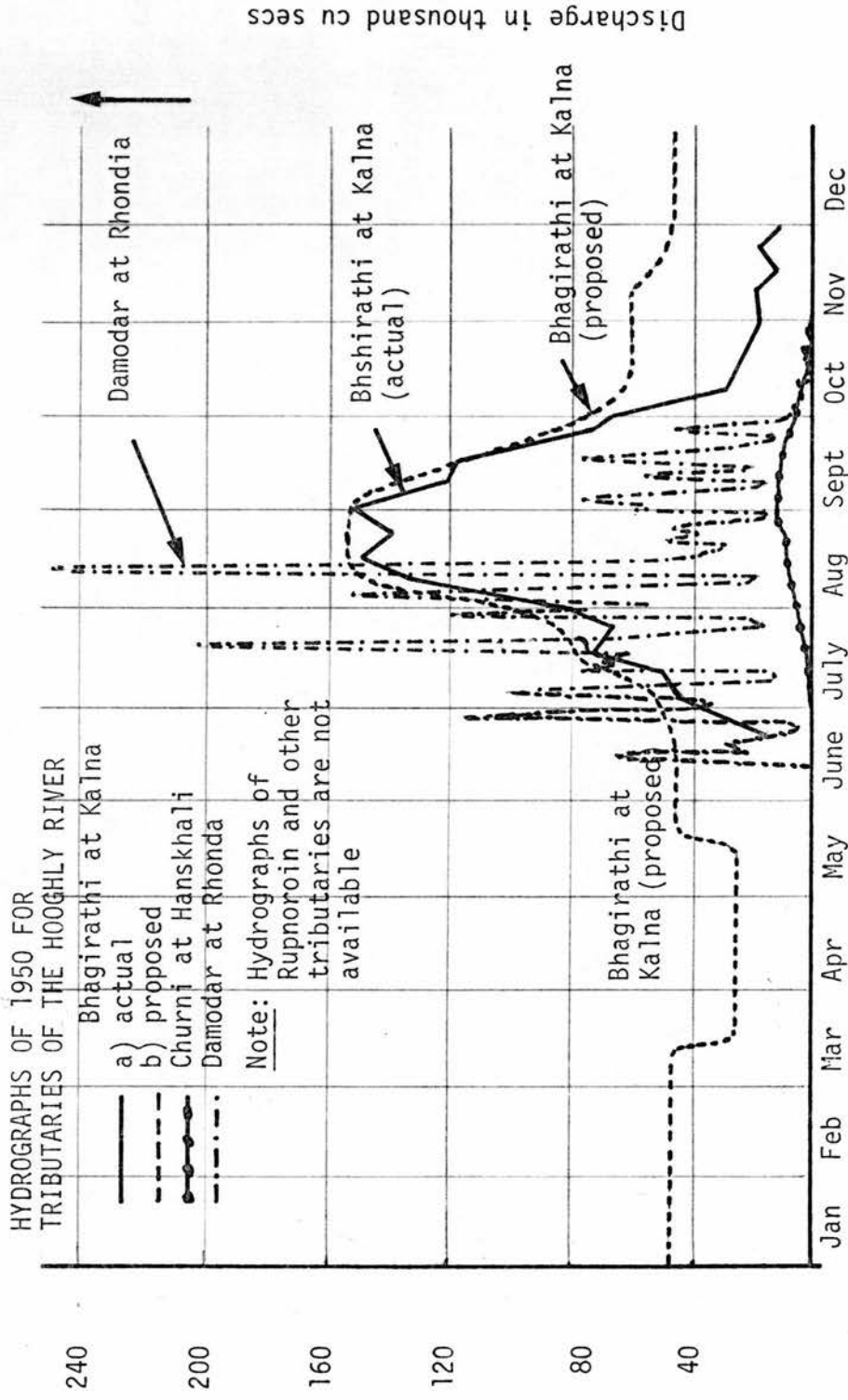
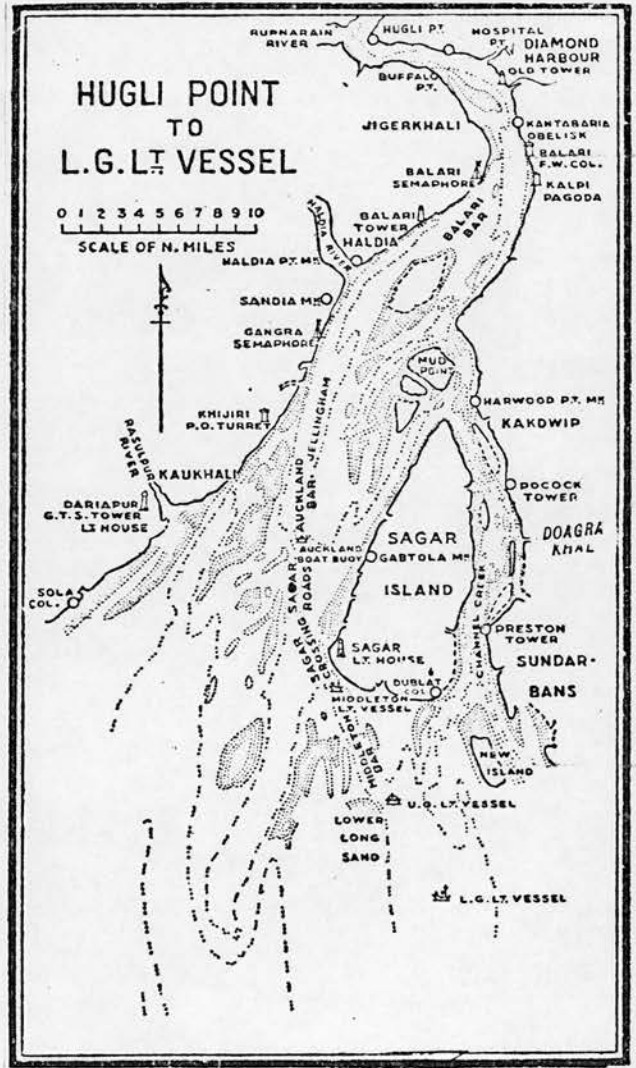
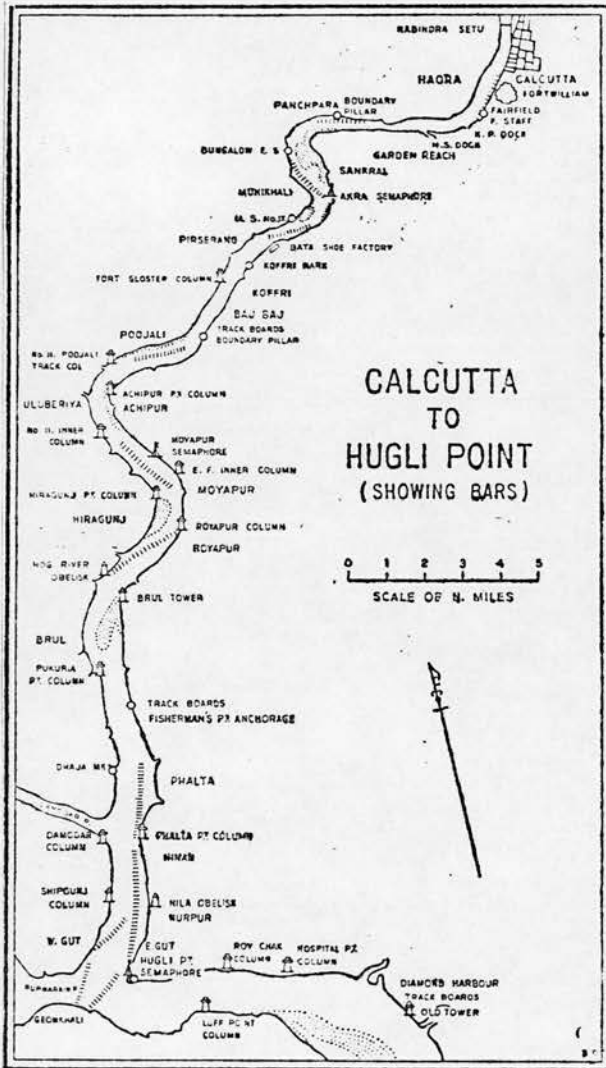


Figure I.2 1950 Hydrographs for some tributaries of the Hooghly

Source: Ippen and Wicker, The Hooghly River Problem, duplicated report for the Government of Pakistan, 1962.

Note: The proposed hydrograph of the Bhagirathi shows the expected effect of the Farakka diversions.

Figure I.3: Navigation maps of the River Hooghly showing the approximate position of bars.



Source: Calcutta Port Trust, Director of Marine, Tide Tables, Calcutta, 1979.

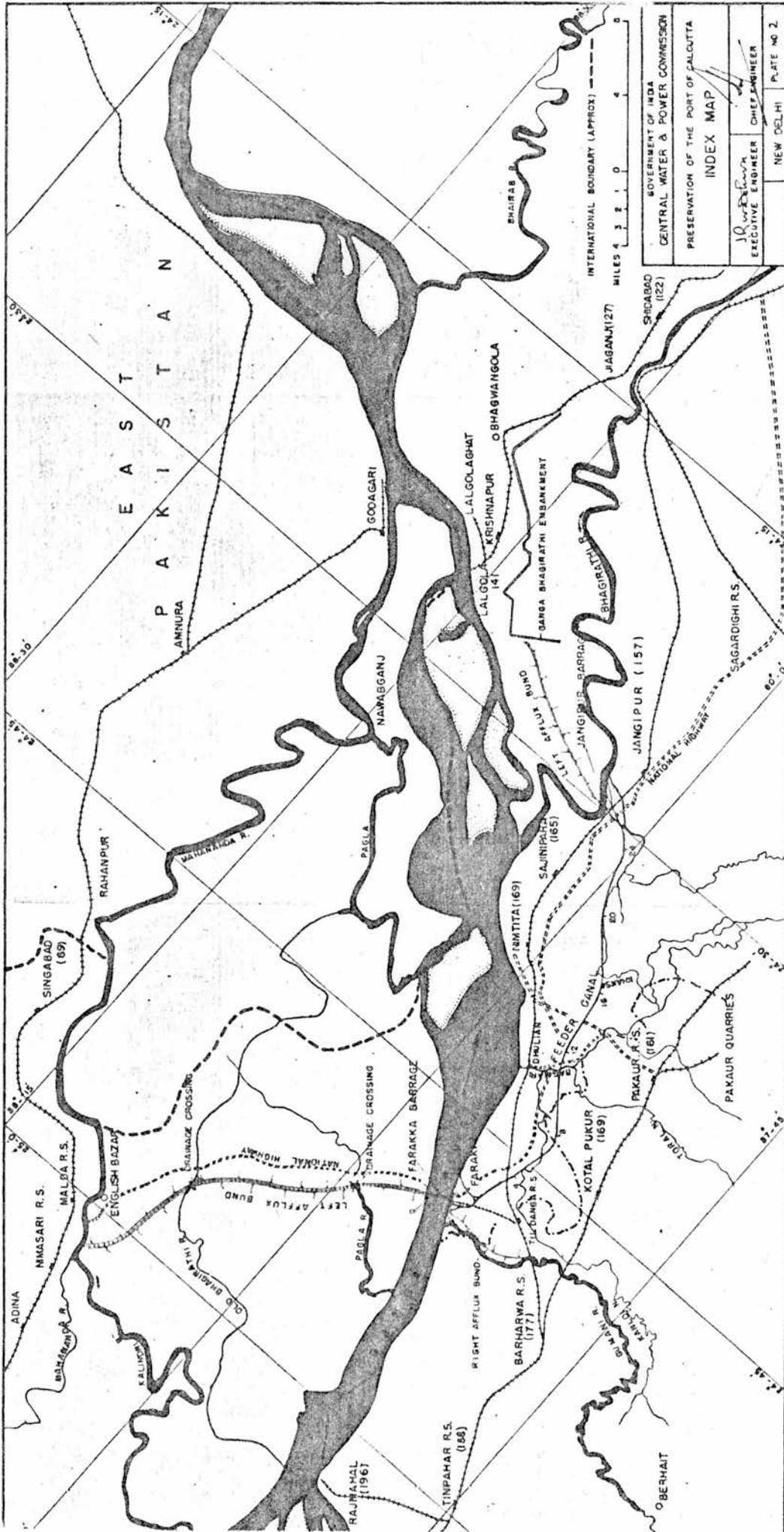


Figure I.4: Map of the Farakka Barrage Project.

Source: India, Preservation of the Port of Calcutta, Plate 2, New Delhi, 1961.



The operating schedule of the project, that is the size and timing of diversions from the Ganges, has been the subject of some confusion and even dispute. The question is, how much water is needed to 'flush' the Hooghly during the months when Ganges water is scarce? It is in these months that the sharing of the water is most contentious.

Table I.1 shows two proposed operating schedules for the project. These schedules show that in 1961 and 1976 the Indian Government envisaged that the Hooghly would require reduced quantities of water during the period of scarcity. However, we shall see in Part II, that the Indian Government have generally stated in their negotiations with Pakistan and Bangladesh that 40,000 cusecs, that is the full capacity of the feeder canal, is required throughout the year.

Table I.1: Proposed operating schedule for the Farakka Project

PERIOD	PROPOSED FLOW	
	10 <sup>3</sup> cusecs	
	(a)	(b)
1 January to 15 March	40 to 20	40
15 March to 15 May	up to 20	20
15 May to 20 June	20 to 40	} 20
20 June to 30 June	40 to 60	
July to September	60 to 140	
October to November	80 to 40	} 40
December	40	

- Source: (a) India. Lok Sabha Secretariat, Public Accounts Committee 196th Report, The Farakka Barrage Project, New Delhi, 1976, p 114.  
This column includes both the diversion through the feeder canal and the natural freshets overflowing into the Bhagirathi during the flood season.
- (b) India. Ministry of Irrigation and Power, Preservation of the Port of Calcutta, New Delhi, 1961, p 14.

## Chapter One

### THE HOOGLHY PROBLEM

From 1853, if not before, Governments of India have been anxious about the apparent deterioration of the River Hooghly. On the banks of the Hooghly lie the docks, wharfs and jetties of the Port of Calcutta. For much of the last century that port has been India's busiest, providing access for international trade primarily to and from Europe. Ships docking in Calcutta have to travel 125 miles up the Hooghly from the sea. The apparent deterioration of this channel gave rise to the understandable anxiety that trade between India and Europe could become more expensive, or Calcutta Port itself become unusable. As we shall see, it was to halt or reverse this deterioration that the Farakka Barrage was built.

In 1853, the Government of Bengal, acting in response to a representation from the Bengal Chamber of Commerce, set up a Hooghly Commission to enquire into the difficulty of navigating the river. Numerous further investigations were made into this problem in the 106 years between 1854 and 1960/61, when the decision to build the Farakka Barrage was taken. The purpose of this first chapter is to document the conclusions reached by these investigations, and to follow the debate and disagreement which frequently attended the analysis of the River Hooghly.

In a pamphlet distributed by Indian Embassies and at the United Nations in 1976, the Government of India argued that the deterioration of the Hooghly was a subject of expert unanimity:

'For more than a century it has been recognised that the only means of saving the Port of Calcutta from choking up with silt and eventual destruction is the construction of a barrage across the Ganga near Farakka, located about 400 km North of Calcutta. In the last century five commissions, ten foreign and numerous Indian experts looked into the problem and concluded that the only solution was to increase and regulate headwater supplies by constructing a barrage on the Ganga.'

(1)

The Indian Government is not telling the whole story. It will be shown in this chapter that the various experts and committees which examined the question found difficulty in establishing the nature and extent of the deterioration of the river. Some doubted that any progressive deterioration was taking place. There was no unanimity; the characteristic feature of investigations into the deterioration of the Hooghly was uncertainty. It is true that many of the experts recommended a particular solution, building a barrage to divert water. However, the experts did not agree on the existence of the problem this barrage was to solve.

The faltering steps which these enquiries took toward agreement on the problem of the Hooghly are described in this chapter. It is concerned with the period from 1853 to 1952, when the last governmental committee of inquiry reported on the problem. The narrative returns to this question in Chapter Three, which describes further examinations of the Hooghly made at the time the Farakka Project was sanctioned.

#### INVESTIGATIONS PRIOR TO INDIAN INDEPENDENCE

##### 1853, The Hooghly Commission

The first governmental inquiry into the deterioration of the River Hooghly ended in disagreement. In 1853, the Bengal Chamber of Commerce drew the attention of government to the difficulty of navigating the Hooghly, and, as a result, a three person Hooghly Commission was appointed to investigate the matter. At the end of their investigation, two of the three found it:

'very difficult to understand how a river like the Hooghly can do otherwise than deteriorate, however gradual or slow that process may be.' (2)

Accordingly they recommended that consideration should be given to the establishment of an alternative port. The third member of the commission differed from his colleagues on the question of deterioration. He wrote:

'I find nothing to lead us to anticipate any future deterioration beyond such as may arise from a temporary shallowing of some of the difficult channels while a change is going on near it...' (3)

It appears that no action was taken on this report. But ten years later further deterioration of the channel was noted:

'It was reported in London that the trade of Europe with Bengal was in danger of immediate and prolonged suspension.' (4)

This led the government to institute another enquiry, which was undertaken by the Superintending Engineer for the Department of Public Works in Bengal, Hugh Leonard. He had this to say:

'Whether the Hooghly is deteriorating as a navigable channel has long been a disputed question...Now one conclusion may be safely drawn from this difference of opinion, that is, that the fact of there being grounds for such a difference proves that the deterioration cannot be very great.' (5)

Nevertheless, Leonard's analysis led him to conclude that the river 'must deteriorate, however slowly' (6).

In between these two official enquiries a paper was published in the Institution of Civil Engineers' Proceedings comparing the Hooghly with the nearby River Matla (7). At that time the Matla was being considered as an alternative navigable route to, or an alternative site for a port. The author of the paper, J A Longridge, concluded:

'One [river] is dangerous and difficult, whilst the other is safe and convenient for navigation.' (8)

In his view the Matla was the more suitable river because it did not have any fresh water supply. Longridge thought his comparison was:

'conclusive as to the value of tidal water alone as compared with fresh water and tidal scour combined.' (9)

He begged to differ from the majority report of the 1853-54 commission which had stated that the navigability of the Hooghly might be improved by increasing the flow of water from the Ganges.

It is clear that neither the importance nor the nature of the Hooghly problem were the subject of consensus at this time. In 1864 a private company did establish a competing port, Port Canning on the River Matla, but by 1870, 'the Hooghly channels after all had not deteriorated as apprehended and trade showed no tendency to go to Port Canning' (10).

#### 1905, Vernon Harcourt and the Port Commissioners

The next serious consideration of the problem came from L F Vernon Harcourt, who had made his name with a 2 volume work, Harbours and docks, published in 1895. The following year he prepared a 'Report on the River Hugli' for the Commissioners of the Port of Calcutta, and in 1905 he came back to the problem with a substantial paper in the Proceedings of the Institution of Civil Engineers (11). This paper does not, 74 years later, appear contentious, but at the time it received sharp rebuttals from Port Commission officials.

Vernon Harcourt concluded that the depth of the Hooghly was gradually reducing. Nevertheless, he was not pessimistic:

'After the most careful consideration, the Author has come to the conclusion that there is no feature in the condition of the Hooghly which renders it incapable of a moderate amount of improvement...'

(12)

Vernon Harcourt considered the various suggestions which had been made for improving the river and chose river 'training', to concentrate the currents of the ebb and flow tides into a single channel (13).

Though Vernon Harcourt's conclusion of gradual deterioration can hardly be described as alarmist, it brought forth a sharp attack from two Port Commission officials. At this time it was evidently

the Commission's policy to deny any suggestion that the Hooghly was deteriorating. The Commissioners pursued this policy as vociferously and singlemindedly as their successors were, later, to pursue its opposite.

As part of the discussion of Vernon Harcourt's paper, comments were published in the Proceedings from two Port Commission officials, F Palmer and E W Petley. Palmer wrote that he:

'considered that the paper was calculated to give shipowners a feeling of uneasiness, which was as unnecessary as it was erroneous, regarding the safety of navigating the River Hooghly...Throughout the paper there was a running suggestion of deterioration in the navigable condition of the river, and therefore [Palmer] felt it was very important to the Commissioners of the Port of Calcutta that this idea should be immediately and definitely refuted.'

(14)

Palmer also quoted the minority report of the 1853-54 Commission to the effect that there had been no general deterioration of the river and commented that 'fifty years further experience has only shown the extreme accuracy of [these] conclusions' (15). In various later publications, the Government of India, acting on behalf of the Port Commissioners, have used the majority report of the 1853-54 Commission to equally good but opposite effect.

In the second comment from a Port Commission employee, E W Petley made a rather different point:

'the mere study of annual charts, which seemed to have been [Vernon Harcourt's] method of arriving at his deductions, could be of little real value, either to himself or to those responsible for the conservancy of a river of this description. Only an intimate, daily, and extended experience of what was going on in the bed of the Hooghly could possibly give an engineer a practical idea of the difficulties he would have to contend with in attempting to control the waters of this river.'

(16)

Petley contributed a graph showing how the depths over the Hooghly bars had changed between 1889 and 1904. From this, Petley concluded that the depths had 'unquestionably improved'.

Another reader of Vernon Harcourt's paper, J Wyness, also of Calcutta - though, apparently, not an employee of the Port Commission - interpreted the paper very differently:

'no notice seemed to have been taken in the paper of the fact, well known in Bengal, that the channel of the Bhagirathi was deteriorating.'

(17)

This brief, but well-documented, example of controversy amongst experts will be discussed, with other examples, in Chapter 16. At this point in the narrative it is sufficient to note the strength of feeling of the Port Commission employees, indicated by their use of intemperate language, and the fact that the Port Commission was anxious to demonstrate the health of the Hooghly.

#### 1916, The Stevenson-Moore Committee

The next available report on the Hooghly is one produced by a committee constituted by the Government of Bengal and chaired by Sir Charles Stevenson-Moore (18). The committee, which sat between 1916 and 1919, was asked to advise on the systematic observation of the Nadia Rivers (the Bhagirathi, Mathabanga and Jalangi) and to suggest action to improve their condition as feeders of the Hooghly (19).

Though the conclusions of this committee and the reports of others are now used to bolster the consensus view that the Hooghly is and was deteriorating and that its problem was the shortage of headwaters, the committee's terms of reference essentially prejudged the nature of the Hooghly's problem. Almost despite their brief, the committee did comment on the 'alleged deterioration' of the Hooghly:

'The process of deterioration, however, if indeed any deterioration has taken place, appears to have been very gradual and the fact that even with the evidence available it is difficult to arrive at a definite conclusion proves that the conditions cannot now be very materially worse than in the past.'

(20)



However, the report goes on to say:

'It is obvious that if the beds of the head-water rivers continue to rise more than those of the Ganga and the lower Hooghly, the result will be the obstruction of the freshets and the restriction of the action of the tide wave. Any further deterioration of the head-waters would accordingly be a matter of extreme gravity, and it is imperative that steps should be taken to ensure a flow of water through the upper reaches sufficient to keep open the channels, but not such as to result in excessive deposits of silts of a heavier quality in the lower Hooghly.'

(21)

The committee cautioned that improvements could be overdone causing increased silting in the lower Hooghly and deterioration in the Ganges downstream from the Bhagirathi-Hooghly offtake. It recommended dredging and river training in the Nadia rivers and some restriction on the building of embankments along the Hooghly. Significantly, the committee's members apportioned some of the blame for the deterioration of the Nadia Rivers, and hence of the Hooghly, to the construction of irrigation canals in the upper reaches of the Ganges, which, they considered, abstracted 20% of the low discharge of the river.

#### 1939-47, Investigations by Oag and Webster

Twenty years later, a Deputy River Surveyor working for the Commissioners for the Port of Calcutta, T M Oag, was asked to update the Stevenson-Moore Committee's report, particularly the observations on the state of the river. Oag noted:

'The current popular belief, as manifested by articles which have appeared in the press at frequent intervals from the pens of public men, appears to be that, as a result of the alleged deterioration of the Nadia Rivers the river Hooghly itself has deteriorated and Calcutta, therefore, cannot continue to maintain its importance as one of the principal distributing centres of trade.'

(22)

Contrary to this popular belief - or, would it be more accurate to describe it as the anxiety of British commercial and shipping interests? - Oag found:

'It is definitely established that the navigability of the river has improved during the last hundred years and, while in more recent years improvement must be attributed largely to the Commissioners' dredging policy, the capacity of the river and tidal conditions show no indications of general deterioration.'

(23)

But Oag did recommend immediate adoption of measures to control the supply of water into the Hooghly from the Ganges:

'I have endeavoured to show that it is essential to obtain control over the feed water entering the Hooghly not only to provide a supply during the dry season but to regulate its flow so as to obviate excessive and spasmodic discharge volumes during the freshets and, that experiments by models, should be carried out to obtain some indication of the degree of control that is necessary...'

(24)

Prior to independence, only one more report of significance was prepared. This was by the then Chief Engineer (Special) of the Port Commissioners, Mr A Webster. Like his various predecessors Webster surveyed the records of the river and drew his own conclusions:

'(a) the tidal conditions at Calcutta have not shown any marked changes during the past century, and while there is no evidence of progressive deterioration in the river generally, below Calcutta, there are indications of a rise in bed levels between Sankrail and Poojali.

'(b) There have been periodical fluctuations in the navigable channels, but there is usually a relationship between these variations and the seasonal tidal changes, as well as the freshet discharges.

'(c) The fresh water supply through the Nadia Rivers has apparently **decreased** especially during the dry season, but there are insufficient records available to determine the extent of this reduction.'

(25)

Whilst he could not find evidence of deterioration of the Hooghly, Webster emphasised the importance of the river's headwater supply. In his opinion the river was 'dependent for its existence' on the fresh water supplied by the Ganges through the Nadia Rivers (26). Webster was not constrained by his failure to find proof that the

Hooghly was deteriorating. He noted the lack of evidence and then continued by re-stating his belief that if the river was deteriorating, it must be the result of a reduction in the spill from the Ganges:

'The position today is, that there is practically no dry weather flow from the Ganges into the Bhagirathi or any of the other spill rivers in the Nadia group, but in the absence of systematic records it is not possible to state definitely that progressive deterioration of these feeder channels is going on.

'No apology is made however, for re-emphasising the need to take all possible steps to improve the Headwater supply of the Hooghly, otherwise it will be useless considering schemes for the development of the port of Calcutta, which, as has already been pointed out, is dependent for its existence upon the maintenance of an efficient waterway between the Docks and the Sea.'

(27)

There seems to have been a general belief, amongst even the experts concerned with the problem, that, by some fairly simple mechanism, additional fresh water from the Ganges could 'flush' out the slit which was creating the obstacles to navigation. The rise of this belief is documented in the following chapter.

These seven reports contain many valuable observations on the mechanisms of the river system. The quotations given here do not do justice to the full reports. Nevertheless, it was not until after India had freed herself of colonial ties that adequate investigations of the Hooghly problem and particularly of the function of the headwater 'freshets' in the Hooghly regime were published.

#### INVESTIGATIONS AFTER INDEPENDENCE

In May 1947, three months prior to independence, discussions were held between the government Central Water and Inland Navigation Commission (CWINC, later the Central Water and Power Commission, CWPC) and the Commissioners for the Port of Calcutta 'on the question of the construction of a model of the Hooghly, as affecting navigation at the Port of Calcutta...' (28). By 1950, a 1:2000 scale model of the Hooghly had been built and proved, and a 1:300 scale model of the port was under preparation at the CWINC Research

Station at Poona. In the annual technical reports of the Research Station for the early fifties, several papers were published describing experiments on different aspects of the Hooghly problem and its solution (29).

1952, The Man Singh Committee

In 1952, a review of these experiments was made by a committee of experts constituted by the Indian Government under the chairmanship of Shri Man Singh (30). This committee summarised the considerable literature and noted that "it was only in the comparatively recent reports that notice was taken of the lack or absence of reliable hydrological data" (31).

The committee was composed of eminent Indian experts in the field of hydraulics, and its terms of reference did not prejudge the issue. In addition to being asked to review the CWPC's hydraulic model experiments, the committee was to:

'assess the effects of the Damodar Valley Corporation and the Ganga Barrage scheme on the regime of the River Hooghly; [ and ] to make recommendations on the steps necessary to improve the regime of the River Hooghly, particularly within the port limits.' (32)

The Damodar Valley Corporation (DVC) was supervising the multi-purpose development of some of the Hooghly's Western tributaries, and there were fears that this interference would cause deterioration of the Hooghly. The Ganga Barrage scheme became the Farakka Barrage Project.

The committee was able to muster evidence of the Hooghly's deterioration. They provided figures showing that the volume of the river below low water in the stretch between Nabadwip and Calcutta had steadily diminished:

YEAR	1924	1934-5	1944	1951	
VOLUME					
(yd <sup>3</sup> x 1,000)	90	87	76	67	(33)

However, the committee noted that the signs of deterioration were less pronounced lower down the river (34), and the evidence they found of systematic change in the spill from the Ganges (reproduced here as Figure 1.1) cannot be regarded as conclusive. Nevertheless, the committee did conclude: 'it is clear that the entire river system shows trends of deterioration...' (35).

The committee's explanation of the mechanism of deterioration is summarised in this paragraph:

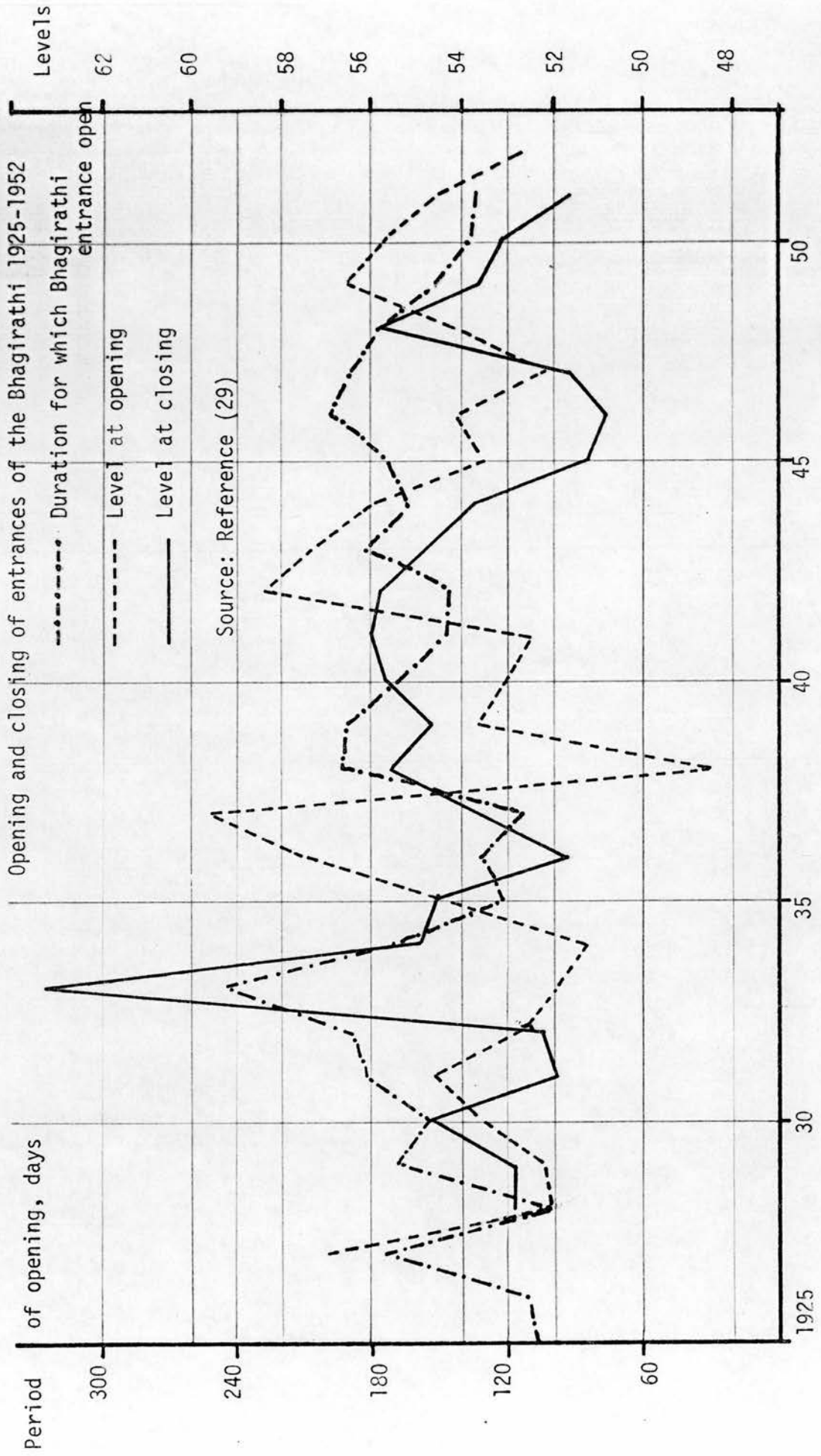
'As the flood current in the upper reaches is of shorter duration than the ebb, it is, therefore, stronger and brings with it material in suspension, which tends to deposit in the channel in the region of slacker water. The ebb current being less strong is unable to scour out the material being deposited. There is ample evidence in Bengal of this phenomenon having caused the deterioration and death of several tidal rivers. In order that the channel may be kept permanently open, the ebb current must be reinforced by upland discharge so that all the material brought up by the tide is carried back by the ebb. With diminishing upland supplies and the tidal influences as they operate the river must deteriorate. If this were allowed to happen, the consequences will be disastrous.'

(36)

Although the committee had definite opinions on that mechanism, it noted that the hydraulic modelling of the process was not without uncertainty and complications. Tidal effects without silt can be well modelled, but when there is silt, there is also the problem of coagulation of colloidal particles when salt water is met. This complication, the committee noted, is a 'difficult problem' to introduce into a hydraulic model. The influence of this difficulty can be traced, through a 1962 report prepared for the Pakistan Government by two American engineers, to the belief of some Pakistan and Bangladesh politicians and engineers that the Farakka Project was not technically sound. We shall see, in Chapter Three, that the importance of salt water in the siltation mechanism of the Hooghly may have been underrated by the Man Singh Committee.

The dams built by the DVC on the Damodar River were discounted by the committee as a cause of the Hooghly's deterioration. However,

Figure 1.1 Trends in river bed levels at the offtake of the River Bhagirathi from the River Ganges.



the committee's report noted that any substantial reduction in the flow of the upper tributaries of the Bhagirathi would be:

'bound to have an adverse effect [on the Hooghly]...If this source of supply cannot be conserved, the loss must be made up from some other sources. The Ganga is the only alternative source.' (37)

In its conclusions, the committee commented upon the deficiency of hydrological evidence of deterioration, but it was nevertheless convinced of the existence and causes of deterioration:

'...it is clear that the entire river system shows signs of deterioration, on account of lack of perennial upland discharge as also to the play of natural tidal forces. Natural restoration of dry weather flow of upland water is definitely impossible. It has not been possible to establish the existence of deteriorative trends by analysis of hydrological data because they do not exist for the upper reaches and are not sufficient in the lower reaches of the river.' (38)

The report of the Man Singh Expert Committee was the last systematic investigation into the Hooghly problem to be published by the Government of India. The Committee's analysis of the problem appears to be the diagnosis for which the Farakka Barrage Project was chosen as remedy.

#### Definitive description of the deterioration

The definitive statement of the problem is, however, given in Preservation of the Port of Calcutta (39), the Indian Government's official (that is, limited circulation) report on the Farakka Project. In this, new evidence is presented to corroborate the assertion that the Bhagirathi-Hooghly is deteriorating, and thus to justify the project. This new evidence can be summarised as follows:

1. The 'bulge' of the freshet discharge curve of Kalna, defined as the ratio of the number of days when the discharge is greater than 100,000 cusecs to the number of days when the discharge is above 40,000 cusecs, has decreased from 0.9 in 1936 to 0.5 in 1956 (40). This reduction indicates a change in the substained

high discharge of water flowing from the Ganges into the Bhagirathi.

2. Regular measurements of cross-sectional areas of the Hooghly show a progressive reduction in its capacity, varying between 1% per year in the upper reaches to 0.3% per year lower down (41).
3. Despite intensive dredging, the depths over the river's bars have substantially decreased, as is shown in the following table:

BARS	DEPTH REDUCTION % 1920 - 1924	
Panchpara	26	
Sankral	29	
Munikhali	42	
Pirserang	29	
Poojali	22	
Moyapur	4	
Royapur	15	
Ninan	44	
Eastern Gut	18	(42)

The description of the processes of siltation given in Preservation of the Port of Calcutta is essentially the same as the Man Singh Committee's description (quoted earlier). In addition to the difficulties for navigation of the Hooghly, the former report noted two further consequences of deterioration; increases in the intensity and frequency of bore tides and in the salinity of Calcutta's water supply.

These two secondary consequences of the siltation of the Hooghly are well-substantiated and clearly significant. Tidal bores caused damage to jetties and ships moored in the river and, because they occurred during spring tides which would otherwise be used for moving ships up river, they increased the congestion of shipping. Calcutta's water supply comes from the Hooghly. By 1936, the salinity of this water was sometimes above the potable limit, and by 1959, salinities of almost ten times this limit had been recorded (43).

Preservation of the Port of Calcutta provided the evidence for the deterioration of the Hooghly, the description of the processes of



siltation, and an explanation of the consequences of deterioration, on which the decision to build the Farakka Barrage Project had been taken. This was the explanation, as supplied to officials of the Government of India and to the Government of Pakistan, of the problem which the project was intended to overcome.

### CONCLUSIONS

In retrospect, two aspects of these enquiries attract attention. Firstly, we have seen in this chapter that the characteristic feature of investigations into the decline of the Hooghly is not, as the Indian Government claims, unanimity; it is uncertainty. Secondly, it has also been shown that, despite this uncertainty, several of the investigators were predisposed to recommend preventive action to avoid the possibility of deterioration.

Of the three major governmental committees of enquiry, in 1854, 1916 and 1952; only the last concluded unanimously that there was clear evidence of deterioration. The Hooghly Commission of 1854 was divided on the issue and, in 1916, the Stevenson-Moore Committee noted the difficulty of arriving at a 'definite conclusion'.

Individual experts who examined the matter arrived at no greater certainty. There was, as Oag noted in 1939, a 'popular belief' that the Hooghly was deteriorating, but, as he and Webster reiterated, the evidence was inadequate to establish this belief. The heated debate which arose in response to Vernon Harcourt's 1905 analysis clearly indicated both the importance of the question of deterioration and the sensitivity of the Calcutta Port Commissioners. It did not, however, resolve the matter.

Turning to the second conclusion of this chapter, it might reasonably be expected that a recommendation for action to halt deterioration would only be made by investigators who had found clear evidence that deterioration was taking place. This was not always the case. Apparently inconsistent recommendations were made by Oag, Webster, and the Stevenson-Moore Committee.

The Stevenson-Moore Committee was, as we have seen, uncertain that deterioration was taking place. Such uncertainty notwithstanding, it recommended 'that steps should be taken to ensure a flow of water through the upper reaches sufficient to keep open the channels...' (44). This apparent inconsistency is explained by the terms of reference of the Committee. The Government of Bengal had asked it to suggest action to improve the rivers 'feeding' the Hooghly with water from the Ganges. In this case, the Government of Bengal had prejudged the issue. Even should the anxiety about the river prove unfounded, the state government still wanted a recommendation for action.

Oag, the river surveyor who, in 1939, was asked to review and bring up to date the report of the Stevenson-Moore Committee, came to similar somewhat inconsistent conclusions. He decided that the navigability of the river had improved over the previous century, but he also thought it 'essential to obtain control over the feed water entering the Hooghly...' (45).

The Chief Engineer of the Port Commissioners, Webster, found no evidence of progressive and general deterioration of the river but he did find indications of decreasing fresh water supply to the Hooghly. He too identified a 'need to take all possible steps to improve the Headwater supply of the Hooghly...' (46). Webster seems to have recognised the inconsistency of this recommendation. He prefaces it with a phrase indicating embarrassment: 'No apology is made however, for re-emphasising the need to take all possible steps...'

In none of these three reports is there evidence proving, to the satisfaction of their authors, the deterioration of the Hooghly. Nevertheless, each report recommends that measures should be taken to stop this deterioration. In each case pre-emptive measures were proposed. The level of anxiety, in the commercial community and in the Government of Bengal, was such that action was generally thought desirable to stave off the possibility that the river might deteriorate.

It was not any action which these three inquiries suggested. Oag, Webster and the Stevenson-Moore Committee all recommended action to control the headwaters of the Hooghly. In Chapter Two the development of support for a project to provide that control is documented.

## Chapter Two

### AN IDEA AND ITS PROPONENTS

This chapter provides a history of the concept on which the Farakka Barrage Project is based. It is a history which differs in at least one significant respect from the Indian Government's account. According to the Government of India, the idea of diverting water from the Ganges to overcome the deterioration of the Hooghly was the suggestion of a British military engineer Lieutenant Colonel (later Sir) Arthur Cotton in 1853. Cotton did propose diversion of water from the Ganges into the Hooghly, but he suggested it as a solution to a different problem. He was concerned with inland navigation on the upper reaches of the Hooghly (the River Bhagirathi) not with the deterioration of the estuary of the Hooghly.

The Indian Government have repeatedly used Cotton's role to legitimate the Farakka Barrage Project; as, for example, in this account:

'The Ganga Barrage is not a new Project. That, owing to the change in the course of the main stream of the Ganga - as stated above, at one time the Ganga found its way into the sea through the Bhagirathi-Hooghly - the Calcutta Port had begun to suffer from insufficiency of headwaters was observed over a century ago. To arrest this deterioration, Sir Arthur Cotton, an eminent Engineer, suggested as far back as 1853, that a barrage at Rajmahal, with a canal from the Ganga to the Bhagirathi should be constructed to supply fresh water to the Hooghly. Unfortunately, this suggestion was not followed up owing to an inadequate appreciation of the dangers of the situation.'

(1)

The Indian Government's history of the Farakka Barrage is selected to establish the unanimity of the experts who investigated the Hooghly and the continuity of support for the project from colonial times to the present. Chapter One showed that the experts were not unanimous. In this chapter we shall see that the colonial Government of India did not decide to support the project; and it

was not until 1958 that support for the project began to crystallize within the central government of independent India.

Support for the idea of a Ganges Barrage only came after a prolonged campaign of parliamentary pressure. In 1952 the Man Singh Expert Committee concluded that the project was both necessary and urgent but it was apparently not this report which convinced the central government ministries of the importance of the project. The records of the Indian parliament show that in the mid-fifties the Government of India thought the Farakka Barrage should be the responsibility of the state in which the project would be located and to which most benefits would accrue, West Bengal. It was only in 1958 and 1959, after a sustained campaign of questioning by MPs for West Bengal, that the Ministries of Irrigation and Power and Transport reluctantly conceded that the Farakka Barrage Project might be of national importance and therefore a central government responsibility.

#### Cotton's ideas

Cotton is best known for his work as Chief Engineer of Madras, where he was responsible for irrigation works which brought prosperity to a considerable population. He seems to have learnt some of his construction techniques from the methods used in the construction of the Grand Anicut, a huge weir built across the River Cauveri in about AD 200 (2).

Cotton made two separate suggestions for building a weir across the Ganges. The first was published in 1854 in a book dedicated to popularising the view that water transport would be more appropriate for India than the then expanding railways (3). Cotton thought that a system of inland water communications would enable India to provide England with cheap agricultural produce (4). It was in this context that he proposed:

'Perhaps the greatest improvement that could be made in communications in all India, in comparison of its cost, would be the construction of a weir across the Ganges below the head of the Bhugirutty, to turn the whole stream into that river in the dry season. This weir would

keep the Bhugirutty navigable throughout the year, and effect an immense traffic.'

(5)

Cotton's book elicited an official response from the Government of India's Consulting Engineer, Colonel Baker. Baker told the Governor General, Marquis Dalhousie, that although Cotton's plans were 'eminently deserving of attention', he, Baker, did 'not attach much importance to the suggestions Cotton has offered for the improvement of the Ganges' (6).

Whilst defending his scheme against Baker's criticisms, Cotton elaborated on a feature he thought Baker had overlooked. Cotton intended that reservoirs should be constructed in the upper reaches of the Ganges, Jamuna, Chambal and other rivers. These reservoirs would store water to increase the dry season flow of the Ganges. Without that extra water, wrote Cotton, 'the mischief arising from the Ganges weir would be really incalculable' (7). In this passage, Cotton was anticipating that river navigation would become difficult lower down the Ganges if large diversions were made at a Ganges weir (such problems did arise in 1976 and 1977, see Part III). He was also anticipating the solution to those difficulties now proposed by Bangladesh (see Chapter 15).

Cotton devised a second scheme in 1858. He was in Calcutta to advise on the development of the Cuttack Rivers (in Orissa), when the Lieutenant Governor of Bengal sent a request to the Department of Public Works for whom Cotton was working:

'that, if Colonel Cotton's duties should permit, he may be allowed to proceed under the directions of the Lieutenant Governor to the heads of the Nuddea Rivers and to Rajmehal, to examine the Ganges at those places, and assist by his advice in elucidating the much discussed and deeply interesting question whether anything can be done to facilitate the navigation of the Nuddea Rivers during the whole year, and whether it may not be possible to provide irrigation for such parts of the Kishnaghur and Jessore districts as are now liable to suffer from drought as well as from excessive inundation...'

(8)

Cotton visited the areas and, on his return, wrote a memorandum

which proposed a canal from Rajmahal to Calcutta (Cotton's two schemes are shown in Figure 2.1). He thought a weir could be built at Rajmahal to divert water into this canal but, this time, he was proposing to divert a much smaller quantity of water. The canal he proposed would have had a capacity of about 7,500 cusecs (9). This is only one fifth of the capacity of the canal built as part of the Farakka Barrage Project. Considered from another angle, this diversion capacity represents only 18% of the minimum recorded flow of the Ganges (42,000 cusecs), whereas the canal built has a capacity to divert 95% of that flow.

In both proposals, Cotton was devising schemes to provide navigation in the Nuddea (Nadia) Rivers, the upper reaches of the Bhagirathi-Hooghly. There is no indication in the works quoted that he was concerned with the lower reaches of the river system. The problem of the Hooghly and the problem of Calcutta Port were, as far as he was concerned, the seasonally restricted and circuitous navigation between Calcutta and the Ganges. He was not concerned with the navigation between Calcutta Port and the sea. So far was he unconcerned about the deterioration of the lower river that he proposed to dam the Bhagirathi in the process of constructing the navigation and irrigation canal which he thought would supplant it (10).

It is clear that Cotton's proposals were not precursors of the Farakka Barrage Project. In addition, Cotton was aware of the consequences for downstream areas of diverting water from the Ganges into the Bhagirathi. We shall see in later chapters that these downstream effects were underrated by the Indian Government and played an important role in the dispute over the Farakka Project.

#### 1865 - 1947, Recommendations for a Ganges Barrage

In 1865, Leonard mentioned 'two rather impractical suggestions' for improving the Hooghly. One was to admit more fresh water from the Ganges, the other to shut off Ganges water completely. He concluded:

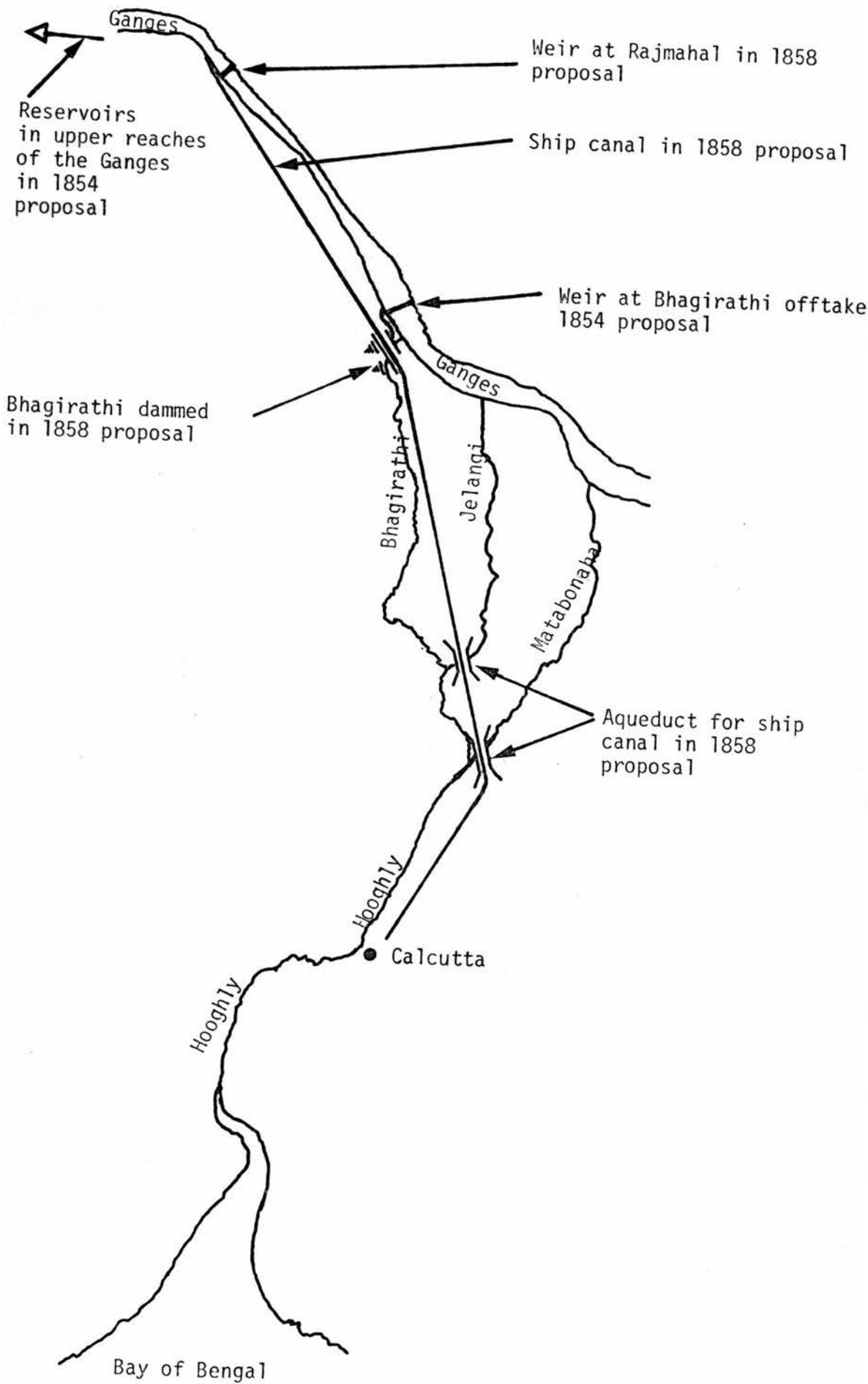


FIGURE 2.1 Sketch Map of Cotton's two proposals for improving navigation between Calcutta and the Ganges.



'A weir across the Ganges is really the only practicable plan which has not been tried, and that is too great and too difficult to work to be undertaken without much more probability of success and much greater results than we are at present in a position to promise.' (11)

In 1919, the Stevenson-Moore Committee recommended action to maintain the Hooghly's headwater supply from the Ganges. It thought this could be done, however, by dredging the channels where the Nadia Rivers diverged from the Ganges (12).

In the 1930s, another eminent British engineer, Sir William Wilcocks, revived the idea of a Ganges Barrage (13). He intended the barrage to provide primarily irrigation, but he thought it could also prevent siltation in the Hooghly. The Chief Engineer of Bengal rejected the proposal as impractical and too costly (14).

Webster's investigation of 1946 (15) was the first to provide a substantial recommendation for a Ganges barrage. Webster's recommendation is worth quoting at length because it shows he was aware of the complexity of the problem and that he thought only quite a small diversion from the Ganges would be required:

'It is understood that the Government of Bengal have under consideration at least three schemes which may have far reaching effects on the River Hooghly viz. The Damodar Valley Project, the Mor Dam Project and the Ganges Barrage, but so far, the Commissioners have not been supplied with any information concerning these schemes and their probable effects on the regime of the Hooghly.

'The most important scheme from the Commissioners' point of view is the proposed Ganges Barrage, which is believed to aim at resuscitating the Nadia Rivers and providing a perennial discharge into the Bhagirathi of something in the region of 10,000 cusecs. This would undoubtedly be of great value in improving the condition of the Hooghly, and if this dry weather flow can be coupled with an ample freshet discharge, then the problem of the maintenance of the Hooghly as an active river, instead of a possible tidal creek, may well be on the way to a solution

'It has been suggested that a continuous flow of headwater through the Hooghly, will in time, improve the tidal

reaches of the river to the extent of deepening the navigable channel for ocean going craft, thus rendering further dredging operation unnecessary. This is undoubtedly a 'consummation devoutly to be wished', but unfortunately the problem is not quite so simple as it would appear. In the first place we are not dealing with a straight channel in which the axes of the flood and ebb-tides are coincident, but with a winding river in which divergences of flood and ebb-tides as well as tidal, seasonal, and other periodical variations have to be taken into account.

'It is impossible to predict the extent to which the navigable channel would be improved by a constant and adequate headwater supply, but speaking generally it is doubtful if dredging or river training works could be entirely eliminated, on the score of drafts alone, while the curvature of the river must continue to impose restrictions on the length of deep draft ship which can be navigated, especially in the upper reaches.

'It is recommended however, that a strong representation be made to Government regarding the need for improving the headwater supply to the River Hooghly, with particular reference to the proposed Ganges Barrage, and similar schemes which may affect the river.'

(16)

Webster's was, anyway, only one of the opinions held within the port authorities. An apparently different view was articulated by the Chairman of the Port Commissioners. Giving evidence to a government committee, he suggested that the deterioration of the Hooghly could be circumvented by the construction of a ship canal linking Calcutta Port to the sea (17). (This project is described and discussed in the following chapter.)

At the end of British colonial rule, then, the idea of diverting water from the Ganges into the Bhagirathi was no more than an idea. The Port Commissioners, representing the interests who were presumably most affected by the problem of the Hooghly, had not decided to exert pressure for the implementation of the project. They had held discussions with the Central Water and Inland Navigation Commission on the subject of the Hooghly in May 1947, and the CWINC had started to construct a model of the Hooghly (as recorded in the previous chapter), but that was as far as the idea had developed.

1952, The Man Singh Expert Committee

The question of a Ganges barrage was raised (as will be described in Chapter Five) before the Bengal Boundary Commission in 1947, and in 1952 unequivocal support for the project came from the Expert Committee on the River Hooghly and the improvement of its Headwater Supply, under the chairmanship of Shri Man Singh (18). The Man Singh Committee reported it was:

'firmly of the opinion that deterioration can not only be arrested, but improvements can be effected which will attract larger trade to the port...Introduction of perennial headwater supplies can effect permanent improvement in the regime of the river enabling further cuts in maintenance costs.'

(19)

Although the committee was unable to say exactly how much water should be diverted, it was in no doubt that a Ganges barrage was the only way of improving the Hooghly.

In a long and authoritative article, published some months after the committee had submitted its report, S C Mazumdar, a member of the Committee and Consulting Engineer to the West Bengal State Government, expressed his fears that the problem was not being taken seriously:

'from our recent inquiries in connection with the work of the Hooghly River Expert Committee, I have gathered the impression that the importance of the headwater supply has not yet been sufficiently realised even in some responsible quarters. The impression seems to prevail that since by far the major problem of the Hooghly flow is contributed by the tides, it should be possible to maintain the Hooghly as a navigation channel by tidal inflow and training works.'

(20)

Mazumdar's anxiety was justified. Another nine years elapsed before a project for headwater control was sanctioned. The parliamentary record suggests that much of this time was taken up by a tussle between state and central governments over the priority of and responsibility for the project.

## Parliamentary pressure to secure central government support

By 1952, the project was sufficiently well known and supported, at least within West Bengal, for two questions to be put in the Lok Sabha (lower and directly elected People's House of the Indian parliament) and a resolution passed in the budget session of the West Bengal State Assembly. An indication of the Union Government's uncertainty about the scheme at that time can be drawn from the response of the minister when that West Bengal resolution was brought to his notice. The Government of India, he said, have asked West Bengal how they propose to finance the scheme (21).

Under the Indian Constitution the legislative power to implement river development projects is divided between Union and State Governments. River development is a state responsibility except when parliament legislates that central control of an inter-state river is in the public interest. Major ports are, however, a Union responsibility (22). The prime purpose of the Farakka Barrage being the improvement of Calcutta Port, it was eligible for central finance, but the secondary purposes of the project, that is salinity control and inland navigation, were state concerns. It was therefore possible for the Union Government to procrastinate. Not only did the benefits of the project accrue to West Bengal, but it was also arguable that constitutional responsibility for the project lay there too.

In 1954, a West Bengal Member of Parliament managed to extract an answer from the Deputy Minister of Railways and Transport in which the Minister accepted that the River Hooghly was deteriorating as a result of 'lack of perennial upland discharge' and the 'play of natural tidal forces'. The Ganges barrage scheme was, he said, under consideration (23).

Another West Bengal MP tried to increase the pressure in the following year by asking:

'Is it not a fact that the research station at Poona has commented that unless the Ganga Barrage scheme is taken up the passage of the Calcutta Port is not safe

for transportation, and if so, why is the Ganga Barrage not being taken up at the present?...

The Deputy Minister replied:

'...There is no use of raising this alarm that the Calcutta Port will be threatened if something is not done. This alarm has been there for a number of years. But the particular question whether there should be a barrage constructed at a particular point is, I think, under the consideration of the Ministry of Irrigation.' (24)

In 1956, a 'cut motion' (25) was introduced which proposed a cut in the grant of the Ministry of Irrigation and Power by a nominal Rs 100 because of the 'delay in preparing the Ganga Barrage scheme' (26). A similar motion was put the following year (27). Both motions were defeated along with other expressions of discontent.

At this stage, in the mid-1950s, MPs representing constituencies in West Bengal thought the project was of national significance and considerable urgency; they suggested it should be funded by the central government. That the Union government on the other hand thought of it as a state concern of low priority was made clear by the Minister of Irrigation and Power at the end of the 1957 debate on his Ministry's budget. The project is under 'active consideration', he said, but everything cannot be done at once and, anyway, West Bengal has the Damodar Valley Corporation (28). A state cannot expect, he implied, to have more than one major project.

#### 1958, The Lok Sabha debate

In September 1958, the Minister of Irrigation and Power laid a statement on the Ganges Barrage Project before the Lok Sabha, and in November it was debated by the house for two-and-a-half hours (29). This was the most substantial discussion on the Farakka Barrage to be held in the Indian parliament. It began with West Bengal MPs expressing their frustration, and ended in confusion with the Minister of Transport alluding to a secret he was not able to divulge.

T K Chaudhuri, Member for Berhampore, West Bengal, commented upon the six years of 'surprising procrastination, evasiveness, and indecisiveness' since the project had been mooted in 1952. Two more West Bengal MPs contributed lengthy speeches with similar expressions of frustration. One of them, H N Mukerjee of Calcutta Central drew the house's attention to the secrecy surrounding an expert report on the project (30).

The Minister of Transport, S K Patil, then gave a long and curious speech, in which he dismissed various explanations which had been put forward for the delay in starting the project. It was not, he told the house, that central government did not accept the importance of the project; not that there was any disagreement amongst experts; nor was there any delay as a result of Pakistan's objections; it was not even a problem of money, if necessary India would finance the project without aid. However, there was a reason for the delay, but he could not tell the house:

'the difficulty that we are experiencing is...that sometimes perhaps too much of expression is no good on this subject...

'Surely, the Government's mind, if it is occupied on any particular subject, it is on this more than on anything else. As soon as we find an opportunity of going into it, we can do it. Beyond this, hon Members must not expect me that I should go into any more details...Whatever hurdles there may be in our way, to which I have not made a complete reference, surely hon Members will understand that there is some weighty reason...'

(31)

Towards the end of the debate, the Deputy Minister of Irrigation and Power gave a more mundane explanation of the delay. Heavy flooding in 1954, he said, had eroded the river bank at Farakka, and, as a result further investigations were required (32).

#### Central Government Acceptance

Patil's enigmatic reticence notwithstanding, it is clear that by this time, 1958, the Farakka Project had acquired the support of the two relevant central government ministries, those of transport and of irrigation and power. Financial and political sanction had

not been obtained - that would require several more years - but ministerial backing had.

The Minister of Irrigation and Power's statement, which was the subject of the 1958 debate, clearly indicated that Ministry's support for the Farakka Barrage. It said that the barrage was 'the most effective way of stopping the long term deterioration' of the Hooghly (33).

The Ministry of Transport's position was made clear in its report for the year 1958-59. Previous and subsequent annual reports are silent on the project, but in the 1958-59 report this passage appears:

'The Government of India are...of the view that the most effective method of arresting the long term deterioration [of the Hooghly] is by regulation of upland supplies to the River Hooghly through the River Bhagirathi which can be achieved by the construction of a barrage on the Ganga at Farakka.'

(34)

#### CONCLUSIONS

The Indian Government's account of the history of the Farakka Barrage Project emphasises three features: that it was an eminent British military engineer who suggested the project in 1853; that the many experts who examined the Hooghly problem during the following century were unanimous in supporting it; and, by implication, that there was a continuity of support for the project which transcended the transfer of power from the colonial to the independent government. These points are all included in a speech which the Indian Foreign Secretary made to the Special Political Committee of the United Nations in 1976. He said

'Mr Chairman, this problem of Calcutta Port has been studied for more than a century. Enquiries into the problem were started as early as 1853 by Sir Arthur Cotton and continued by a long series of experts and expert commissions. All of them concluded that the only means of saving the port from its impending destruction was by increasing and regulating the headwater supply through the construction of a barrage over the Ganga near Farakka. There are few examples in history where

a river problem has been investigated so thoroughly and for so long a period and where so many experts, applying their minds to the problem came to the same conclusion on what ought to be the best solution to the problem...

'It will be observed that Farakka is not a recently conceived project... Even its technical feasibility was established decades before the partition of India.' (35)

We have seen that these appeals to history for support are misplaced. Cotton was not concerned with the problem of the siltation of the lower Hooghly. He wanted to provide navigation on the Bhagirathi. He was also sensitive to the difficulties which might be caused by large diversions from the Ganges. One of his suggestions, the 1858 proposal, was for a modest diversion; and the other, took account of the needs of the downstream areas with a proposal for storage of the headwaters of the Ganges. Cotton's appreciation of downstream consequences is in marked contrast to the lack of concern demonstrated, as we shall see in the next chapter, by Indian engineers in the late 1950s.

It has been shown that the experts were not unanimous about the deterioration of the Hooghly, nor about its solution. It is clear that the technical feasibility of the project was not established prior to the partition of India. Even in 1947, there was disagreement within the Calcutta Port Commissioners about the best solution to the problem of the Hooghly. The Chief Engineer was in favour of a barrage across the Ganges, but the Chairman wanted a ship canal built instead.

It has also been argued, in this chapter, that centre-state conflict over the priority of and responsibility for the Farakka Barrage was the prime reason for the delay in implementing the project. Alternative explanations for the delay were discussed during the Lok Sabha debate in 1958 but they are not convincing.

We shall see later, in Chapter Five, that there were no consultations with the Pakistan Government until 1960. It seems implausible, therefore, to suggest that the Indian Government were seriously considering Pakistan's objections. A second explanation that further



technical investigations necessitated delay seems equally unlikely. Whilst investigations may have continued during the period 1952-58, the record of technical publications suggests that few significant new tests were made.

Obtaining the sanction of any government for a large and expensive project requires the decisions, spread out over time and place, of a variety of government bodies. In this case, even after the relevant ministries had pledged their support for the project, there remained the hurdles of the Planning Commission, the National Development Council, the Ministry of External Affairs, the Cabinet and the Prime Minister, himself. These obstacles must have been surmounted between 1958 and 1961, when sanction for the project was announced. Chapter Four will be devoted to a description of the political, economic and physical circumstances which may have contributed to the clearing of these final obstacles.

The intervening chapter, Chapter Three, investigates the potential alternatives to the Farakka Barrage, the doubts which were raised about the technical rationale of the project and the consideration which the Indian Government gave to the downstream consequences of the project.

## Chapter Three

### ALTERNATIVES, OPPOSITION AND AMBIGUITY

This third chapter is an investigation into three separate questions each closely connected with the decision to build the Farakka Barrage Project and with the subsequent dispute initiated by that project.

The first question is: What alternatives to the Farakka Project were available? The Pakistan and Bangladesh Governments believed that there were better ways of providing a navigable channel between Calcutta Port and the sea (1). These alternatives were preferable, from the perspective of the inhabitants of East Bengal, because they did not threaten to damage East Bengal. Were they, however, feasible alternatives? It will be argued in this chapter that their practicality was not proven, but nor was it disproven. The Indian Government bears the responsibility for rejecting these alternatives, and the evidence suggests that they were rejected on the basis of only a cursory investigation.

The second question is: What feature of the technical rationale of the Farakka Barrage Project allowed experts advising the Governments of India and Pakistan to disagree completely about the efficacy of the project? In 1957, Professor Walter Hensen of Hanover University was employed as a consultant by the Government of India to review the Farakka Barrage Project (2). Four years later, the Pakistan Government asked two American consultants, Professor Arthur T Ippen of Massachusetts Institute of Technology and Clarence F Wicker a retired hydraulics engineer, to carry out a similar review (3). The two reports these three consultants wrote came to opposing conclusions and laid the foundations for a technical controversy which has never been fully resolved. Hensen thought that the Farakka Barrage was the only solution to the Hooghly problem, whilst Ippen and Wicker thought it might make the problem worse.

The alternative explanations of estuarine hydraulics and sedimentation which led the consultants to opposing conclusions will

be explored in this chapter. It will be argued that the evidence available was not adequate to enable a choice to be made between the consultants' ill-formed 'models' of what was happening in the Hooghly Estuary. There was, it appears, a 'technical ambiguity' in the data describing the Hooghly.

Finally, this chapter investigates the third question: How much consideration was given by the Indian Government to the likely consequences of Farakka Barrage diversions for areas further down the Ganges? As we shall see in Part II, much of the dispute about the Farakka Barrage arose from fears that it would cause damage to East Bengal. Part III shows that those fears were well-founded: the operation of the Farakka Barrage did have serious consequences for downstream areas. It is important to know if the decision to build the barrage was taken with a knowledge of its probable consequences. When Cotton proposed a similar project to meet different ends in 1854, he was aware of the damage his project could do. He even suggested how this damage could be avoided (see Chapter 2). Did something happen in the intervening century to make Cotton's caution unnecessary? Pakistan was not given access to the designs of the Farakka Barrage until the project was in its final form. Were the disbenefits, which Pakistan, and later Bangladesh, would suffer, therefore ignored? Such evidence as is available suggests that Cotton's caution was still relevant, and that India did largely ignore the disbenefits of the project.

For the discussion of each of these three issues the evidence is incomplete. In each case the report of the original investigation made for the Government of India remains confidential. However, summaries of those reports are contained elsewhere. This chapter is based on those summaries. The most important one is of the Indian Government's investigations into the Farakka Barrage Project and its alternatives immediately prior to the authorisation of the project (4). This account is provided by K K Framji who directed the investigations.

## Alternatives to the Farakka Barrage

Alternative means for providing navigable access to Calcutta Port from the sea fall into two categories. There are four alternatives which can be classed as substitute schemes: a ship canal, a barrage with a ship canal, increased dredging and an alternative port. Then, in a second category, there is the view of Kapil Bhattacharya, a Bengali engineer, who opposed the project on the grounds that the mechanism by which the Hooghly was deteriorating had been misunderstood. Bhattacharya presented a different conception of the problem and an alternative remedy.

### Substitute Schemes

#### A ship canal

In 1946, the consulting engineers Messrs Rendel, Palmer and Tritton of London produced a feasibility study of a ship canal to link Calcutta Port to Diamond Harbour, lower down the Hooghly (see Figure 3.1). Their report concluded:

'The construction of the proposed ship canal is a feasible engineering project, with no difficulties beyond those normally associated with such projects.' (5)

The canal would have by-passed some of the worst bars in the Hooghly. The engineers estimated that the cost of a 180 ft wide canal would be Rs 14.5 million. They were not, however, asked whether the canal would solve the navigational difficulties experienced by ships attempting to enter Calcutta Port.

The Chairman of the Calcutta Port Commissioners, giving evidence in 1946 to a Government Inquiry, said that a ship canal could a) allow ships to avoid the most difficult reaches of the Hooghly and b) allow a considerable reduction in the amount of dredging required to maintain the Hooghly. He noted that the three suction dredgers then in use were 'practically solely employed on the bars between Garden Reach and Diamond Harbour' (6).

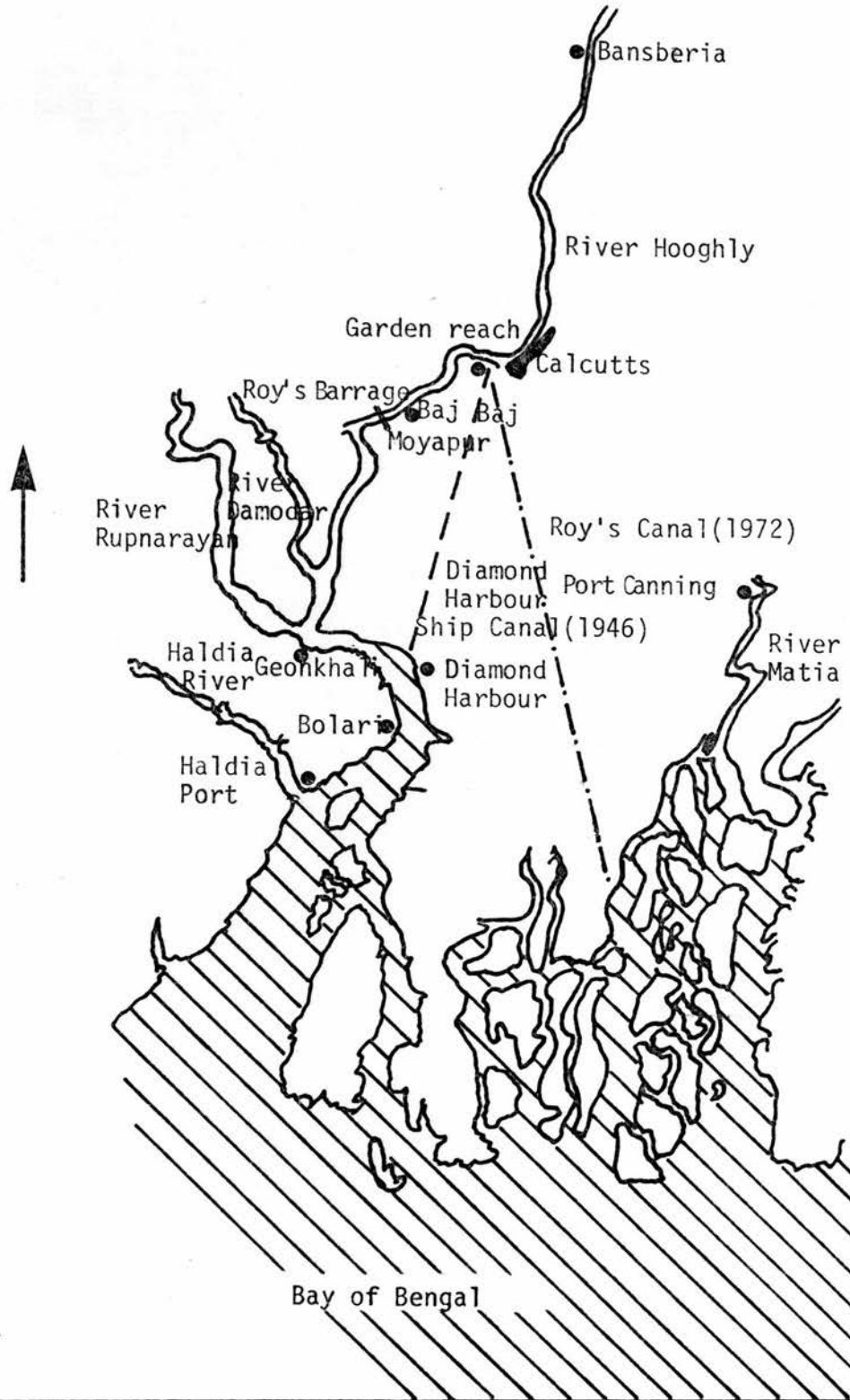


Figure 3.1 ALTERNATIVES TO THE FARAKKA BARRAGE PROJECT.

Not to scale

In the early 1950s, the ship canal scheme was under consideration (7). But in 1952 the Man Singh Committee concluded that the Farakka Barrage Project was preferable. The committee wrote that a deep channel 'can be achieved more satisfactorily without the ship canal by providing training works and ensuring perennial headwater supply' (8).

Subsequently, further hydraulic model tests were carried out which showed that 'if the river were left to itself, it would gradually deteriorate' (9). Since this deterioration would also take place in reaches of the river below the seaward end of the canal, it could over-ride the advantages of the canal. The tests were later reported in more detail:

'To test this [ ship canal ] idea the model was run with freshet season followed by dry season for an equivalent period of seven years. Results showed that the tidal ranges at Bansbaria reduced first and then as the experiment proceeded the same effect was observed at Garden Reach. This effect gradually proceeded downstream. The low waters rose indicating likely deterioration in the channel retarding tidal propagation. It was apprehended that in the long run this deteriorative trend would affect the lower reaches as well. The proposal [ for a ship canal ] was, therefore, dropped.' (10)

Although the researchers noted that the limitations of the model exaggerated the speed with which the river was likely to deteriorate, they concluded that the deterioration was inevitable.

These model tests seem to have been decisive in turning the attention of Government of India engineers away from this alternative (11).

#### Barrage and ship canal

There is however a brief and tantalising mention of a more sophisticated alternative in Framji's report of his investigations (12). Framji describes a 'new ship canal proposal' consisting of a straight, 50 mile long canal with a barrage at Budge Budge. This alternative looks similar to one publicised in 1974 by L B Roy, and subsequently backed by the Bangladesh Government (13). Roy's

alternative is shown in Figure 3.1.

Framji dismissed this proposal because he thought there would be difficulty in constructing the canal through 'creeks and quagmires' and because meandering and sedimentation would occur in the canal and in the river above and below it (14). He thought that this alternative, like the earlier ship canal scheme, would be neither effective nor lasting without increased headwater to the Hooghly (that is, without the Farakka Barrage).

Unfortunately, Framji does not provide the evidence on which he bases his assertions. Possibly the Government of India carried out tests on this alternative; if so, they are not reported in the usual technical journals. In the absence of such tests and of a detailed description of the 'new ship canal proposal', Roy's alternative is all that can be assessed. At a superficial level this appears promising. Roy's barrage is intended to maintain the river level upstream of Budge Budge one metre higher than mean sea level. This is intended to reduce tidal bores in this section of the river. At the same time, the barrage would allow saline water into the upper reaches of the river only for a shorter period than at present, thereby reducing the salinity at Calcutta. The barrage is further intended to provide an obstacle to silt being carried inland by the flood tide. If it could do that, then the steady deterioration of the Hooghly, the problem which led to the 1946 ship canal proposal being shelved, might be halted. However, it is not clear that deterioration of the river below Budge Budge could be prevented. This alternative cannot be assessed without detailed surveys of the proposed route and tests of the operation of the proposed barrage, and Framji's account suggests that these surveys and tests have not been carried out.

### Dredging

The lower Hooghly has been continuously dredged since 1906 in an attempt to maintain a navigable channel. Almost invariably shallow bars were dredged and the silt redeposited in a deeper section of channel (15). As late as 1976, the Bangladesh Government believed

that dredging represented an alternative to headwater diversion. The Indian Government, with their experience of the size and cost of the dredging already being carried out in the Hooghly, dredging which was not preventing the deterioration of the navigable channel, did not believe that 'more effective' dredging represented any real alternative.

Framji, in his study of the alternatives to Farakka, concluded that dredging could be no more than a temporary palliative:

'With the super-imposed long-term deterioration in the minimum navigable depths also clearly taking place and seriously limiting the navigational conditions of the approach from the sea, dredging would doubtless be not only prohibitively costly, but also an ineffective permanent remedy.'

(16)

A year or two later, in 1961, the World Bank, who had been asked to provide finance for port improvement, were less certain but, nevertheless, they did not expect dramatic improvements to be available from dredging and they proposed a study of the possibilities:

'The consensus of opinion is that no great improvement of the depths of water up to Calcutta can reasonably be expected but that by employing modern, scientific investigation and the latest research techniques it should be possible to increase the efficacy of dredging methods and suggest beneficial training works.

'...it has been agreed by the Calcutta Port Commissioners and the Government of India that a program of scientific studies of a type not heretofore attempted be undertaken promptly to determine the long-term effects of different dredging techniques on the hydraulic regime of the river in both its riverine and estuarial sections.'

(17)

The results of this study are not available (18) but, since the dredging alternative had already been dismissed and the decision taken to build the Farakka Barrage, they are not strictly relevant.

The size of the dredging being undertaken in 1961 can be envisaged from the US \$2 million being spent annually (19) and Framji



estimated that in order for dredging to be effective a dumping ground would have to be found for 100 million cubic feet of silt per year. He did not think that would be possible (20).

Some years after these estimates, the Indian Parliament's Public Accounts Committee investigated the accounts of the Calcutta Port Trust for the years 1968-69 to 1972-73. They criticised the regulation at the port. They stated that there had been 'serious mismanagement', and that 'dredger utilisation at Calcutta Port has been miserably low and the same has affected the navigability of the Port'. They noted an allegation that utilisation was low in order that more work could be given to dredgers hired from foreign private companies (21). It is possible that this low utilisation of dredgers also took place in the years when the decision was being taken that dredging could not solve the problems of the Hooghly. Perhaps better usage would have changed the picture.

Ippen and Wicker in their 1962 report to the Government of Pakistan concluded that existing dredging practice was contributing to silting in the Hooghly (22). However, they thought that permanent removal of dredged spoil from the river could provide 'effective control of navigable depths' (23).

#### An alternative port

The difficulties of navigating the Hooghly have led many observers to suggest that Calcutta is not a sensible site for a port; one nearer the Bay of Bengal would be preferable.

In 1955, there was a suggestion that an auxiliary port should be established, but the government said it was 'not considered necessary' (24). However, after a World Bank recommendation (25), investigations were started, and a port was built at Haldia (see Figure 3.1).

Haldia Port was not, however, intended as a replacement for Calcutta Port. It is not large enough to handle more than a small proportion of Calcutta's trade. It provides access for ships of up to 40 ft

draught carrying bulk cargoes. Nevertheless, an expert on ports, working at the World Bank, has said that, 'informed opinion at the time a deep water port was being considered was that Calcutta Port should be allowed to die, or to become a barge port' (26).

Framji gave two reasons for his dismissal of a new port as an alternative to Farakka. Firstly, he thought that such a port would 'require a century to develop'. Then, secondly, he argued that 'even the port of Haldia would be doomed as deterioration will positively travel downstream without the beneficence of the Farakka Barrage' (27).

A third reason, cost, is given in passing in a World Bank report:

'If it is taken as axiomatic that the present Port of Calcutta (whose replacement value alone must be greater than US \$ 250 million) will remain a major port and that access thereto must be maintained and improved to the economic limit of so doing...' (28).

At this time the cost of the Farakka Barrage Project was estimated to be Rs 564 million, rather than Rs 1,563 million, the 1968 estimate (29) (about US \$27 million and US \$120 million, respectively at relevant exchange rates). If the final cost had been known the maintenance of Calcutta Port might have seemed less 'axiomatic'.

Framji believed that the Farakka Project would halt deterioration of the river, and that without it even Haldia Port would be doomed. He therefore rejected the idea of an alternative port. In the event, Farakka or no Farakka, Haldia is suffering from siltation. The Government of India have apparently spent almost US \$100 million on dredging the approaches to Haldia with, nevertheless, a net worsening of the draught (30). With the benefit of hindsight, it seems that even Haldia would not have represented a panacea. It may be that there is no suitable site for a replacement port but, on the other hand, there are few indications that the Government of India seriously searched for one.

## Internal opposition

Kapil Bhattacharya, a Bengali engineer living in Calcutta, has for many years opposed the Farakka Barrage Project. In 1961 he wrote a pamphlet, Silting of Calcutta Port, setting out the reasons for his opposition (31). Essentially Bhattacharya believes that the deterioration of the Hooghly was caused not by a natural decline of the river's headwater, but by man's intervention in building dams on the Rivers Damodar and Rupnarayan, Western tributaries of the Hooghly. Bhattacharya's somewhat sensational resume of his argument is this:

'The Farakka Barrage proposed on the reach of the Ganga river will cause disaster in Bihar and West Bengal. By pressure of misguided public opinion [KB's italics] the Government of India is going to implement it. The government has been advised to tackle the wrong river to save the Port of Calcutta - the Bhagirathi-Hooghly. It is the Rupnarayan which should be tackled.

'In spite of my warnings the Damodar Valley Project has been implemented without taking into consideration flood-tides and tide-borne silts into the Rupnarayan and the Lower Hooghly. As a result the Calcutta Port has been killed and the main drainage channel (the Hooghly) of West Bengal choked up causing repeated flood-havocs on ever increasing scale. If my warnings against Farakka Barrage is not heeded, people will have to suffer the consequences.'

(32)

The Damodar Valley Corporation (DVC) which built the dams on the Rupnarayan and Damodar Rivers was a direct descendant of the Tennessee Valley Authority (TVA). It was established in the euphoria following the success of the TVA with the advice of those who had designed the TVA schemes. The DVC was intended to provide a multi-purpose river development to rejuvenate the fortunes of West Bengal, but it was not enormously successful. Industry was not attracted by the availability of cheap electricity, little irrigation development was introduced and, because many of the flood control dams were never built, the element of flood control in the project is not strong. Nevertheless, Bhattacharya argues that the control of these rivers took away the main flushing action in the River Hooghly. He believes that the Rupnarayan and Damodar provided much greater

velocity in flood than did the freshets of the Hooghly. Bhattacharya says that he predicted that the deterioration of the Hooghly would become serious by 1960 if the DVC dams were closed in 1955. This, he says, is what happened.

In a paper read to the 1965 Annual General Meeting of the Association of Engineers (Calcutta), Bhattacharya explained his main point:

'Prior to the DVC dams withholding the Damodar floods, the ebb flow used to be swifter and continuous during the monsoon months of June to September and there used to be little flood flow upwards in those months. Thus the bars, especially in the lower reach of the river [Hooghly], were scoured and the navigable channels were naturally maintained with occasional help of dredgers at required points. With DVC dams this natural hydraulic operation has been practically stopped with progressive deterioration of channels...' (33)

From this analysis, Bhattacharya proposed his remedy for the deterioration of the Hooghly, which was: 'perennial and rapid discharge discharges through a narrowed and deepened Rupnarayan into the lower Hooghly' (34). Bhattacharya's ideas are not rigorously defined, but his analysis has not been adequately rebutted. Both the Man Singh Committee (see Chapter One) and the Lok Sabha's Public Accounts Committee (35) discussed Bhattacharya's ideas but neither provided a systematic critique.

#### LEGITIMATION AND EXPERT CONTROVERSY

We turn now to the second question asked at the start of this chapter: what feature of the technical rationale of the Farakka Barrage Project allowed experts advising the Governments of India and Pakistan to disagree so completely about the efficacy of the project?

In 1957, Professor Walter Hensen was invited by the Indian Government to examine the problem of Calcutta Port. The Government wished to know if the Indian engineers were working on the right lines, and it also wished Hensen to confer a seal of international scientific legitimacy on the project. A former General Manager of the project, Debes Mookerjea, has written of Hensen's 'seal of approval', and



described the review in these terms:

'The study was placed before Dr Hensen. As likely objections had to be kept in view, Dr Hensen made a brief review of the proposals of 1956 and recommended the project with a tentative operation plan...' (36)

Hensen's report has never been made public even though, in the words of the Lok Sabha's Public Accounts Committee, 'the Farakka Barrage Project was based on Dr Walter Hensen's report' (37). Nevertheless, a summary of Hensen's conclusions has been published in articles by Mookerjea (38), and a more detailed summary was published in Preservation of the Port of Calcutta. This reads as follows:

'(1) The best and only technical solution of the problem is the construction of a barrage across the Ganga at Farakka with which the upland discharge into the Bhagirathi-Hooghly can be regulated as planned, and with which the long-term deterioration in the Bhagirathi-Hooghly can be stopped and possibly converted into a gradual improvement. With a controlled upland discharge a prolongation of the freshet period will be obtained, and the sudden freshet peaks which will cause heavy sand movement and bank erosion will be flattened.

'(2) The upper five bars and crossings (namely, Panchpara, Sankral, Munikhali, Pir Serang and Poojali) will be improved.

'(3) The lower four bars (namely, Eastern Gut, Moyapur, Royapur and Ninan) will also improve with the construction of training works.

'(4) With upland discharge and training works and/or dredging at some of the bars, there will be no additional difficulties encountered at the bars and crossings considered above.

The measures adopted on the Ganga-Bhagirathi-Hooghly system will not have any ill-effect on the estuary below Diamond Harbour.

'(5) The tidal reach will be improved, and the frequency and intensity of bores will be decreased.

'(6) The water supply of the city of Calcutta and its industrial areas will be improved by reduction in salinity.

'(7) The drainage capacity of the Bhagirathi and the Upper Hooghly will be improved and flood hazards in the catchment area will be reduced, and sanitation and public health will be ameliorated.'

(39)

The significance of Hensen's report is increased by the fact that two American experts, who were presented with a very similar task and much of the same information, came to opposite and equally definite conclusions. Professor Arthur T Ippen and Clarence F Wicker were engaged by the Government of Pakistan to answer eight questions, the most important of which were these:

'Pakistani engineers desire consideration of the following matters prior to undertaking further negotiations with India. They would like to know:

'(a) If the proposed diversion of sweet water into the Hooghly River will have a beneficial or a harmful effect on the problem of Calcutta Port.

'(c)...Can there be any reduction in the proposed diversion by India without adversely affecting the Calcutta Port? Pakistan is interested in reducing the diversions during the months of January through May.'

(40)

Ippen and Wicker's conclusions include the following:

'(a) The diversion of fresh water into the Hooghly River through the construction of the Farakka Barrage will not contribute to the solution of, but is likely to accentuate, the serious shoaling problems in that river...

'(b) No evidence is apparent that the economic benefits from Farakka Barrage justify the cost of the project whether or not the shoaling conditions are improved.

'(c) The dredging requirements for channel maintenance will be as high or even higher following the diversion of more fresh water into the Hooghly.

'(d) The salinity intrusion phenomena in relation to fresh water flow play a major role in establishing the shoaling regime in the Hooghly.

'(f) There is no evidence that the average fresh water flow into the Hooghly from upstream sources has decreased at least in the last 15 years.

'(g) The shoaling problems presently encountered must be largely attributed to the type of dredging practice, which has been found ineffective and abandoned in comparable situations.

'(p) Decreased flood discharges and controlled fresh water flows from the Damodar and Rupnarain Rivers have a definite bearing on the increased salinity conditions in the Hooghly.

'(q) There can be no doubt that salinity conditions near the Palta water supply intake will be improved with increased fresh water flow...

'(r) It is finally concluded that the entire complex of problems for the 'preservation of Calcutta Port' has not received adequate technical investigation by model studies simulating salinity fresh water mixing and penetration. It is suggested that a major project costing \$ 117 million should not be undertaken without receiving such attention in view of many precedents, which revealed unforeseen consequences.'

(41)

Thus, it can be seen that whilst Hensen thought that the Farakka Project was the 'best and only' solution to the deterioration of the Hooghly, Ippen and Wicker thought that the project would exacerbate the problem; Hensen thought the project would also contribute to the solution of a whole range of secondary problems, whilst Ippen and Wicker said it would only help to reduce the salinity of Calcutta's drinking water, leaving other conditions unchanged.

#### A technical ambiguity

Why should three experts faced with the same body of data come to conflicting conclusions? One possible explanation for this contradiction is the existence of what I have termed (in the introduction to this thesis) a technical ambiguity. It is possible that the data describing sedimentation mechanisms in the Hooghly was such that it could support two conflicting interpretations of the processes involved. Under one interpretation, Hensen could conclude that the Farakka Project represented the 'best and only solution' to siltation in the Hooghly, whilst Ippen and Wicker, with a different interpretation of the mechanism, could conclude that the project would 'accentuate' the problem rather than solve it.

This appears to be what happened. Without access to all the relevant Indian Government publications, notably the text of Dr Hensen's report, it is impossible to fully identify the two conflicting theories. The outlines of the two interpretations can, however, be distinguished and it can be shown that, at the very least, Ippen and Wicker were able to cast doubt upon the completeness of Hensen's (and the Indian Government's) theory of sedimentation in the Hooghly.

Hensen's view seems to correspond with that of the Man Singh Expert Committee, as quoted in Chapter One. The committee argued that the strong flood tide in the Hooghly brought sediment up the estuary which the weaker ebb tide was not capable of carrying back toward the sea. Additional fresh water flow could, according to this theory, reinforce the ebb tide so that the sediment could be carried back out to sea. This is the 'flushing' theory at its simplest.

As we have seen earlier in this chapter, Hensen's conclusions support this theory. Hensen writes that 'with a controlled upland discharge a prolongation of the freshet period will be obtained' (42). The freshet period is the period, during the monsoon season, when the Ganges contributes a considerable volume of fresh water to the Hooghly's flow. Hensen argues that controlled upland discharge, that is the Farakka diversions, will extend the beneficent flushing into other seasons of the year.

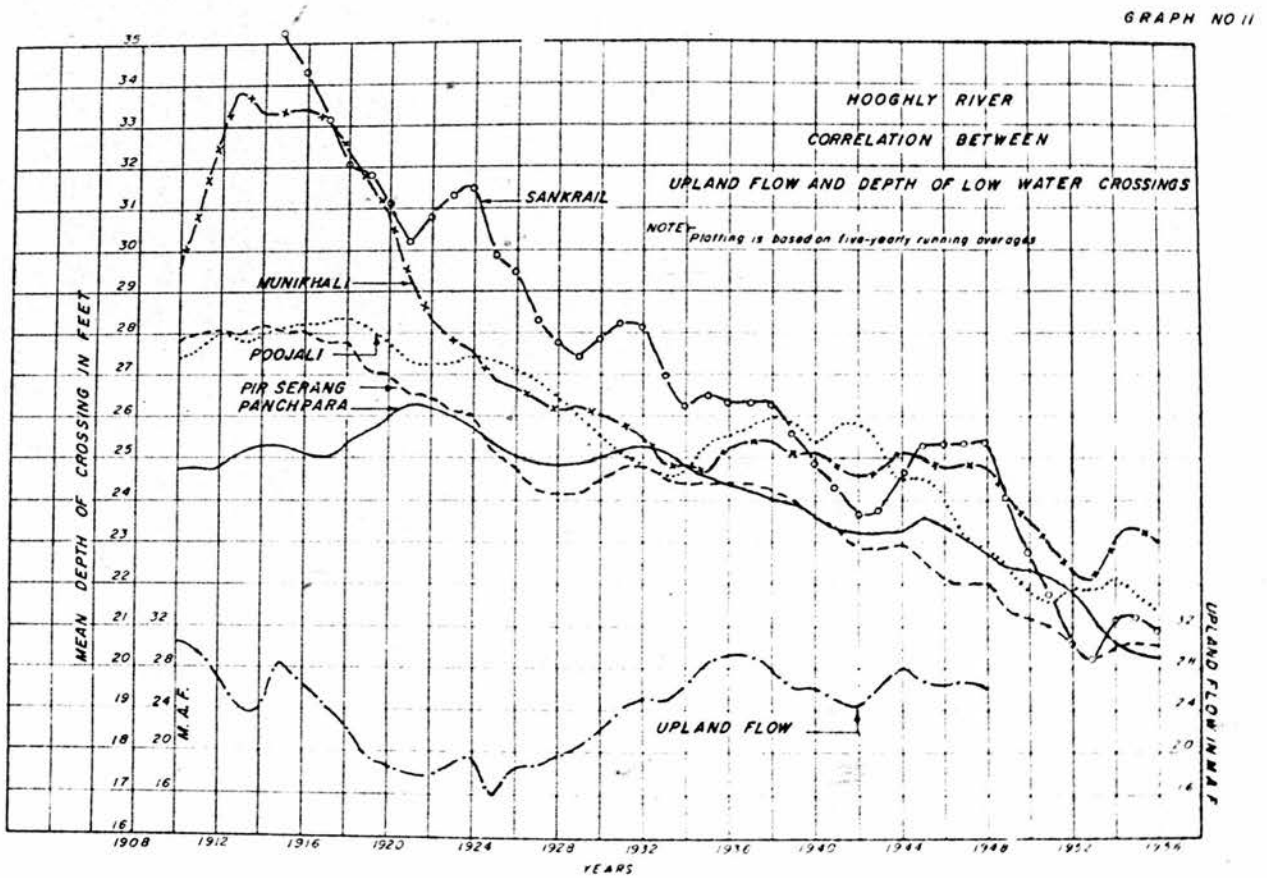
Ippen and Wicker doubt that flushing with fresh water is beneficent. They find that some at least of the observations made of the Hooghly suggest the opposite. They include in their report a graph (reproduced here as Figure 3.2) relating depth at one of the bars in the Hooghly with the volume of freshets, or upland flow. From this they conclude:

'It is immediately apparent that a higher upland discharge in the period 1935-45 than in 1925-35 produced shallower, rather than greater, depths over the crossing studied. The conclusion that an increase of discharge causes shoaling of the 'low water' crossings rather than preventing it is warranted.'

(43)



Figure 3.2: Ippen and Wicker's graph relating navigable depth in the Hooghly to the volume of freshets.



Source: Ippen and Wicker, The Hooghly River problem, mimeo, 1962.

This is a correlation which contradicts the traditional flushing theory propounded by the experts employed by the Indian Government. Ippen and Wicker suggest one reason *why* the theory does not fully explain sedimentation in the Hooghly. They maintain that a crucial variable has been ignored: salinity. On this Ippen and Wicker write:

'It has been repeatedly emphasised by India in response to requests from Pakistan for salinity measurements over the vertical and longitudinal directions that such information is irrelevant. The argument is "that the water in the river Hooghly with the prevailing high velocities, heavy turbulence and immense volume of tidal inflow, constitutes a well-mixed tidal channel at all depths. There is no indication whatever of stratification or density currents in the Hooghly".'

(44)

What is in question here is the existence and effect of salinity gradients in the Hooghly. The greater density of saline (sea) water creates a tendency in all estuaries for sea water to intrude as a wedge beneath river water flowing toward the sea. This tendency can create water 'strata' of different salinities and different densities. If a saline wedge exists then there will be a net landward movement of water near the bed of an estuary, with a compensating seaward movement near the water surface. Much of a river's sediment load is carried near to the bed of the river and a landward current in this region can cause sediment deposition. However, the picture may be complicated by turbulence in an estuary. If turbulent mixing is intense then the vertical density gradient will be slight; instead there will be a horizontal, or longitudinal, density gradient, varying from the density of sea water to the density of fresh water. This is the condition for an estuary described as 'well mixed'.

We have seen that the Indian Government, according to Ippen and Wicker, state that the Hooghly estuary is well mixed, without stratification or density currents. Ippen and Wicker say that this conclusion is reflected in the absence of experiments simulating salinity conditions and salinity-related sedimentation in the Hooghly. They contend that salinity effects cannot be ignored whether or not the Hooghly is well mixed.

Ippen and Wicker accept that the Hooghly estuary falls into the 'well mixed' category but they do not accept that salinity effects are, therefore, unimportant. They maintain, on the contrary, that salinity is the most important factor explaining the type and position of shoaling, or sediment deposition, in the Hooghly.

According to Ippen and Wicker, upstream mean velocities are to be found near the bed of well mixed estuaries. They cite river observations and laboratory simulations which have identified this phenomena. Turbulent mixing prevents defined stratification, say Ippen and Wicker, but it does not wholly remove the vertical density gradient in an estuary. The slight vertical density gradient remaining in a well mixed estuary is sufficient to cause slight, but nevertheless important, upstream bottom velocities. These currents will be weakest at the upstream and downstream ends of the portion of estuary in which saline water is mixing with fresh. It is in these zones, according to the Ippen and Wicker theory, that sediment deposition will take place. They describe the process in these words:

'As the upstream limit of the salinity intrusion is approached, the bottom currents tend towards zero and eventually reverse direction. No material moving into this zone can, therefore, be transported any further downstream and must accumulate in shoals. Only suspended material light enough to be diffused into the upper layers still may move downstream in part. However, in almost all estuaries flocculation of these fines, especially when the sediments involved contain clays, in the presence of salt water promotes the settling out of even these formerly suspended materials into the lower portions of the section and mud deposits are formed in the same area.'

(45)

In this passage Ippen and Wicker have explained that estuarial sedimentation cannot be understood without study of the salinity conditions prevailing in the estuary. The ends of the longitudinal salinity gradient define the positions where sediment carried near to the bed of the estuary is likely to be deposited and, also, the regions in which the flocculation and deposition of finer sediments can be expected.

In support of their theory, Ippen and Wicker show that the shoaling in the Hooghly is where it would be expected: at the end of the salinity gradient. They write:

'Toward the end of the dry season the salinity registers its farthest upstream advance and the profiles of Figure 5 [not reproduced] indicate that the river stretch from Hooghly Point to Garden Reach falls in the zone of the largest salinity gradients. There can be little doubt, even though the intrusion may be classified as in a well-mixed state, that the heavy shoaling in this river length is related to the salinity gradients there.' (46)

Having introduced this new variable, salinity, into the explanation of sedimentation, Ippen and Wicker then show how this variable alters the picture of the flushing action to be expected from Farakka diversions. They argue that whilst the large (natural) freshet flows may be adequate to move sediment to the lower parts of the estuary, the smaller Farakka discharge will be insufficient:

'Any smaller discharge, such as visualized for the diversion scheme at Farakka, [ will be ] inadequate to accomplish a reversal of the upstream bottom velocities engendered by the salinity intrusion and will result only in a downstream shift of the shoaling areas from the upper crossings for a relatively small distance. The prediction of the exact location for the new shoaling concentrations is beyond present knowledge, but from experiments it is known that the intrusion length is relatively insensitive to changes in the fresh water flow...' (47)

Ippen and Wicker argue, however, that although increased fresh water flows may cause the salinity intrusion to recede, they will also cause the salinity gradient to be steeper. Stronger upstream bottom currents and increased shoaling may be associated with steeper salinity gradients. This conclusion leads Ippen and Wicker to argue, in complete contradiction of the theory of flushing, that the introduction of fresh water into an estuary increases sedimentation. The point is expressed as follows:

'Finally, it must be emphasized that in view of the role which fresh water plays with respect to the mechanics of the salinity intrusions, the minimum shoaling in estuaries is to be expected with the least amount of fresh water flow

and vice versa. Furthermore, the sediment introduced into an estuary will to the major part be retained in the estuary and thus will accumulate progressively and indefinitely unless removed from it by dredging.' (48)

Thus, the experts employed by the Government of Pakistan, Ippen and Wicker, came to a very different conclusion than those employed by the Government of India. The former argued that the latter had overlooked an important variable; inclusion of that variable suggests that the Farakka diversions will not produce the expected improvement in the River Hooghly. The experts employed by India, on the other hand, seem to have argued that the variable is unimportant and can be ignored. The difference between the two theories constitutes a technical ambiguity or uncertainty.

Ippen and Wicker's point about salinity effects was raised, along with other technical doubts, in the discussions of the Public Accounts Committee in 1975. It was answered to the satisfaction of the committee by a note submitted by the Ministry of Irrigation and Power. The note restated the view that the phenomenon of density currents (and salinity-induced sedimentation) is associated with stratified estuaries and does not occur in well mixed estuaries, of which the Hooghly is an example.

This unsatisfactory answer notwithstanding, it can be deduced that the Indian Government recognised in 1962 that their theory of sediment transport was open to question. In that year, on the advice of (and with financial support from) the World Bank, a well-equipped Hydraulic Study Department was established under the aegis of the Port Commissioners. It began work with measurements 'intended to clarify the physical behaviour of the system' of the River Hooghly. These measurements included:

'Systematic measurement of flow, sediment transport, temperature and salinity at a few selected cross-sections, with simultaneous measurements at three or more points in any cross-section, in addition to measurements of tidal level and surveys of the bed which supplemented the routine surveys. Radioactive tracer tests were used to determine local rates of sand transport.' (49)

These are the sorts of measurements which would be made to determine whether or not salinity-induced sedimentation was taking place.

The establishment and initial work of the Hydraulic Study Department provides further evidence of the existence of technical uncertainty. The Department was intended to 'clarify' an uncertain behaviour; it began by observing a variable which had previously been thought insignificant.

Ippen and Wicker were not the only foreign experts to have doubts. F Posthuma, Managing Director of the Port of Rotterdam, led a World Bank advisory mission to Calcutta Port in 1957. He wrote:

'If, after the completion of the Farakka Barrage there will be silt-free fresh-water in abundance for the Hooghly, it may be possible to deepen the Hooghly, but in this respect so little is known about the results of this barrage and, besides, it does not seem very likely at all that there will be such a supply of water.'

(50)

Presumably, one element in the World Bank's decision to fund the Hydraulic Study Department was its recognition of doubts about the Farakka Project (51).

#### The consequences of ambiguity

Thus, in 1961, there seems to have been a profound uncertainty about the sedimentation process of the Hooghly - a technical ambiguity. From the Pakistan Government's point of view, this cast doubt upon the whole Farakka Barrage venture. The existence of this ambiguity raises two questions. Firstly, why did India decide to build the barrage if there was doubt about its technical rationale? Secondly, what effect did this profound doubt have upon the Pakistan Government's response to the project? Chapter Four, the following chapter, is directed to an examination of the issues relevant to the first question. The second, about the consequences of ambiguity is discussed briefly below.

At one level, the ambiguity provided a resource which the Pakistan

and Bangladesh Governments have used in the dispute. Thus, a pamphlet published by the Pakistan Government in February 1971 contained a chapter entitled, 'Farakka Barrage Project and its technical weakness', in which the following paragraph appears:

'The Indian project is termed as the "Project for the preservation of the Port of Calcutta" aimed to divert waters of the Ganges river with the avowed objective of improving navigation in the Hooghly. An analysis of the data supplied by India, however, shows that the diversion of the fresh water into the Hooghly river by the construction of the Farakka Barrage will not contribute to the preservation of the Port of Calcutta. On the contrary, the proposed diversion is likely to accentuate the shoaling problems of the Hooghly River.'

(52)

The pamphlet continues with a more detailed description of Ippen and Wicker's conclusions. In a similar manner, five years later, the Bangladesh Government employed the resource. B M Abbas, an adviser of the Chief Martial Law Administrator told a BBC interviewer in March 1976:

'...you have said it is for the improvement of Calcutta Port. We hold the opinion that the improvement of Calcutta Port will not be facilitated by diverting the fresh water from the Ganges and there would be a much better use for this water to produce a food crop.'

(53)

Later in that year, the Chairman of the Bangladesh delegation to the United Nations declared that India's use of the water was 'new and wasteful' because:

'Many experts of repute have questioned the very practicality of the diversions for the purpose of removing silt.'

(54)

In this manner, the Governments of Pakistan and Bangladesh were able to employ Ippen and Wicker's conclusions and the technical ambiguity to cast doubt upon India's case.

At a less public level, the ambiguity contributed to the generation of a myth about the malignancy of Indian policy; the Farakka Barrage became illuminated in a sinister light. If the Farakka Barrage would

not solve the problem of the Hooghly, why was India constructing it? The answer, suggested by the context of Indo-Pakistan and Indo-Bangladesh hostility was: India is building a barrage to deprive East Bengal of Ganges water; it is an attack against East Bengal. This myth about the Farakka Barrage is rarely publicly stated but it is one which senior participants, particularly technical experts, offer in private (55). The importance of this myth in the development of the dispute is impossible to establish, but there can be little doubt that it enhanced the hostility toward India of many Pakistan and Bangladesh participants.

#### CONSIDERATION OF DOWNSTREAM CONSEQUENCES

Finally, we turn to the third question of this chapter: How much consideration was given by the Indian Government to the probable consequences of the Farakka diversions for areas further down the Ganges?

In 1961, Nehru told the Lok Sabha:

'there should be no real injury caused to Pakistan by this scheme [ the Farakka Barrage Project ] '. (56)

We shall see in Part III that there was real injury; Nehru's was a sanguine interpretation of the project's consequences. Why were these effects unforeseen by India?

In his 1975 article, Framji describes an investigation he directed in 1958 into these downstream effects. It is clear that this investigation was inadequate. Framji writes that proof of the efficacy of the Farakka Project:

'was not enough to obtain sanction for the project. It had also to be established that the supplies required for the Farakka Project would not prejudicially affect other interests, upstream or downstream of Farakka, in the water resources of the Ganga.' (57)

He was, therefore, charged with the responsibility of assessing the



downstream consequences of the Farakka Project, and this is how he describes his method:

'The numerous reports and Projects prepared by Foreign Consultants and Consulting Engineers of Pakistan concerning irrigation, flood control and drainage of the area of East Pakistan (now Bangladesh) were thoroughly scrutinised; and subject to the limitations of the available data alternative projects were prepared, having regard to the existing and ultimate surface and ground water resources in the Padma-Jamuna-Brahmaputra basins. Particular attention was given to the estimation of dependable regeneration in the low water season at different stages of development. As far as data permitted, preliminary studies were also made of the possible remedial measures - storages, barrage and link canals - for augmenting the flow.'

(58)

This study, probably the only study of downstream effects made prior to the decision to build the project, can be criticised on two grounds. Firstly, Framji's study concentrates, apparently to the exclusion of all else, on irrigation, flood control and drainage projects in East Pakistan. Framji does not anticipate that the effects of reduced flow in the Ganges may be diverse and general. He does not consider whether salinity will increase, nor whether it will effect agriculture, industry, fisheries, forestry and drinking water. He does not consider the possibility that there might be effects on 'traditional' agriculture - which is much more important to Bangladesh's (East Pakistan's) food production than the 'modern' agriculture to which he turns his attention. He does not mention the disruption of navigation, or ecological effects. Secondly, even within the area on which Framji concentrates, he does not show that there are no 'prejudicial' consequences. On the contrary, he accepts that there are such consequences. He even talks in terms of 'remedial measures'. What Framji showed, according to his own account, was that it is possible to overcome the prejudicial effects of the Farakka Project, at least as far as modern agriculture is concerned, by turning to other sources of water and, presumably, less 'thirsty' crops. It is not that there were no disbenefits; Framji did no more than show that certain narrowly defined disbenefits could be overcome. He does not say what this would cost.

## CONCLUSIONS

This chapter has dealt with three discussions closely connected with the decision to build the Farakka Barrage Project in the years just prior to that decision. We have looked at the alternatives to the project, at the debate over the technical efficacy of the project and at the consideration given by India to the project's downstream consequences.

At least five alternative solutions to the problem of providing access to Calcutta Port were discussed in the years immediately before the Farakka Project was sanctioned. Only one of them, the Diamond Harbour ship canal, seems to have been investigated thoroughly at that time. The remaining four alternatives were all subject to reasonable objection but, as this thesis shows, the project finally chosen was also subject to reasonable objection.

The Pakistan and Bangladesh Governments believed not only that there were better ways of providing access to Calcutta Port, but that the Farakka Project would actually exacerbate the deterioration of the Hooghly (59). The foundation of this belief appears to be the advice given by Ippen and Wicker. The contrast between their conclusions and those given by Hensen to the Indian Government provides the most dramatic example of technical controversy in the whole history of the Farakka Project. Hensen thought that the project was the 'best and only technical solution of the problem', whilst Ippen and Wicker said that it was 'likely to accentuate' the deterioration of the Hooghly.

There are two possible explanations for this disagreement. One is that Ippen and Wicker did not have access to all the evidence, and therefore could not come to the correct conclusion. If this is the case, it rebounds on the Government of India, who at this stage of the negotiations (in 1962) claimed to have supplied to Pakistan all material necessary for a complete assessment of the Farakka Project. Pakistan gave Ippen and Wicker access to the material supplied by India. If that data was inadequate the fault lies with India. However, this does not appear to be the case. The crucial evidence

on the mechanisms of sedimentation seem to have been available to neither party.

It seems to have been this evidence which the Hydraulic Study Department set out to collect in 1962. The second explanation of the disagreement is, thus, that there was a technical ambiguity in the data describing the sedimentation mechanism of the Hooghly. The three consultants approached the problem of the Hooghly with different preconceptions, that is with different 'models' of sedimentation, and they were able to find the evidence needed to support their preconceptions.

Ippen and Wicker believed that salinity was an important variable in the sedimentation process, and they were able to fit their model to the evidence available. Hensen was apparently more inclined to accept a theory of 'flushing' in which salinity was discounted as an insignificant variable, and sedimentation rates were primarily related to velocities of flow. According to this theory, salinity could be ignored in a 'well-mixed' estuary, of which the Hooghly is an example. This model, as we have seen in earlier chapters, had a lengthy history in Indian engineering circles. It was pointed out in the conclusions of Chapter One that three inquiries into the Hooghly problem showed a marked prejudice in favour of controlling the Hooghly's headwaters. It was this 'flushing' model of sedimentation which directed their attention toward the headwaters. It is therefore apparent that Hensen's conclusions suited Indian preconceptions.

The Government of Pakistan, on the other hand, were anxious about the effects of the Farakka diversions on East Pakistan. Ippen and Wicker's ability to cast doubt upon the technical rationale of the project therefore aided its case against the project. Without detailed information on salinity variation in the Hooghly it was possible for the two models, Hensen's and Ippen and Wicker's, to co-exist. Despite repeated requests from Pakistan, the Indian Government were unwilling to supply this information. As a result, the technical ambiguity was prolonged; India was able to believe that the Farakka Project was the best solution to the Hooghly problem, whilst

Pakistan believed the project was no solution at all.

Lastly, this chapter dealt with the extent of Indian consideration for the downstream effects of the Farakka Project. If Framji's study was, as it appears, the only Indian Government study of these effects prior to the approval of the project, then it is clear that the Indian Government was negligent in this respect. Framji's study ignores most of the consequences for East Pakistan of Farakka diversions. He overlooked effects on traditional agriculture, industry, navigation, fisheries, forestry, and the ecology of the region.

It is probably true that, although Pakistan had been raising objections to the Farakka Project since 1951, the emphasis of the objections at this stage was on the fact that less water would be available for projects providing irrigation water for modern agriculture. However, the Indian Government was aware of the sorts of effects which follow from the reduction of a river's flow. A part of the justification for the Farakka Project rested on just such effects. The consequences of salinity were at that time affecting Calcutta, and navigation in the Bhagirathi and Hooghly had been reduced, as a result, according to Indian expertise, of reduced flows in the Bhagirathi. Would reduced flows in the Ganges have a different effect? These two consequences, at the very least, should have been assessed in the Indian Government's study of downstream consequences. They should have been foreseen by Framji.

Even in the area of modern agriculture, the area on which Framji focussed his attention, he did not show that there would be, as Nehru claimed, no injury to East Pakistan; he showed only that remedial measures could be taken to overcome that injury.

The final conclusion of this chapter is that when the decision to build the Farakka Barrage was taken, the technical rationale of the project had not been adequately established. The mechanism by which the project would work was apparently still being investigated after the project had been sanctioned. Alternative and contradictory interpretations could find support in the data available at the time the decision was taken.

## Chapter Four

### THE FARAKKA BARRAGE

In preceding chapters three aspects of the development of the ideas which provided the technical rationale for the Farakka Barrage Project have been explored. The first chapter provided a resumé of the diagnoses given by those who had listened to the pulse of the River Hooghly. Out of disagreement, emerged a consensus description of the disease of the Hooghly. The second chapter investigated the origins and preparation of a remedy for this disease, the remedy of fresh water flushing. In this chapter we learnt that the disease was at first thought to be localised, not the concern of the whole body-politic. By the end of the 1950s, however, the relevant organs of the body-politic were conscious of the disease and convinced of the remedy. As a last, and almost token, check the doctors of the central government briefly considered alternative treatments and consulted colleagues (some from other lands) for a second opinion before prescribing their chosen remedy. This was described in the third chapter. There we must leave the medical metaphor.

This chapter is an investigation into the political, economic and physical circumstances which contributed to the final decision to build the Farakka Barrage Project. It is concerned with the latter years of the 1950s and the early years of the 1960s.

We have seen in Chapter Three that the technical rationale of the Farakka Project was, at the least, questionable. We shall see, in Part II, that the Pakistan Government regularly objected to the Project, throughout the 1950s, on the grounds that it would cause damage to downstream areas dependent on water from the Ganges. The central question, therefore, which this chapter seeks to answer is how, in these circumstances, was the project sanctioned?

Without access to the government papers for the period answers to this question must inevitably be sketchy and speculative. However,

some of the political and economic factors which influenced the decision can be identified.

What we wish to know can be summarised in four questions: who? why? when? and how?:

- Who influenced the decision to build the project, and who stood to gain from it?
- Why did they want the Farakka Project? and why that project rather than an alternative?
- Why was the decision taken in 1960/61?
- How was pressure brought to bear upon the Indian central Government?

It cannot be pretended that this chapter provides complete answers to these questions. It identifies some possible answers and suggests directions for further study by those who obtain access to the government papers.

Table 4.1 is an outline chronology of the decision to start construction of the Farakka Project. It can be seen, even in this summarised and incomplete chronology, that the decision to build the project involved a series of decisions, spread over a period of years, by a variety of bodies. This chapter is primarily concerned with the decisions taken between 1959, when the relevant central government ministries had decided to support the project, and 1961 when the formal announcement of the start of construction was made.

#### Who influenced the decision?

In 1853 it was the anxiety of the Bengal Chamber of Commerce which prompted the Government of Bengal to establish the Hooghly Commission. Again in 1959, the same chamber of commerce, representing primarily British interests, was troubled by the deterioration of the Hooghly. Its President, Mr J D K Brown, told the 1959 Annual General Meeting of the Chamber:

Table 4.1: Chronology of Decision

1947		West Bengal Govt starts investigating Ganga Barrage Project. Field surveys made and preliminary report prepared.
1949		Investigations taken over by central government.
1952		Expert committee chaired by Man Singh reviews model studies and recommends the project.
1952-58		Pressure in <u>Lok Sabha</u> from West Bengal MPs.
1956		Preliminary report revised. Cell created in Central Water and Power Commission to investigate the project.
1957		Dr Walter Hensen invited to review the preliminary report. He recommends the project.
1958		Long debate in <u>Lok Sabha</u> . K K Framji, head of Ganges Basin Organisation, starts 'scientific study of the problem' - rejecting alternatives, looking at adverse effects and preparing an operational programme.
1960	MAR	Nehru tells West Bengal Chief Minister 'this project is certainly being included in our plans'.
	APR	Administrative approval and financial sanction given. Ganga Barrage Field Investigation Circle formed.
1961	JAN	National Development Council sanctions inclusion of the project in Five-Year Plan. Pakistan Government is informed that work has started.
	JUN	Farakka Barrage Control Board formed.
	AUG	Technical Advisory Committee formed.
	OCT	R B Chakraborty appointed as Chief Engineer.
1962		Port Commissioners set up Hydraulic Study Department which starts investigating the quantity of diversion required.
1963	SEP	Site for Barrage chosen by Dr K L Rao.
	OCT	Mookerjea replaces Chakraborty as Chief Engineer
1964		Construction of Barrage starts.

'A matter which has gravely concerned shipping interests in particular and commerce and industry generally in this part of India throughout this past year has been the state of the River Hooghly. This is not entirely a local problem as it has all-India significance when we consider the proportion of the export and import trade which passes through the Port of Calcutta...it appears that unless something is done, and done as quickly as possible, the repercussions on the trade and industry of North East India and of India itself might be very severe.'

(1)

The Economic Weekly noted in April 1961:

'Since reduction in draft means heavy loss of cargo-carrying capacity, and shipping is crippled, there has been a unanimous demand for years by all the Chambers of Commerce, both Indian and European, that high priority should be given to the implementation of the Farakka Barrage Project.'

(2)

Commercial and industrial interests in West Bengal have particularly close links with the Congress Party, the party in power both in West Bengal and at the centre at the time in question. Dilip Hiro has commented upon the 'traditional affinity between the business community and the Congress' (3). More specifically, an American political scientist has written:

'The business community of West Bengal tends to give more support to the State government than business communities elsewhere. It involves direct financial support to the Congress Party organisation and for the Congress candidates to the State legislative assembly and to parliament... [ in return ] both Bengali and non-Bengali business communities have the ear of B C Roy, the Chief Minister.'

(4)

It is not surprising, therefore, that the anxiety of the business community should have been translated into the questions put in the Lok Sabha during the 1950s.

Dr B C Roy was a strong supporter of the Farakka Project. He told Prime Minister Nehru, in a letter dated March 8 1960:

'I can only tell you that this scheme is essential not merely for the economy of the State itself but also for



the safety of the Port of Calcutta which handles a very large quantity of goods for export and import purposes. It will save the city of Calcutta from extra salinity during the hot weather. Meanwhile it will help us to have a balanced distribution of water in the Delta and to the different parts of West Bengal.' (5)

It can be seen that Roy held the view that the project would bring a variety of benefits to the State, not just better access to the port: it 'is essential...for the economy of the State', he wrote,

Why did they support the project?

The reasons why the chambers of commerce were demanding the Farakka Project are straightforward. On the one hand, the deterioration of the lower Hooghly was increasing the cost of exporting and importing through Calcutta Port and therefore cutting into the profits of commerce and industry. On the other hand, the reduction in the draught available to ships visiting the port was allowing only smaller and smaller ships to visit the port at a time when the economics of shipping were dictating that ships should be larger and larger.

In their Report submitted to the World Bank Mission, of November 1957, the Commissioners for the Port of Calcutta wrote:

'The port has to take cognisance of the economics of shipping. In the past, ships might have been designed and constructed to suit the port conditions of Calcutta, now the port has to be constructed to keep in step with the economics of shipping.' (6)

The Commissioners used this as an argument for the establishment of a subsidiary port nearer the sea. But it is likely that industrial and shipping interests hoped that the Farakka Project would stabilise or even increase the draught available to shipping so that Calcutta Port itself could more nearly compete with other ports.

Why should the chambers of commerce, and other influence groups, support the Farakka Project rather than its alternatives? Against

all the remedies, including the Farakka Project, there were either political or technical objections or both.

The construction of an alternative port raised the spectres of unemployment and wasted investments. Dredging of the Hooghly was being tried and was perceived to be failing. The two ship canal schemes would have bisected industrial areas to the South of Calcutta and, in addition, a fairly clear technical objection could be raised against them. Even Kapil Bhattacharya's alternative conception could only have been implemented against opposition from the Damodar Valley Corporation and its industrial and agricultural beneficiaries. Only in the case of the Farakka Project were the objectors outwith the boundaries of India.

The Farakka Barrage Project was, as we have seen in earlier chapters, the subject of both technical doubts and political disapproval. However, the technical doubts may not have been obvious to Indian experts in the period 1959-61 (Ippen and Wicker wrote their report in 1962 and it was for the consumption of the Pakistan Government), and the Pakistan Government was effectively unrepresented in West Bengal and apparently ignored in Delhi.

The political influence which the Pakistan Government might have brought to bear upon the Indian Government's deliberations was seriously undermined by expert assurances that there would be no adverse effects in East Pakistan. K K Framji believed, as we saw in Chapter Three, that his studies had established that the Farakka Project 'would not prejudicially affect other interests, upstream or downstream of Farakka' (7). Therefore, Prime Minister Nehru could, with a clear conscience, tell the Lok Sabha in 1961:

'...our approach to the Farakka Project is that we do not wish in any way to harm the interests of East Pakistan in this, and we shall try to adhere to that in the best of our ability.'

(8)

A few days later he told the Lok Sabha:

'It is our view that there should be no real injury caused to Pakistan by this scheme.'

(9)

Thus, the Farakka Project was preferable to its alternatives partly because its objectors were distant and their objections discredited. But, in addition, the Farakka Project, unlike its alternatives, promised a package of subsidiary benefits. Not only did it offer a solution for the navigational problems of the lower Hooghly, it seemed likely to ameliorate the salinity of Calcutta's water supply, provide year-round navigational facilities on the upper Hooghly (Bhagirathi) and provide a rail and road bridge across the Ganges at a strategically useful point.

If any further explanation is required for the strong support that MPs, particularly West Bengal Congress party MPs, gave to the project, there is an additional factor upon which we may speculate. There appear to have been political benefits associated with projects intended to improve the River Hooghly, and specifically with the Farakka Project.

There is evidence that West Bengal in particular and the states of North East India generally were, from the time of independence, 'under-developed' by the central government. The financial policies of the centre discriminated against West Bengal and in favour of states like Maharashtra and Tamil Nadu (10). It is possible that MPs for West Bengal and members of the state government looked on the Farakka Project as a panacea that would attract a large investment from the central government and rejuvenate the economy of the state.

In the minds of some the delay in starting the Farakka Project was related to the more general central government discrimination against the state. Speaking during the 1959 budget debate in the West Bengal Assembly, Rankim Mukherjee, a member for the Communist Part of India:

'criticised New Delhi's attitude toward West Bengal. The Farakka Barrage scheme had not yet been taken up for execution though Calcutta Port was dying. It was the

Centre's policy he alleged, to move important government offices from Calcutta to Bombay...'

(11)

That the Farakka Project was seen as a technical panacea for the political and economic decline of West Bengal can, perhaps, be indicated by the extravagant responses to the project when it was finally inaugurated a decade and a half later. Framji, who had played an important role in the preparations for the project, referred to its completion as the 'fulfilment of a dream' (12). The Public Accounts Committee of the Lok Sabha wrote in 1976 that the dedication of the project was:

'for many in the country...almost like a dream come true. Hopes long deferred now seemed near fulfilment.'

(13)

For the Congress party, a technical panacea for the economic ills of the state may have seemed particularly attractive. The Indian National Congress, having been built to fight colonial rule and gain national independence, is a cross-class alliance. In the years after independence the basis of that alliance was brought under strain by economic failure. An analysis of the ills of West Bengal which laid the blame on the Hooghly River and looked to central government investment for its solution did not threaten but actually facilitated that alliance. If, on the other hand, West Bengal's economic decline had been attributed to the structure of land tenure in the state, or to central government policies toward the state, the basis of the party's support would have been in danger. Political and economic solutions to the decline of West Bengal would, almost inevitably, have been much more divisive than a technical solution, such as the Farakka Barrage. This latter project had all the makings of a panacea; not only did it have few effective opponents and promise to bring a variety of benefits, it also had almost a ready-made popular support.

As early as 1940, T M Oag, the Deputy River Surveyor, was referring to:

'the current popular belief as manifested by articles which have appeared in the press at frequent intervals from the pens of public men...'

(14)

This was a belief in the deterioration of the river. What seems to have happened is that commercial anxiety about the condition of the river gradually became accepted by a wider public as reality. By 1961, business and other interests favoured the Farakka Project as the remedy for deterioration, and Bhattacharya noted that there was the 'pressure of misguided public opinion' supporting this project (15).

Why was the decision taken in 1960/61?

Various spokesmen for the Indian Government have asserted that the Farakka Project would have been announced or built earlier but for one or other of three factors: discussions with Pakistan about the Indus, discussions with Pakistan about the Ganges, and constraints on India under the Barcelona Convention.

In a letter dated March 12th 1960, Nehru told B C Roy:

'I can assure you that we are all anxious to go ahead with this scheme in fact, work to that end is being done in various ways. We did feel, however, that we might not make a public announcement about this for two or three months while the canal waters discussions are going on. We hope they will be completed in about two months time. But this does not mean any delay and this project is certainly being included in our plans.'

(16)

The canal waters discussions were the negotiations between India and Pakistan, mediated by the World Bank, over the sharing of the Indus Rivers. Nehru and President Ayub Khan signed the Indus Waters Treaty in September 1960. In the passage quoted here Nehru is saying not that the Farakka Project would be delayed by the Indus negotiations but that its announcement would be. In fact, it was four months after the signature of the Indus Treaty before the Farakka Project was announced.

It is probable that apprehensions about the political consequences for relations with Pakistan contributed some delay to the decision to build the barrage. Shri Hathi, Deputy Minister of Irrigation and Power, attributed postponement to that cause in a statement to

the Lok Sabha in November 1961:

'Government of India had delayed the Project to take into consideration Pakistan's reasonable interests. The Project has been sufficiently delayed in the past to take Pakistan's interests fully into account, but there is no obligation or intention that there should be any further delay.'

(17)

Another cause for postponement has been mentioned by Debes Mookerjea, former Chief Engineer of the project:

'There was some initial hesitation about the Farakka Project since India was a signatory to an international navigation treaty which might have acted as a prohibition. The treaty expired in the late fifties.'

(18)

He was probably referring to the Barcelona Convention which states:

'No state is allowed to alter the natural conditions of its own territory to the disadvantage of the natural conditions of the territory of a neighbouring state.'

(19)

India unilaterally withdrew from the Convention in 1957. At the time Dawn commented:

'...the conclusion is inescapable that she [ India ] wants to wriggle out of an international obligation, to pave the way for the construction of the Farakka Barrage.'

(20)

Further delays may have been occasioned by a search for foreign aid to finance the project but there is no direct evidence to suggest this (21). If there was such a search it was almost fruitless. There is a suggestion that the USSR may have offered to provide Rs 140,000 worth of equipment (22) (probably connected with the unsuccessful coffer dams, built with Russian advice). That is, however, a small sum compared to the total cost of the project.

There were, thus, at least four possible reasons why the project should be postponed until 1960. But, the question 'why was it built then?' may be best answered not by searching for tangible reasons for delay but by finding reasons which injected urgency into the pressure-

group demands for the project. The project might have languished indefinitely in the pile of proposals submitted to the Planning Commission had not some new element directed the attention of the government to the proposal and persuaded them that it should be overlooked no longer.

This new element was possibly the sharp worsening of the Hooghly's decline which took place in the late 1950s. A World Bank report noted:

'The promptings of the Bank Mission in 1957 coupled with the sudden deterioration of the Balari Bar in 1958, spurred the Calcutta Port Commissioners and the Indian Government to increased efforts to solve the problem of the access of deep draughted vessels...'

(23)

It was in 1958 that the Government of India started their study of alternatives to the Farakka Project. The Personal Assistant to the West Bengal Chief Minister has written about the situation in 1960, and a particularly alarmist statement from foreign shipping companies:

'The continually deteriorating trend in the silting up of the River Hooghly and the consequent fall in the river draught loomed large in the minds of both the Government and the shippers. On April 8, representatives of foreign shipping companies publicly expressed the view that if the deterioration continued for another two years the Port of Calcutta would be lost.'

(24)

How was pressure brought to bear?

We have seen that the business community of West Bengal was concerned that something, preferably the construction of the Farakka Barrage, should be done to stop the deterioration of the Hooghly; that the Congress party in the state had strong links with the business community and that, in addition, there may have been political benefits for the Congress party from giving support to the Farakka Project. However, the discrimination by the central government against the state has also been noted. Clearly West Bengal MPs did not have great influence at the centre. How, in that case, did they persuade the government to sanction the project?

There is evidence of the meeting, in March 1959, of an ad hoc caucus of Congress MPs representing constituencies all over North East India. They decided to use their combined influence to get the project sanctioned. The Statesman reported:

'A meeting of Congress MPs called today to discuss the Calcutta Port problem came to the conclusion that top priority should be given to the Farakka Barrage to enable big ships to continue to come to Calcutta Port. MPs from eastern Uttar Pradesh, West Bengal, Bihar, Assam, Orissa, Manipur, Tripura, and Andaman and Nicobar Islands were present. Members expressed concern at the increasing salinity of the waters of the Bhagirathi River. It was felt that this problem as also the construction of the Sone Bund and the Rihand Barrage should be examined in relation to the entire region. It was generally agreed that members should try to impress upon the Government to take steps to 'save' Calcutta Port and to make efforts for the proper utilisation of water resources for the region.'

(25)

A pressure group of MPs had been formed. Their constituents shared a common interest in the well-being of Calcutta Port: all the states mentioned are served in one way or another by the port. However, the group is not quite so straightforward as that. Two of the states, Uttar Pradesh and Bihar, also have a conflicting interest in the waters of the Ganges. These two states are part of the powerful group of North Indian states, known more recently as the 'Hindi belt', whose interests have dominated most Congress Governments of India. The inclusion of MPs from these two states increases the influence of the caucus considerably. The two projects mentioned in addition to Farakka (the Sone Bund and the Rihand Barrage) are projects specifically benefitting Bihar and Uttar Pradesh. A plausible hypothesis can therefore be constructed, suggesting that these two projects were added as enticements for two states whose political backing was important, but whose interests were, to some extent, in conflict with the needs of the Farakka Project.

#### A DIVERSION?

The Farakka Barrage was constructed to divert water into the Bhagirathi. At the same time, it may have been a diversion, a distraction, from



the historically significant issues in the sharing of the waters of the Ganges. In the twenty years since the Indian Government decided to build the project, the demand for irrigation water has risen dramatically. Perhaps if the issues could be presented all over again, an Indian Government would now decide that the demands of agriculture should take precedence over those of industry and commerce. In these final paragraphs of Part I, the circumstances in which the Farakka Project was conceived and sanctioned are summarised, questions which this account raises are identified, and the possibility that the project is now, or soon will be, a 'white elephant' is discussed.

The history of the Farakka Barrage starts in the middle of the Nineteenth Century. From about 1853, for almost one hundred years, there was an intermittent controversy amongst experts concerning the deterioration of the Hooghly. That controversy was effectively ended in 1952, when the Man Singh Committee presented fairly conclusive evidence of deterioration. Several participants in this debate had a marked preference for headwater control as a means of restoring the Hooghly if its decline should be proven. They owed this preference to the insights provided by a 'flushing' model of sedimentation in the Hooghly.

Between 1952 and 1958, the focus of the history moves to the Indian parliament. In this period, West Bengal MPs succeeded in changing the central government's perception of the project, from that of a state preoccupation to being a national priority. In 1957, Hensen was consulted and provided his seal of approval. He embraced the traditional 'flushing' theory of sedimentation in the Hooghly so his view coincided with the main current of Indian expert advice. In 1958, Framji made a final technical assessment of the project in which he dismissed alternatives and gave a sanguine assessment of the project's 'side-effects'. The history of the project over the next three years is obscured by government secrecy. The project was considered and approved by a series of governmental organisations from the Ministries of Finance and External Affairs to the Indian Cabinet. Their deliberations are confidential, but some of the circumstances which contributed to their decisions can be identified.

With hindsight it can be seen that the technical rationale for the Farakka Project was inadequate. The setting up of the Hydraulic Study Department and its immediate investigation of matters central to the understanding of sedimentation in the Hooghly, when seen in conjunction with the technical scepticism of Ippen and Wicker, suggest that the primary consequences of the project were not fully understood. The presence of a number of economic and political pressures for a rapid solution to the problem of the Hooghly explains why an inadequate technical rationale was accepted and the project approved.

In 1959, as in 1853, business interests provided the main pressure for government action. The profitability of shipping, industrial and commercial ventures was threatened simultaneously by the shallowing of the Hooghly and the deepening of the average draught of international shipping. MPs and the Chief Minister of West Bengal acted as intermediaries communicating this pressure to the central government. In order to obtain the support of MPs from more influential states, MPs from West Bengal appear to have entered into a bargain in which they supported projects in nearby states, in return for the support of MPs whose interest in Farakka was slight or even contradictory.

West Bengal MPs were not only acting in response to the demands of the Chambers of Commerce. There were political factors which reinforced those demands. The continuing underdevelopment of West Bengal provided good reason why they should seek, and be seen to be seeking, large scale central government investment in the state. The Farakka Barrage was, however, more than that. It was a useful panacea for the economic decline of the state, and one which did not threaten the cross-class alliance fundamental to the politics of the Congress party. Social or political programmes to rehabilitate the economy might have exposed the political base of the party.

The advantage of maintaining party unity could also have arisen from the implementation of other technical programmes, but the main alternatives to the Farakka Barrage would have roused political opposition. The Farakka Project was a proposal for which public support already existed, whereas dredging of the Hooghly had been

carried out for many years, and was seen to be failing. An alternative port could not be suggested without raising the support-withering spectres of unemployment and wasted investments. Kapil Bhattacharya's suggestion could only be implemented against the opposition of the Damodar Valley Corporation and its industrial and agricultural beneficiaries. The two ship canal schemes also threatened industrial developments and, in addition, a fairly clear technical objection could be raised against them. Finally the secondary benefits of the Farakka Project, salinity control, inland navigation and a strategic bridge across the Ganges, would not have accrued from any of the alternative projects. All these factors contribute selective considerations which may have made up for the project's unsatisfactory technical rationale.

This choice between alternative projects, on political grounds, is only plausible if the Government of Pakistan and the interests of the people of East Bengal were effectively unrepresented in Calcutta and Delhi. If serious account had been taken of the Pakistan Government's objections to the project, and of the damage it could do to East Bengal, it is unlikely that the same choice would have been made.

As I wrote at the start of this chapter, it cannot be pretended that this account provides a complete answer to the questions: who, why, when and how was the decision taken to build the Farakka Project? The history of the project can be followed in the public record up to 1958, after that the trail becomes blurred because governments are wary of releasing information about a sensitive subject. Amongst the questions which remain to be answered by further research are these:

Was Framji's study the only investigation into Pakistan's interest in the project?

What role was played by the Indian Ministry of External Affairs, particularly in estimating the reaction of Pakistan?

Was the Farakka Project rejected by foreign funding agencies?

Were Indian experts aware of the technical ambiguity to

which Ippen and Wicker drew attention? If so, how had they satisfied themselves that salinity effects were insignificant?

With the benefit of twenty years of hindsight, the decision to approve the project looks ill-judged. Quite apart from the international dispute which followed in the wake of the decision, and whether or not the project achieves what is expected of it, continuing economic trends in shipping and in the development of irrigated agriculture leave the project ill-suited to the needs of India in the 1980s.

The average draught of the world's merchant fleet has continued to rise since 1961. Even the rejuvenation of the Hooghly to the extent that it can normally expect to accept ships of 26-28 ft draught, will only make Calcutta Port accessible to a small percentage of sea-going ships. It seems most probable that the future of Calcutta Port is as a feeder port for Haldia and as an inland trading centre, not as an international maritime port.

The Government of India is generally coy about issuing statistics which indicate the trend of consumptive water use in the Ganges Basin. Irrigation development is invariably measured by the area irrigated not by the volume of water consumed. It is therefore difficult to compare the water used by Calcutta Port with the needs of agriculture in India or Bangladesh. Nevertheless, the Indian Government has indicated the extent of the overall shortage of water in the Ganges Basin by a comparison which shows that whereas intensive irrigation requires a depth of water of 1.2 m/yr, the annual flow of the Ganges distributed over the basin would provide only 0.57m (26). This gives only an approximate indication of water shortage. Read in conjunction with an Indian estimate that the entire low season flow of the Ganges could be consumed by irrigation within fifteen years (27), it does provide a measure of the scarcity of Ganges water. It may be that India and Bangladesh will agree to build engineering works to increase the dry season flow in the Ganges (this question is discussed in Part IV of this thesis). Even then, it is likely that the demands of Calcutta Port

will be competing with the needs of irrigated agriculture for scarce water. In the context of using Ganges water to combat saline intrusion in Bangladesh, Indian spokesmen have argued that it is wasteful to allow water to flow into the sea. By the same argument, it is wasteful to use scarce, dry season water in flushing Calcutta Port (28).

The case for saying the Farakka Barrage is a 'white elephant' is not conclusive, but it is sufficient to raise doubts about the priority of the project, its appropriateness to the needs of India. Calcutta Port may be dying anyway, and the water may be required more urgently elsewhere.

The Farakka Barrage Project initiated the dispute about the sharing of the Ganges. It set the stage and chose the actors for the start of the dispute. In the early years, it was also the focus of the argument. Nevertheless, the project is not the central issue of the argument. This is the fact that there is insufficient water in the dry season for the needs of both countries. In the next section of this thesis, Part II, a history of the conflict which arose from this scarcity is presented.

II

A DISPUTE

Was there any point when the Indian Government could have acted differently so that the dispute could be settled?:

'There may have been. Things took place so fast. We had so many problems.'

- Mrs Indira Gandhi, author's  
interview, September 26, 1978.

## II

### INTRODUCTION

This part of the thesis presents the first detailed history of the conflict between India, Pakistan and Bangladesh over the sharing of the water of the Ganges. The dispute arose from the construction of the Farakka Barrage, but that was only the immediate cause. At root the conflict occurs because there is insufficient water, for the needs of both countries, in the river during the dry season.

Conflict over the division of the water started in 1947 and is continuing at the time of writing. Some of the subsidiary issues within the conflict have, however, been resolved. The dispute can therefore be divided into a number of phases, or subsidiary disputes, corresponding to the main concerns of the parties. Three phases can be identified as follows:

<u>Period</u>	<u>Main issue</u>
1951 - 1971	Riparian rights and the Farakka Project
1971 - 1977	Division of the existing dry season flow
1977 - to date	Augmentation of the dry season flow.

It will become clear in Chapter 9 and in Part IV that a fourth phase concerned with the overall development and management of the Ganges may be emerging at the present.

The selection of historically significant facts is a subjective process. In this case my selection has been guided by three primary objectives:

- (i) to identify underlying government strategies and tactics in the conflict,

- (ii) to identify opportunities for its resolution which were missed, and
- (iii) to attempt to explain why these opportunities were missed and why at other times the resolution of elements of the dispute was possible.

The negotiation and dispute over the sharing of the Ganges did not take place in a political vacuum. No evidence has emerged of a direct link between this issue and other bones of contention between the parties concerned, although assertions of such linkage are not uncommon. There is, however, a general connection between the 'state of relations' between the concerned nations and the progress of the conflict. This general relationship can be seen in Figure II.1.

The 'state of relations' between two nations is an ill-defined, aggregated concept including the decisions of a variety of governmental organisations and the perceptions and interactions of many individuals. However, in this case, the chart of bilateral relations is used only to draw attention to two 'windows' of cordiality, the existence of which is confirmed by participants in the conflict. The windows in 1969 and 1971-71 indicate missed opportunities which will be investigated in these chapters.

In all, there are four main landmarks in the conflict which need to be investigated. There are the two 'windows' in 1960 and 1972-1975, and two partial resolutions of the conflict, in 1971, when the question of riparian rights was set aside, and in 1977, when a division of the existing dry season flow was negotiated. These four landmarks are described and discussed in the chronological order of this section.

The main points I intend to draw from this account are these. Until 1971 India conducted a policy of procrastination in the conflict over the Ganges. Under this policy technical 'talks' with Pakistan were occasionally permitted, but not political 'negotiations' (1). This policy was effective in defusing Pakistan's opposition to the Farakka Project while it was under construction.



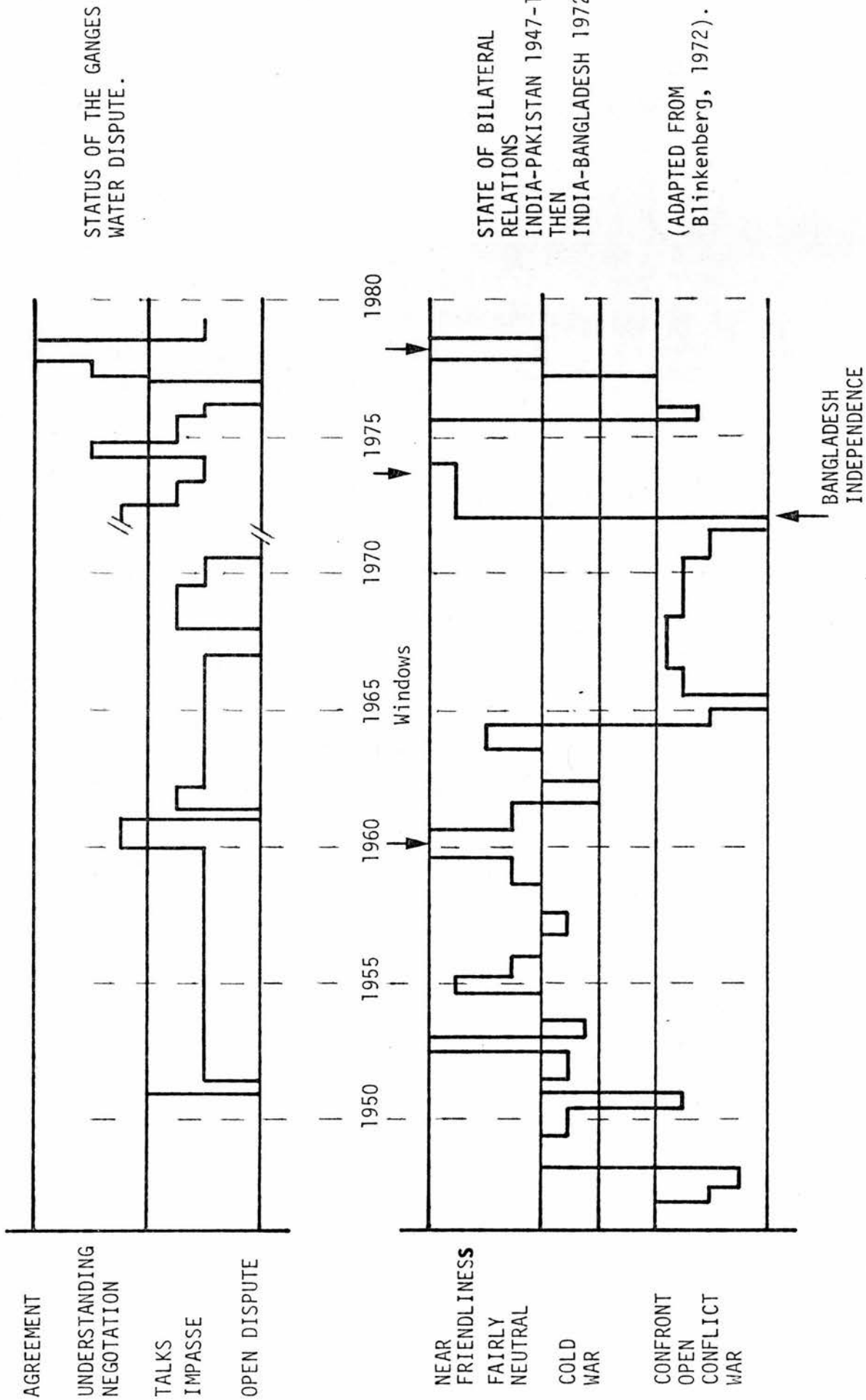


FIGURE II.1. Status of the Ganges Dispute and State of Bilateral Relations.

Between 1972 and 1975 Bangladesh failed to prosecute the negotiations with diligence, possibly as a result of an internal power struggle within the Bangladesh Government. But, in 1977, after Bangladesh had suffered a virtual defeat at the United Nations, the newly-elected Janata Party Government of India made a calculated sacrifice of India's interests in order to resolve the immediate issue of sharing the dry season flow.

The chapters in Part II each cover a particular period, as follows:

<u>Chapter</u>	<u>Title</u>	<u>Period</u>
5	Partition and after	1947 - 1961
6	The Indian position and the Pakistan response	1961 - 1971
7	The Sheik and Mrs Gandhi	1971 - 1974
8	Arrival and departure	1974 - 1976
9	The Ganges Waters Treaty	1977 - 1980

- Within each of these chapters there is first a section setting out the events in chronological sequence. This section is predominantly based on documentary evidence. It is followed by one or more sections in which questions raised by consideration of the events are explored. In these sections material from my interviews with participants in the dispute is introduced to reinforce and clarify what has emerged from the chronology.

## Chapter Five

### PARTITION AND AFTER

On the night of August 15th 1947, British imperial rule in India ended. Out of British India emerged two independent states, Pakistan and India. This partition and the manner of its doing has reverberated through the subsequent history of the subcontinent. The origins, meaning and consequences of Partition are still, thirty years later, controversial questions. This study is not concerned with that controversy, whether the event was the culmination of a British policy of 'divide and rule' or, alternatively, whether Mountbatten made the best of an intrinsically difficult situation. This study is concerned with the minutiae of the event because in the midst of the struggles for territory can be found the first political dispute over the Farakka Barrage.

Before India and Pakistan existed, but only by a few weeks, lawyers acting for the fledgling states had crossed swords in a tussle for territory which would allow the victor to control the Ganges. This tussle, out of which the new state of India gained the District of Murshidabad and the site for the Farakka Barrage, was only a slight murmur almost lost in the hubbub of historic events. But it is here that a narrative of the Farakka dispute must start.

The narrative continues in this chapter up to India's decision to build the Barrage. Through the 1950s, the Government of Pakistan regularly protested against India's proposed project and, until 1960, India generally responded that no decision had yet been taken on the project. In 1960, the first of a decade of intermittent technical exchanges took place, and in 1961 there was a brief meeting between Prime Minister Nehru of India and President Ayub Khan of Pakistan.

This chapter will show that two Indian assertions, one minor and one important, about the history of the conflict are incorrect. First, it is stated that India was awarded Murshidabad District because

the Farakka Barrage was considered essential (1). We shall see that the partition award was more complex than that, and that this attempt to find support for the project is misplaced.

A second claim made by the Indian Government is more important. If dispute and conflict are to be avoided in the development of any shared resource, negotiation, or at the least consultation, is required between the parties concerned. The following paragraph outlines the Indian Government's claim that consultations took place:

'Throughout the period of technical studies, planning and actual construction of the Farakka Barrage India held extensive consultations first with the Government of Pakistan and then with the Government of Bangladesh to ensure that the reasonable requirements of water of East Bengal and later Bangladesh were duly taken into account.'

(2)

This chapter documents the political and technical contacts between Pakistan and India during 'the period of technical studies and planning'. It will be seen that no political discussions took place prior to India's formal announcement that the Farakka Barrage was to be built. The technical exchanges which did take place were brief, formal exchanges of data difficult to describe as 'extensive consultations'.

The nature of political and technical contacts between the Governments of India and Pakistan must be established if the conflict is to be fully understood. It is argued in this chapter and the next that the Farakka Barrage was a unilateral act of the Indian Government. It was the Indian policy to enter into talks which had the appearance of negotiations or consultations, but the Indian Government did not give consideration to the objections and alternative courses of action raised by Pakistan.

At the end of the period covered by this chapter Nehru and Ayub Khan met and discussed the Ganges conflict. The imprecise and verbal agreement which they reached at that meeting was the only agreement on this subject made between India and Pakistan. In Chapter 6 it will be seen that even this agreement was, in practice, flouted by

India with impunity.

Before the Nehru-Ayub meeting in March 1961, there was a 'window' in the relations between India and Pakistan. A period of amicability occurred in which genuine negotiations might have been possible. This opportunity was neglected; the reasons why are here explored.

### Partition

'The root of [ the disputes between India and Pakistan ],' Rajeshwar Dayal, a former Foreign Secretary of India, told me 'was the manner in which Partition was carried out' (3). Or, as an American scholar put it, 'On the face of it, it would certainly seem that Partition could have been accomplished in a less hasty and less violent manner; that the boundaries could have been drawn more carefully had six months been allowed instead of six weeks...' (4). Since the first murmur of the Farakka dispute took place during the hearings of the Bengal Boundary Commission, it may be useful to establish how those hearings came to be carried on with such haste.

Though it has been justified after the event, the real reason for the unseemly haste does seem to be a spur-of-the-moment decision taken by Mountbatten. It is certainly correct to note that all three parties to the Partition - the Congress, the Muslim League and the British Government - were agreed that a speedy transition was necessary. But, as far as the British Government was concerned, on June 3rd, this was expressed as a willingness 'to anticipate the date of June 1948' (5). The following day, Mountbatten foreshortened this anticipation from twelve months to ten weeks. 'I think the transfer could be about the 15th of August', he is reported to have said (6). More recently, Mountbatten himself has described the occasion. It was at a press conference and the very last question put to Mountbatten was, when will transfer take place? Mountbatten says that until that point he had not had time to consider when it would be. He, 'did some very quick thinking' and 'settled on the 15th of August' because it was the second anniversary of the surrender of Japan (in which Mountbatten had played a part), and it seemed a suitable occasion (7). British historians have taken pains to

stress that all parties were associated with the decision for a rapid partition (8), but they were not consulted about the exact date until after Mountbatten had made his public announcement.

One of the consequences of Mountbatten's haste, and the acquiescence of Nehru and Jinnah, was that by the time all the formalities had been completed less than a month was left for the crucial work of dividing the Provinces of Bengal and the Punjab (9). This work fell to a British barrister, Sir (later Lord) Cyril Radcliffe, who was chosen to chair two Boundary Commissions, one for the East and one for the West, each made up of four judges chosen by the contending parties. Arrangements were made for the Boundary Commissions to hold public sessions at which evidence concerning the boundary and territory of the new states could be presented. Radcliffe did not attend these hearings but made arrangements to read each day's transcripts.

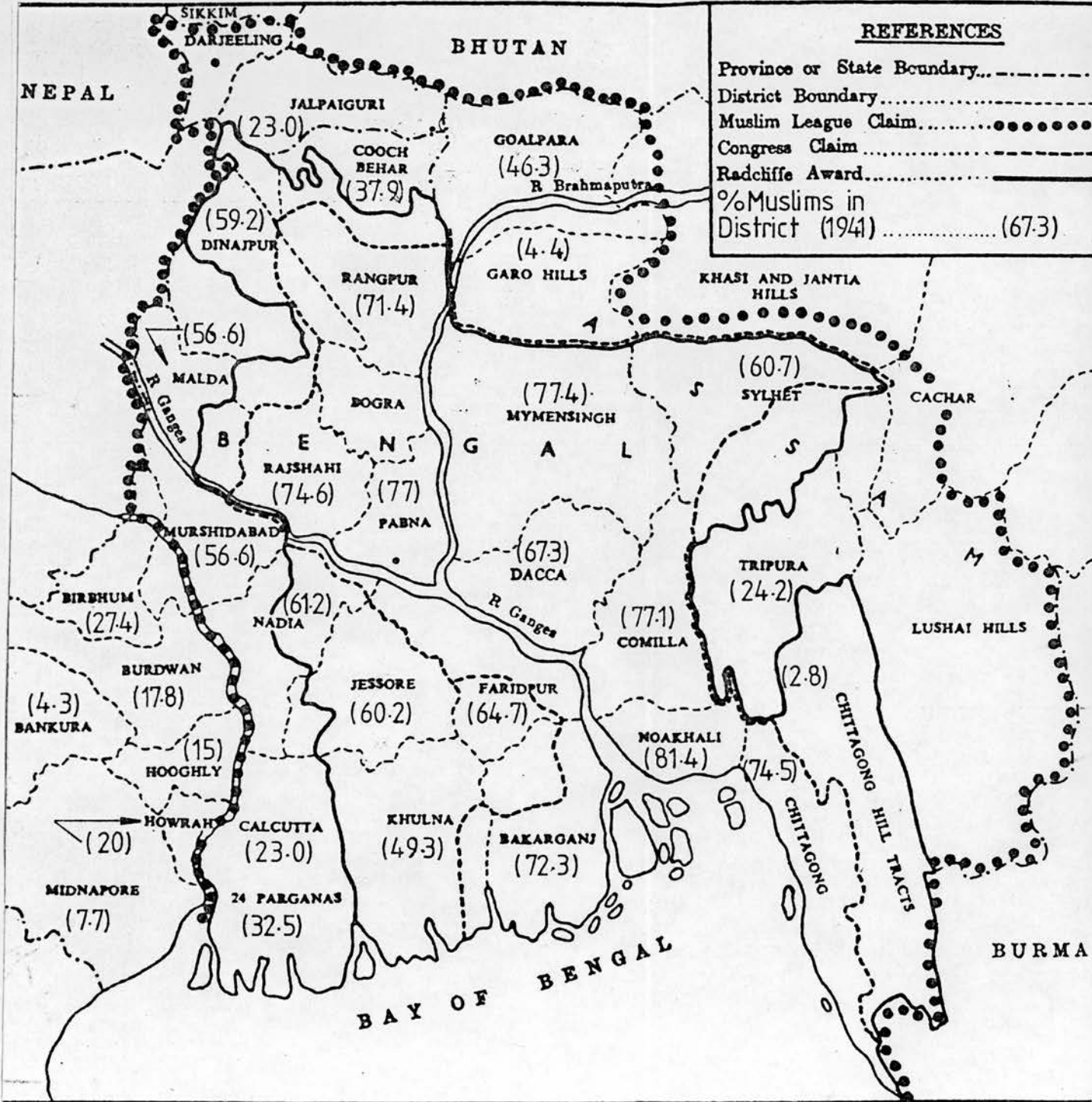
The Bengal Boundary Commission met in Calcutta and held public hearings for eight days at the end of July. In subsequent discussions the four judges partitioned themselves according to their communal loyalties and they were, therefore, unable to agree on a partition of Bengal. Radcliffe, as a result, 'had no alternative but to proceed to give my own decision' (10).

The Bengal Boundary Commission was:

'instructed to demarcate the boundaries of the two parts of Bengal on the basis of ascertaining the contiguous areas of Muslims and non-Muslims. In doing so, it will also take into account other factors.' (11)

The main cases presented to the Commission were from counsel representing the Congress, the Bengal Provincial Hindu Mahasabha and the New Bengal Association on the one hand, and representing the Muslim League, on the other. (The territorial claims of the Congress and the Muslim League are shown in Figure 5.1.) The 'other factors' tagged on to the terms of reference allowed a very wide range of evidence to be put. The complexity of the evidence is reflected in the two long and detailed reports written by the judges

Figure 5.1: Map of Bengal and Assam showing the District boundaries in 1947, the Congress claim, the Muslim League claim and Radcliffe's Award.



Source: Razvi, The Frontiers of Pakistan, National, Karachi, 1971.

at the end of July (12). The Muslim and Non-Muslim judges were able to agree that twelve of the Districts involved could be assigned to one or other state, but on the remaining fifteen Districts there was dispute. For the Presidency Division and one District within it, Murshidabad District, the dispute was focussed primarily on the River Bhagirathi-Hooghly and its role.

According to the two Muslim judges, the Hindu Mahasabha told the Commission that control of the river system of the Presidency Division:

'should be vested in West Bengal authorities in order that they might maintain the Port of Calcutta in a satisfactory and workable condition. It is maintained that the Port of Calcutta depends for its existence on a well-regulated flow of water in the Hooghly...' (13)

But, the Muslim judges noted, 'there seems to be a conflict of expert opinions on these points'. They cited, and included as annexures to their report, expert opinion opposed to the barrage proposal. The two judges came to the conclusion that there had been 'no progressive deterioration in the Hooghly as the navigable outlet for the trade of Calcutta', and 'we cannot, therefore, accede to the view that retention of the Nadia river system as an integral unit for the benefit of the Port of Calcutta, is a compelling factor which would justify the inclusion of a large Muslim majority area in West Bengal' (14). These two judges argued that the Bhagirathi-Hooghly provided the most satisfactory line between the two parts of Bengal.

The other two, non-Muslim, members of the Commission took a different position and selected different experts to support their position. They wrote:

'We are conscious of the fact that in the district of Murshidabad only the Kandi sub-division and all the police-stations comprised within it have a non-Muslim majority...But as the question of having the head-waters of the river Hooghly is a matter of vital importance to the existence of Bengal and its capital, we think that this is an overriding factor to which the principle of contiguity and majority of population ought to be subordinated.' (15)



The non-Muslim judges did not, it should be noted, express an opinion on the barrage project itself. 'Whether a barrage is to be constructed, or dredging has to be resorted to', they wrote, 'it is not pertinent for us to discuss for our present purpose. It is necessary that some means or other should be found by which an appreciable portion of the Ganges flood can be induced to pass through these three Nadia rivers in preference to the Padma...' (16).

It is established that, as far as the four members of the Boundary Commission were concerned, the allocation of this one district turned on the importance of the Hooghly for Calcutta. Radcliffe, the final arbiter, however, extracted from the mass of detail, of which the issue described above is only one of many, seven 'basic questions'. Two of these questions are directly relevant to this issue:

'(1) To which State was the City of Calcutta to be assigned, or was it possible to adopt any method of dividing the city between two States?

'(2) If the City of Calcutta must be assigned as a whole to one or other of the States, what were its indispensable claims to the control of territory, such as all or part of the Nadia river system or the Kulti rivers, upon which the life of Calcutta as a city and port depended? (17)

On the basis of his own answers to these questions, Radcliffe made his decision. This boundary is shown in Figure 5.1. Radcliffe refrained from justifying his decision (18); explanation has to come from his basic questions and the line itself.

There is however one official interpretation of Radcliffe's line. This is a document prepared for the India and Burma Committee of the British Cabinet. It was issued over the initials of Arthur Henderson, Minister for Commonwealth Relations. The relevant section reads as follows:

'(b) In the Presidency Division, the Murshidabad District (containing 927,747 Moslems and 648,987 Hindus) goes from East to West Bengal and the Nadia and Jessore Districts are both divided between the two Provinces instead of going entirely to East Bengal. These changes are designed to leave to West Bengal control over Calcutta's

river system. The Kulna [ sic ] District on the other hand (containing 977,693 Hindus and 959,172 Moslems) goes from West Bengal to East Bengal because its communications with the latter are easier.'

(19)

The Indian Government have recently claimed that Radcliffe 'considered Farakka so important for the Port of Calcutta' that he 'awarded the district of Murshidabad...to India in exchange for...Khulna' (20). This assertion lends a somewhat spurious legitimacy to the Farakka Project. Radcliffe's question and the British Cabinet interpretation sustain the view that as far as Murshidabad District was concerned the 'indispensable claim' of Calcutta for control of the river system over-rode the marginal Muslim majority. But Radcliffe was without independent advice on technical matters and short of time, so it is most unlikely that he considered the case for the Farakka Project proven. What Radcliffe did was to provide India with an option to control the intake into the Bhagirathi from the Ganga. In fact Radcliffe's award has a subtlety which has eluded the Indian Government and which belies the Indian assertion quoted above.

During the debates before the Bengal Boundary Commission, the territory in question was that through which flowed the offtakes of the Nadia Rivers. It is probable that the actual site for a barrage had not then been chosen. Certainly Farakka is not mentioned in the reports of the commission members nor in contemporary newspaper reports. Dr K L Rao, an engineer and the Irrigation Minister during the period of construction of the Farakka Barrage, told me, 'If Radcliffe could have given 10-20 miles more, there would have been no need for the feeder canal, the barrage could have been sited at Lalgula' (21). (Lalgula, Farakka and the Radcliffe line are shown in Figure 5.2.) Radcliffe did award the Nadia offtakes to India but he drew a line down the centre of the Ganges. If a barrage had been constructed at the offtake of any one of the three Nadia Rivers, half of the barrage and one abutment would have been within Pakistan territory. Radcliffe partitioned the District of Malda, drawing a line which joined the River Ganges just upstream of the Bhagirathi offtake. It is possible that he drew the line in this way in an attempt to enforce joint Indo-Pakistan control of any barrage India

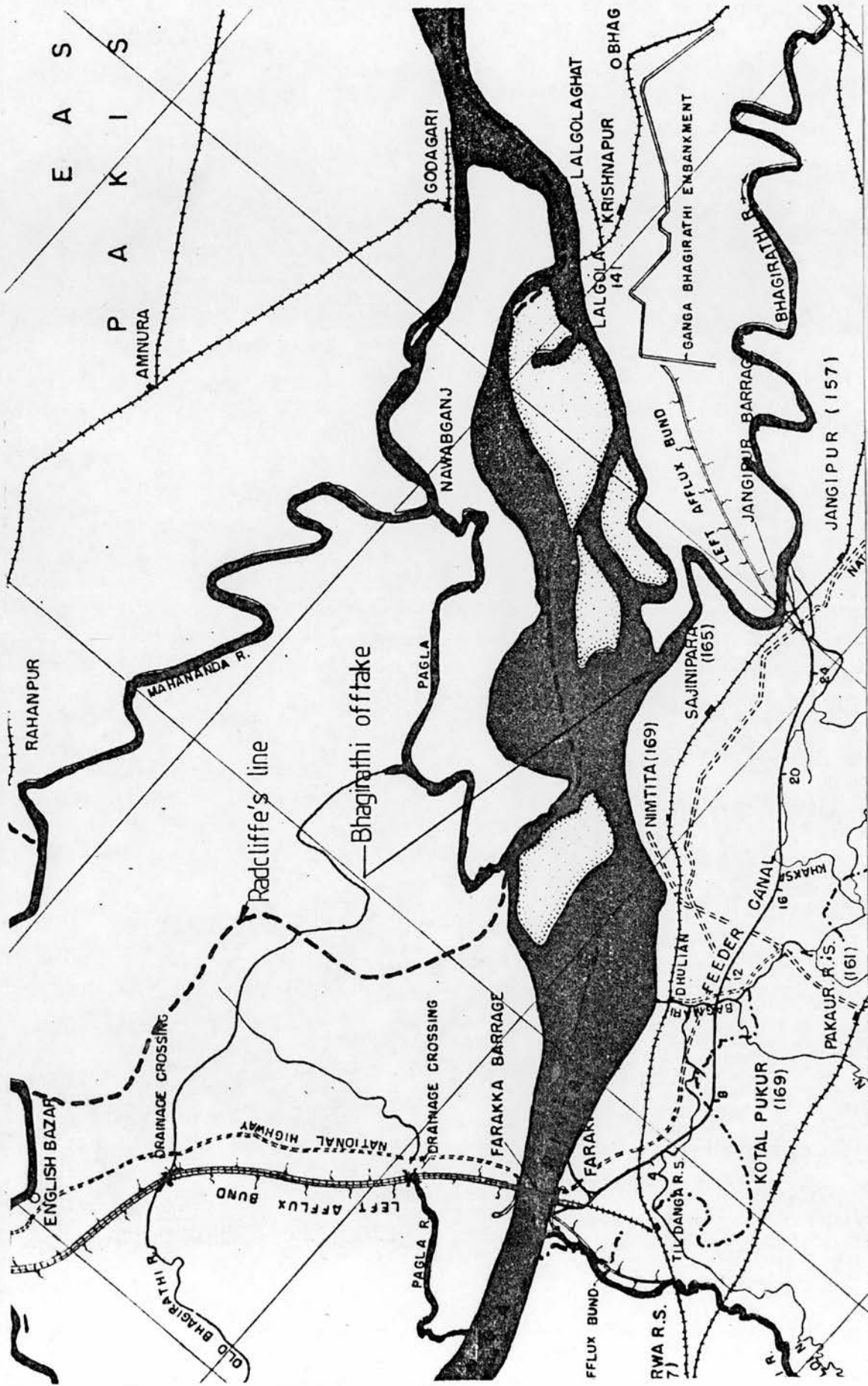


Figure 5.2: Map of Farakka Project showing Radcliffe's boundary, the Bhagirathi offtake and Lalgola.

Source: India, Preservation of the Port of Calcutta, Delhi, 1961.

might choose to build. (India avoided such joint control by choosing a site further upstream and building a 23-mile long feeder canal.) There can be no certainty that this was Radcliffe's intention but his line is capable of such an interpretation.

The partition of the Punjab also involved the division of a river system and a network of irrigation canals. In his Award for the Punjab, Radcliffe wrote:

'I think it only right to express the hope that, where the drawing of the boundary line cannot avoid disrupting such unitary services as canal irrigation, railways, and electric power transmission, a solution may be found by agreement between the two States, for some joint control over what has hitherto been a valuable common service.'

(22)

When earlier he had suggested that the Punjab water system should be run as a joint venture by the two countries, 'He was rewarded for his suggestion by a joint Muslim-Hindu rebuke,' wrote Mosley:

'Jinnah told him to get on with his job and inferred that he would rather have Pakistan deserts than fertile fields by courtesy of Hindus. Nehru curtly informed him what India did with India's rivers was India's affair.'

(23)

The sharing of the Indus Rivers was a subject of dispute between India and Pakistan from 1948 to 1960, when rights to the use of the water were established. A historian of the Indus dispute has argued that the dispute might have been avoided if Radcliffe's line in the Punjab had bisected the barrage at Ferozepur (on the Sutlej River) instead of skirting it and giving control of the river to India. He writes:

'Such an arrangement would have forced the parties to cooperate from the start and might have set a precedent that would have obviated the need to partition and divorce the Indus Rivers in 1960.'

(24)

It is possible that a similar idea was in Radcliffe's mind when he drew the boundary partitioning Bengal.

## Early protests

After the Indian Government's victory in the first round of the dispute in 1947, nothing more was publicly heard until 1951. In that year, Indian newspaper reports on the Ganges Barrage Project prompted a protest from the Pakistan Government. In a note dated October 19 1951, Pakistan expressed concern and demanded consultation before schemes prejudicial to Pakistan's interests were implemented. The Indian Government's reply, on March 8 1952, was that the project was at a preliminary stage and Pakistan's apprehensions were therefore 'purely hypothetical'. The note did, however, suggest co-operation. A further protest from Pakistan in May 1952, was not replied to until the following May, when India repeated the undertaking of co-operation but the co-operation 'would have to be reciprocal'. This was a request for information on Pakistan's Ganges-Kobadak irrigation project, a project which would suffer from Farakka diversions but which could not influence conditions in India because it was downstream of India and incapable of causing changes upstream. In 1954, Pakistan supplied information on the Ganges-Kobadak Project. At this point, India had supplied no information on the proposed Ganges Barrage, but there was a suggestion of general co-operation on flood control for the Ganges and Brahmaputra basins. In May 1955, the Pakistan Government took up this suggestion by proposing a joint survey of the upper reaches of the two rivers. India's reply, in February 1956, advised Pakistan to set up its own flood control commission on the model of those set up in India (25).

The first suggestion of arbitration in this dispute came from the Pakistan Government in 1957. They proposed that (i) a United Nations technical programme should be asked to assist in the development of the eastern river system; (ii) the projects in both countries should be examined jointly by experts from both countries before implementation; and (iii) the UN Secretary General should be asked to appoint an engineer to participate in experts' meetings (26). According to Bangladesh, India rejected all three proposals.

But, from the correspondence surrounding Pakistan's proposal emerged a rather limited agreement for a technical information exchange. The

grudging manner in which India conceded even this small step can be gauged from the statement made by the Indian Minister of Irrigation and Power to the Lok Sabha:

'...Government of India have agreed to a meeting of experts of India and Pakistan for the limited purpose of discussing procedural details and arrangements for exchange of information.'

(27)

It was not until June 1960 that the first meetings of technical experts took place. By this time Nehru had already sent assurances to the Chief Minister of West Bengal that the Farakka Project would be constructed, but Pakistan had not been formally informed of this intention.

#### The first technical exchanges

During the first meeting of technical experts from India and Pakistan, India did not present information on the Farakka Project. According to a list held by the Bangladesh Government (28), India supplied only a note on the Tista Project, a barrage to be built across the Tista River in the North of West Bengal. It was not until October 1960, when the experts met in Dacca, that a 'Project report for the preservation of the Port of Calcutta' was provided for the Pakistan Government. In addition a record of River Ganges flows between 1948 and 1960 was supplied and some more information on the River Tista. The meetings, though they took several days in each case, were apparently confined to an exchange of data (29) and it would seem that the information was of a fairly rudimentary nature. Subsequent meetings of technical experts held in 1961, 1962 and 1968 were somewhat similar.

#### Nehru-Ayub agreement

In March 1961, after Pakistan had been informed that the Project was going ahead, the first meeting of the political representatives of the States took place. Even then it was not a meeting arranged to discuss this matter, but an informal conversation which briefly touched upon the Farakka issue. Prime Minister Nehru and President

Ayub Khan were in London for the Commonwealth Prime Minister's Conference and they met to discuss a number of topics.

Ayub and Nehru had met in September 1959. That meeting was described at the time as 'friendly'; more recently it has been described as 'a disaster' (30). A year later, the two leaders met to sign the Indus Waters Treaty. Their meeting in London appears to have followed the more productive precedent of this second meeting. Nehru described the discussion some months later, in a speech to the Indian Parliament. Nehru said that he had suggested to the Pakistan President that Pakistan and India co-operate over the Farakka Project. He had said to Ayub Khan, 'Let us do it in such a way as to benefit each other...and let us decide this at ministerial level...'. Nehru recounted how they had agreed that there should be a meeting of ministers but that this could only be fruitful if the facts had first been gathered. For that reason engineers of the two countries had met twice already. Nehru went on to say:

'I hope that after the next meeting, which is going to take place fairly soon, both parties would be in possession of these facts. Then the time will come, if it is considered necessary, for ministers on both sides to meet and discuss, that is, not to allow matters to be dealt with by officials who cannot decide things.' (31)

There was no written agreement and, within a month or two of the understanding being reached, there was disagreement over its interpretation. This was, however, the only agreement between India and Pakistan concerning the Farakka Barrage, and it laid the guidelines for the dispute throughout the 1960s until, in 1971, Bangladesh was formed.

#### An opportunity missed?

Between 1947 and 1961, there were two periods when relations between the Governments of India and Pakistan were such that progress might have been made on the Farakka question. In 1953, soon after the appointment of Muhammad Ali Bogra as Prime Minister of Pakistan, Nehru and he entered into direct negotiations over Kashmir. But at

this time, the dispute on the River Ganges was no more than a shimmer on the horizon and the issue was not raised.

A much more promising, and in the context of this dispute much more timely, 'window' in Indo-Pakistan relations occurred between 1958 and 1960. This window started soon after Ayub Khan took power in Pakistan in 1958 and ended in the first months of 1961 as progress ground to a halt in the negotiations over several areas of dispute between India and Pakistan.

The two lasting achievements of this period are the demarcation of most of the border between India and Pakistan and the negotiation of the Indus Water Treaty.

Soon after Ayub took power, he met the Indian High Commissioner to Pakistan to discuss the demarcation of the Indo-Pakistan boundary. Radcliffe had drawn a line, but the line had not till then been marked on the ground: Out of this meeting came agreement to enter into formal negotiations, and from a year of formal negotiations emerged agreement on demarcation of almost all of the boundary. One area where agreement was not reached was the Rann of Kutch. Rajeshwar Dayal, who was Indian High Commissioner to Pakistan at the time, told me:

'Supposing Kutch had been taken up. There were problems. Pakistan was making some claims, challenging the boundary on the basis of administrative practices. There were points for negotiation but putting it off lost the momentum generated by the overall boundary settlement. I pressed the Ministry very hard. If we had pushed the Pakistanis, they couldn't have said no to discussions in the same spirit. When the overall negotiations were taking place, Pakistan said they had certain claims on Kutch. Our people, not Nehru, the official advisers in the Foreign Office, they somehow let the thing drop. I don't think there was any motive, just a disinclination to get involved in another long negotiation.'

(32)

The first of the two Indo-Pakistani wars of 1965 was fought over the Rann of Kutch.



Rajeshwar Dayal also thinks that at this time it might have been possible to negotiate a cooperative division of the Ganges:

'...my own feeling is that in the early years of Ayub's time when agreements were being made, then perhaps we could have reached agreement on Farakka but we had already started our work by that time.'

(33)

Dayal's recollection is incorrect. Work had not started on Farakka at that time; construction did not start till 1963/4 and a final decision on the Project was not announced until 1961, but in 1959 the strength of feeling behind the Project must have made it difficult to postpone or cancel.

The negotiations which led up to the Indus Waters Treaty took much longer than those over the boundary demarcation but again they provided both a precedent and a momentum for a quick settlement of the rapidly growing Farakka dispute. Indian journalist Kuldip Nayar has reported that there were indications that Pakistan was aware of the opportunity:

'In a communication of New Delhi, Dayal also drew New Delhi's attention to indications in Government circles in Pakistan that it would extend the principle of sharing waters, as agreed upon in the Indus Waters Treaty, to the Ganga Basin. Dayal warned that India should never agree to Pakistan's claim to the waters of the Ganga as a riparian State...'

(34)

Commenting on this, Dayal has said:

'My attitude in regard to India and Pakistan relations generally was that I felt the problems very rapidly became psychological and, if not tackled promptly, assumed almost unmanageable proportions. Where there is tension and lack of trust even a minute problem becomes a major hurdle if not dealt with immediately. I said this [to New Delhi] in explanation of a large number of problems which had become major since Partition.'

(35)

So, what happened to Dayal's recommendation? Nothing came of it. The Indian Government decided not to pursue the matter further.

Perhaps, as with the Rann of Kutch, there was a 'disinclination to get involved in another long negotiation'. It is more likely that there was a substantive reason. This may be the first occasion when India refrained from entering into formal negotiations with Pakistan because to do so would recognise Pakistan's locus standi in the matter. It was certainly not the last such occasion.

India has maintained for much of the dispute, that the Ganges is not an 'international river'. To have entered negotiations with Pakistan would have been a denial of this line of argument. Possibly this is an example of the comment attributed to Nehru, 'what India did with India's rivers was India's business'. Certainly, at this time the Indian Government's approach was that they would be willing to talk to Pakistan, but the word negotiate, or any other indication that Pakistan might have rights to the water, was noticeably absent from Indian statement. This, for example, is from Nehru's speech, quoted earlier, to the Lok Sabha:

'...our approach to the Farakka Project is that we do not wish in any way to harm the interests of East Pakistan in this, and we shall try to adhere to that to the best of our ability. We are certainly prepared to talk to them about the whole area or about other schemes that they may have and we may have on the basis of the information gathered.'

(36)

By the time Nehru made his statement, the cordiality had evaporated from his dealings with Ayub Khan and from the relations between the two governments. The window in Indo-Pakistan relations had been shuttered, and Nehru's attention was being turned toward the North and relations with the Chinese.

## CONCLUSIONS

Radcliffe's decision in 1947 to award Murshidabad to India followed from his assessment that the headwaters of the Hooghly should be given to the state which included Calcutta. The Government of India is, however, mistaken in interpreting this as support for a particular project. Radcliffe's decision to divide Malda District is difficult

to interpret but there is a suspicion that he intended to enforce inter-government cooperation if a barrage should be built in that reach of the Ganges.

In the succeeding ten years such cooperation was denied to Pakistan. The Indian Government's assertion that consultations took place is mistaken. Only formal data exchanges occurred. The first political meeting took place in March 1961, after approval had been given to the Farakka Barrage. Neither in the 1950s, nor, as we shall see in the next chapter, in the 1960s did the Indian Government permit substantive negotiations.

An opportunity for negotiation occurred in 1960. The Indian High Commissioner to Pakistan informed his government that Pakistan was willing to negotiate but he got no response. This was an auspicious time for negotiations; other issues had been resolved, and the formal announcement of the Farakka Project had not yet been made. We do not know why this opportunity was neglected but we may speculate that in 1960 the Indian Government had already decided upon a strategy of procrastination in order to construct the Farakka Project as it was designed, without any concessions to Pakistan.

## Chapter Six

### THE INDIAN POSITION AND THE PAKISTAN RESPONSE

Between 1961 and 1971, little progress was made in the Farakka dispute. In 1961, the Government of India formally told Pakistan that construction had started. In the same year, President Ayub Khan and Prime Minister Nehru struck a nebulous agreement to cooperate. Vague though it was, that verbal agreement was the only one to be made on this subject between the governments of India and Pakistan. Frequently throughout the sixties the Pakistan Government despatched protests to India and, on occasion, the two sides met for discussions on the technical aspect of the dispute. In the late sixties, Pakistan increased the force of its protests to the extent that they included a semi-covert threat to retaliate by flooding large parts of West Bengal. Neither the protests nor the threat of retaliation influenced either the construction of the Barrage or the Indian Government's attitude to the needs of Pakistan. The Farakka Project was constructed with great haste and the needs of Pakistan were determined by India according to that government's unilateral and paternal interpretation.

At no point in this decade were relations between the two governments as promising as they had been at the end of the fifties. The decade was dominated by a hostility which broke out into war in 1965. This hostility was briefly set aside in 1969, when a settlement was reached for the Rann of Kutch territorial dispute. But dispute over Kashmir, the most prominent conflict between the two governments, remained. In 1970 a vigorous movement for provincial autonomy started in East Pakistan, and in 1971 India intervened to assist in the establishment of an independent state, Bangladesh. India's victory in that war established India as the dominant power in the subcontinent and removed the Pakistan Government from involvement in the Farakka dispute.

In the decade 1961 - 1971, which is the subject of this chapter, little of significance happened in the Ganges water dispute. It is what did not happen that is important. Talks took place occasionally between India and Pakistan, but negotiations and consultations did not. We shall see in this chapter that the nature of these talks was not hidden from Indian MPs. The Farakka Project was, as an External Affairs spokesman in the Lok Sabha conceded, a 'unilateral action'. Nehru told the parliament that work on the project was going ahead, 'and we do not intend to stop it in any way'. The ministerial negotiations promised in the Nehru-Ayub agreement did not happen. There were four technical exchanges in 1961, a fifth in 1968, and then five meetings were held at Secretarial (senior civil servant) level between 1968 and 1970. But still there were no political meetings. Was this protracted process what was intended by the Nehru-Ayub agreement?

This chapter investigates the Indian Government position and the Pakistan Government's response, in this decade, to seek an answer to that central question. It will be argued that the Indian Government deliberately chose a strategy of procrastination, and made repeated requests for technical data in order to indefinitely postpone the political negotiations promised at the Nehru-Ayub meeting. An alternative explanation for the failure to progress toward a settlement of the dispute has been suggested. It has been alleged that the Pakistan Government's response in the conflict was weak because the Government gave low priority to the interests of East Bengal. This alternative explanation will be dismissed.

A brief section at the end of the chapter describes an attempted international intervention in the dispute by some scientists in the Pugwash movement. The intervention was unsuccessful in so far as it failed to bring the parties together, but it initiated some very interesting research on the possibilities of using ground water storage to provide sufficient water for both countries' needs.

Table 6.1 provides a chronology of the conflict in this period.

Table 6.1: Chronology of the Farakka dispute, 1961-1971

1961	Jan	Pakistan formally told Project going ahead
	Mar	Ayub-Nehru meeting in London, correspondence till June
	Apr	3rd Experts meeting, Calcutta Lok Sabha told Project will not be stopped because of Pakistan
	July	Joint barrage proposal rejected by India
	Aug	Discussions in Lok Sabha
	Dec	4th Experts meeting, Dacca
1962	Nov	Pakistan proposed ministerial meeting
1963	May	Pakistan again proposed ministerial meeting
1964		Joint survey of banks of the Ganges in border area
1965	May	Pakistan sends reminder on final experts meeting Rann of Kutch war
	Aug	India agreed another Experts meeting should be held
	Sep	Indo-Pakistan war
1967	May	Pakistan raises dispute in Water for Peace Conference, USA Lok Sabha told of theft of Farakka plans
	Oct	Pakistan makes another request for Experts meeting
1968	Jan	Agreement is reached that another meeting be held
	May	5th Experts meeting, New Delhi Pakistan renews pressure for a ministerial meeting
	Jul	Kosygin sends letter to Mrs Gandhi urging Indus-like settlement
	Sep	Issue raised at the UN General Assembly by Pakistan
	Dec	1st Secretaries' meeting
1969	Mar	2nd Secretaries' meeting, Islamabad, ends in deadlock
	Jul	3rd Secretaries' meeting, New Delhi
1970	Feb	4th Secretaries' meeting, Islamabad
	Apr	Jayaprakash Narayan et al urge Indus-like settlement
	Jul	5th Secretaries' meeting, New Delhi
1971	Jan	Agreement to hold another meeting of Secretaries
	Mar	Start of Bangladesh Independence struggle
	Dec	Indian intervention in East Bengal and general Indo-Pakistan war

## Indian position

The Nehru-Ayub meeting of 1961 established an interpretation of the dispute which has been accepted ever since: that the dispute has two parts, one technical and the other political. That meeting also laid down the principle that the technical points should be resolved first, to lay the foundations for the political discussions which would follow. Terms of reference for these technical discussions have never been published. The wide range of topics which have been discussed suggests that the nature of the discussions may never have been well-defined.

Perhaps as a result of this lack of definition, there was, through the sixties, a tension between repeated demands from Pakistan for an upgrading of the talks and the response of the Indian Government that more data ~~were~~ required. Pakistan wanted to move on to the political questions (presumably the sharing of the water) for which ministerial discussions were deemed, both by Pakistan and India, appropriate; while India stated that more data were required, primarily to substantiate the demands that Pakistan had made for irrigation water.

From 1961 onwards, statements were made by representatives of the Indian Government, in the Lok Sabha, which characterised the technical discussions with Pakistan as consultations, or talks, which would not influence either the building of the Farakka Project or the quantities of water to be diverted for Indian needs.

In April 1961, just a few months after Pakistan had been informed the project was going ahead, an MP asked a spokesman for the Indian Ministry of External Affairs: Had the Government made it absolutely clear to Pakistan that the Project 'is a matter of unilateral action and that we will not wait for any negotiations and the project will proceed according to schedule?'. The spokesman replied, 'Yes sir... The work on the Project will not be stopped because of this'. Later in the same discussion, another MP asked,

'If the Project will continue as before, may I know what is the use of having these negotiations?'

The External Affairs spokesman replied:

'Negotiations are always good. It is good to talk things over in a general way.' (1)

If the Pakistan Government retained their faith in the negotiations after that exchange, a statement by Nehru a few months later must have made them at least sceptical. He was asked about the protests from Pakistan and the correspondence between himself and Ayub Khan:

'They say that this will affect their water supplies... in East Pakistan, and nothing should be done which affects it. This is their main argument.

'We are proceeding with the work. We have not allowed it to be stopped or suspended and we do not intend to stop it in any way.' (2)

Nehru explained his Government's response to Pakistan's previous protests; Pakistan had been told that they would be 'informed' when the Indian Government's enquiries into the Project were complete. This had been done. Nehru also explained that it is always desirable to 'discuss' conflict. When asked how Pakistan could be affected by the Project if it was only going to regulate monsoon water and not the minimum flow, Nehru did not correct his questioner's misunderstanding. He vaguely replied:

'It is our view that there should be no real injury caused to Pakistan by this scheme. But I cannot answer Hon. Members question how it can be affected. Unless the scheme is understood it is not possible to say. Anyhow it is Pakistan's fear and apprehension that they will be affected.' (3)

Nehru did admit that Pakistan had asked the Indian Government to suspend work on the Project until their dispute had been settled. In November of the same year, a parliamentary answer was misunderstood by newspapers to mean that the project was being delayed or postponed. But the Government was quick to rectify the misunderstanding:



'Government of India had delayed the Project to take into consideration Pakistan's reasonable interests. The Project had been sufficiently delayed in the past to take Pakistan's interests fully into account, but there is no obligation or intention that there should be any further delay.'

(4)

The Pakistan Government would not have accepted this account. There were after all no meetings between the two governments to discuss the project prior to 1960, and neither government at this time believed that adequate data had been exchanged. The Lok Sabha was not told when this delay had occurred.

Throughout the sixties, spokesmen for the Government of India restated the view that India had taken Pakistan's 'reasonable interests' into account. During this period India did listen to the Pakistan Government's interpretation of what constituted East Pakistan's reasonable interests, but the Indian Government had strong views on what was and was not reasonable. When, in August 1961, the Indian Minister of Irrigation was asked in the Lok Sabha if Pakistan's points had been considered, he took the opportunity to say that two of East Pakistan's irrigation schemes were not reasonable. The expansion of the Ganges-Kobadak Project was 'only at the conception stage...Indian engineers have serious doubts whether some of these paper schemes are technically realistic.' Another project, the Faridpur-Barisal Project, he thought was 'highly speculative':

'It has just been conceived, long after the construction of the Farakka Barrage was commenced, and cannot have the same status or equal priority with that Project. Nor can the scheme be said to be as vital for East Pakistan as the Farakka Barrage is for Calcutta...'

'The Government of India have informed the Government of Pakistan of their view that the requirements of the unreal Faridpur-Barisal scheme cannot be taken into account...'

(5)

To an extent, these Indian claims have been justified by subsequent events. The Faridpur-Barisal scheme has not been built, and the expansion of the Ganges-Kobadak Project has not taken place. The reasons why these schemes have not reached fruition are more than

simple 'unreality', though there probably was a measure of bargaining motivating Pakistan's proposal of them in 1961. The point to be made is that the Indian Government adopted a paternal stance to Pakistan's claims. India had the power, and India would decide what was reasonable. In 1968, after a technical exchange at which the Pakistan delegation had increased their estimate of East Pakistan's water needs, the Lok Sabha were told, 'the Indian delegation considered these requirements prima facie untenable' (6). A few days later, Dr K L Rao, the Irrigation Minister, commented:

'I do not think Pakistan is really serious about the discussions when they suggest such a large volume of water. Nobody would, normally suggest any such thing. If one is really interested in getting something, one must make a reasonable demand. No one goes to the extent of this absurd exaggeration. That defeats their case itself. I know the case. There is very little for us to feel, in any way, about having any kind of doubt on our stand about this issue. After all Ganga river is an Indian river.'

(7)

This paternalism, with the Indian Government holding discussions but maintaining the right to veto Pakistan's claims, is one element in the Indian Government's management of the dispute during the sixties. A second element, is a repetitive demand for more data.

As late as December 1969, with the Farakka Barrage itself on the verge of completion, the Indian Government was still maintaining that political discussions could not take place because Pakistan had not supplied all the information they required. After five meetings of water resources experts and three at the level of Secretary (senior civil servant), India still needed more data:

'Mainly because of continual changes introduced by Pakistan in their projects, there are still important gaps which require to be filled.'

(8)

The promise of a ministerial level meeting, and therefore one able to discuss the political issue of sharing the water - the promise held out by Nehru's discussions with Ayub in 1961 - was never fulfilled during the Pakistan reign in East Bengal. Pakistan proposed

in 1962, 1963, 1965 and repeatedly thereafter that a ministerial meeting should be held. The obstacle to such a meeting was always that India believed more data were required. The interpretation and judgement of India's conduct of the dispute in this period is dependent primarily on a judgement of this obstacle: was India's demand for more data reasonable?

Nehru touched on this need for information about projects in the lower riparian country, when he wrote, in a letter to Ayub Khan in 1961:

'One more matter to which I must also refer, is the distinction you still seem to make between the rights of the upper and lower riparians in paragraph 7 of your letter, which implies that the lower riparians can proceed unilaterally with projects, while the upper riparian should not be free to do so. If this was to be so, it would enable the lower riparian to create, unilaterally, historic rights in its favour and go on inflating them at its discretion thereby completely blocking all development and uses of the upper riparian. We cannot, obviously, accept this point of view, especially when three-fourths of the length of the Ganges lies in Indian territory, which gives India the priority interest in this river'.

(9)

Nehru implicitly concedes the right of a lower riparian to influence projects in an upper riparian state. This is in contrast to the public statements of his government at that time. Was the information, which the Indian Government voraciously demanded, required in order to establish Pakistan's 'reasonable interests' in the Farakka Project or was it demanded as an exercise of India's right to veto projects in East Pakistan? Or, simply in order to prolong the talks? Certainly if India did amend the requirements of Calcutta Port to take account of Pakistan's interests, no public statement was made of the fact. But this is not surprising because India was presumably holding concessions in reserve for the real bargaining at ministerial level. It was agreed at the last of the Secretaries' meetings, held in July 1970, that a meeting would be held within 3-6 months to consider the 'quantum of water' to be supplied to Pakistan. That meeting, however, was never held.

## The Pakistan response

The Pakistan Government's response to the Farakka Barrage Project can be interpreted as a response in five stages with each stage putting greater pressure than the last on the Indian Government. The five stages are:

- (i) Cooperation;
- (ii) Technical exchanges;
- (iii) Pressure to upgrade the talks;
- (iv) Attempts to involve third parties; and,
- (v) A threat of retaliation.

Once Pakistan had been formally informed of the sanction for the Farakka Project, attempts to open negotiations were started in earnest. Ayub Khan made his suggestions to Nehru in London and a correspondence ensued between them. These exchanges are reasonably documented elsewhere (10). What is not well-known is a suggestion that Pakistan made in 1961 that the two countries should consider constructing a joint barrage. How seriously Pakistan took the proposal is not known, but such co-operation might have been technically feasible. The South West of East Bengal could be irrigated by gravity canals fed from a barrage across the Ganges. A potential site existed, at Lalgola, which, superficially at least, could have served the purposes of both countries. That site would have put the barrage equally in India and East Pakistan. If the site was satisfactory from engineering considerations, the project would have had substantial economic advantages. The expensive feeder canal would have been unnecessary and Pakistan could have provided a substantial contribution to the cost of the Barrage itself. Unfortunately, but perhaps inevitably, India gave the idea short shrift. According to a report in Dawn, the Indian team to technical talks held in Dacca rejected the idea of a joint barrage on the grounds that:

'considerable work had already been done on the Farakka Barrage and the Indian Government did not intend to give it up.'

(11)

That rejection ended Pakistan's first response suggesting genuine cooperation. Any other reference to cooperation would henceforth mean sharing the water, a discussion in which the countries had no common objectives, only opposing interests.

#### Technical discussions

Technical discussions, the second stage of the Pakistan response, continued in fits and starts throughout the sixties. A great quantity of hydrological data and project descriptions was exchanged in these meetings. From the list of data supplied by India (summarised in Appendix B), it is possible to identify some of the technical issues which were raised in the discussions. The data exchanged fell into three categories:

- (a) Basic discharge measurements,
- (b) Project descriptions, and
- (c) Issues arising from (a) and (b).

The main issues in category (c) were firstly, Pakistan's doubts about the Farakka Project and its technical rationale and, secondly, the subject of regeneration. India had presented a historical series of discharge measurements taken at Farakka or Rajmahal nearby. Pakistan had presented a series taken at Hardinge Bridge. The two series did not tally. One reason why they did not tally was that water flowed from the ground water reservoir to the river and vice versa. During the dry season this flow tended to increase the flow of the river so that the measurement at Hardinge Bridge would be greater than the discharge measured at Farakka, some sixty miles upstream. The estimation of the quantity and continuity of this regeneration became the subject of a long technical discussion on which each side wrote numerous papers (none, unfortunately, have reached the public domain).

Technical discussions were prolonged, but, from the Pakistan Government's point of view, they achieved little. Anxious to achieve a resolution of the dispute before India operated the Farakka

Barrage, and under some pressure from MPs representing constituencies in East Pakistan, the Pakistan Government renewed pressure to upgrade the talks and attempted to involve third parties in the dispute. These actions can be interpreted as the third and fourth stages in the Pakistan response.

#### Pressure for political negotiations

In 1968, Pakistan again urged that the ministerial discussions promised by the Nehru-Ayub agreement should take place in the near future. In the same year, they raised the dispute on the floor of the UN General Assembly and persuaded the USSR to give support to their case. At the end of 1968, India made a slight concession. They did not agree to ministerial discussions, but they were willing to take part in Secretarial level discussions. Even then, Indira Gandhi, the new Indian Prime Minister, told the Lok Sabha that her Government believed ministerial talks to be premature; the technical exchanges had to be completed first. The purpose of the Secretarial talks would be to review the progress of the technical exchanges and establish procedures for speeding up the exchange of data (12).

The Pakistan delegations to the Secretarial talks kept up the pressure for higher level talks, but at the same time they expanded the basis of Pakistan's case. At the technical exchanges, Pakistan had opposed the construction of the Farakka Project on the basis of the consequences it would have for the economy of East Pakistan (13), and a strong element in that case was the argument that they had a prior right to the water of the Ganges. That right rested mostly on the Ganges-Kobadak Project (14).

In 1968, Pakistan's High Commissioner in Delhi, Arshad Hossein, was promoted to Foreign Minister. He visited East Pakistan and decided that Pakistan's case should be founded more solidly on the economic consequences of Farakka diversions. This new case was presented to the second Secretaries' meeting in March 1969, and drew a strong response from the Indian delegation. Arshad Hossein intended to create a deadlock and then break off negotiations, but he was unable to contact the President to obtain his support for this line of action.

Ayub Khan was unobtainable because he was being toppled from power by Yahya Khan. Arshad Hossein was replaced a few days later, and the Pakistan delegation to the talks were left without instructions. The idea of creating a deadlock petered out as Pakistan entered a crisis of succession (15).

#### Discussions at the UN

The fourth stage in Pakistan's response - the involvement of third parties - was partly successful but it did not achieve one apparent objective, that of obtaining a mediator or arbitrator in the dispute. Pakistan did succeed in raising the dispute at the UN. According to Hossein, who led the Pakistan delegation, India was afraid that the General Assembly might pass a resolution demanding that India stop construction of the Farakka Project. In the light of Bangladesh's difficulties at the UN in 1976, when they found that few countries would support their stand, this sounds an unlikely event. In any case, Hossein reassured India that Pakistan was only giving a warning in order to get the negotiations moving: 'we are trying to negotiate, in case we don't succeed, we will come back' (16).

As part of this stage, the Pakistan Government informed the super-powers of the dispute and apparently obtained some support from the USSR. Mr Kosygin wrote a letter to Mrs. Gandhi urging a settlement along the lines of the Indus Water Treaty (17). There is little doubt that the World Bank would have been willing to play a role similar to the mediatory and conciliatory role it had played in that treaty. India publicly rejected the suggestion (18). However, Arshad Hossein, when he was in the USA for the UN meetings, raised the question directly with the Bank's President. A number of conversations were held between the Bank and Hossein, on the one hand, and the Bank and Morarji Desai, then Indian Finance Minister, on the other. Desai apparently told the Bank that India would be willing to consider mediation by the World Bank. Nothing further was heard of the proposal. Hossein says, 'If Ayub had not fallen, maybe that line could have been pursued' (19).

## A threat of retaliation

Emerging at various stages in the dispute, from 1962 to the present day, is a project known as the Ganges Barrage. Not a stone has been laid for this project though several consultant's reports have been prepared, and the project has been discussed at length in several meetings of the two governments. Though the evidence is contradictory and confused, it does seem that the main reason why Pakistan proposed this project was as a threat of retaliation against India. This project was the fifth stage in the Pakistan Government's strategy.

The Ganges Barrage would have been built in the vicinity of Hardinge Bridge, in East Pakistan, probably at the offtake of the Gorai-Madhumati River. Its ostensible purpose was to irrigate huge areas of the West and South West of East Bengal; one report claimed that a gross area of 6.35 million acres could be irrigated (in 1969, East Bengal irrigated only 2.6 million acres). The barrage was also intended to store water for dry season use. The reservoir would have extended into India, almost certainly as far upstream as the Farakka Barrage. This reservoir could have flooded areas of India. India reacted to the threat with a protest. K L Rao, Indian Minister of Irrigation, told the Lok Sabha that the project:

'If executed, will cause harm to large tracts of territory belonging to India by way of submersion and erosion, etc. The Government of India have lodged a strong protest with the Government of Pakistan and have urged that no construction should be undertaken on Padma which may injure the upstream area in India.' (20)

The Pakistan proposal had a certain subtlety. As a Pakistan journalist explained it, the height of the barrage would depend simply on how much water India agreed to release at Farakka. If India agreed to release very little, then the Ganges Barrage would have to store more water, and this might pose a threat to West Bengal (21). Arshad Hossein and other participants in the negotiations with India have now admitted that the project was primarily intended as a threat (22).



In the last of the Secretarial meetings, in July 1970, some progress was made. The two sides agreed that 'the point of delivery of supplies to Pakistan of such quantum of water as may be agreed upon will be Farakka' (23). They also agreed that a meeting should be held in 3-6 months to decide the 'quantum of water' Agreement on the 'point of delivery' ended, presumably, the technical argument surrounding regeneration; agreement that the next meeting should discuss water-sharing signified the end of the technical exchanges. The second part of the Nehru-Ayub Agreement was reaching fruition, ten years after the Agreement. Participants in these discussions say that there was, behind the scenes, some agreement even on the quantity of water to be released at Farakka (24). However, the next meeting was never held. There was agreement in January 1971, at India's suggestion, that another meeting should be held. In March, the Bangladesh independence struggle started, but even before this there were indications that the Pakistan Government was taking a less conciliatory line. In February, 1971, it published a pamphlet, India's Farakka Barrage and its adverse consequences on East Pakistan (25), which was not likely to elicit cooperation from India.

Before discussing the reasons for this decade of delay, we now briefly consider an attempted intervention in the dispute.

#### The Pugwash initiative

'On January 1, 1966 in Addis Abbaba a small group of eminent scientists who were gathered at a Pugwash conference talked late into the night about the problems of world peace and international cooperation. They were looking for ideas that would capture the imagination of the world community and which, at the same time, would provide the focal point for international cooperation between nations that were currently or historically in conflict. The discussion ultimately focussed on India and Pakistan. The previous year, 1965, had seen a war between these countries which both could ill-afford and which had seriously dislocated their economic development programs. The Pugwash group resolved that some organisation, outside of both India and Pakistan, should identify problems common to both nations on which they might work on a co-operative basis. Professor Roger Revelle, Director of the Center for Population Studies at Harvard University, offered to provide the services of his research staff to write a prospectus for such a

study. It was agreed that there was a need to look in some detail at the natural resource development of that area of the Indian subcontinent comprising the basin of the Ganges and Brahmaputra Rivers...'

(26)

Revelle had been associated with President Kennedy's technological approach to the solution of all manner of problems (27): in particular, he had directed a large-scale desalination programme in Pakistan. All went well with the Pugwash initiative. It seemed at first that both Ayub Khan and Indira Gandhi were enthusiastic but, in 1967, a team from the Centre for Population Studies set out to meet both leaders. They did meet Ayub Khan but at the last moment D P Dhar, Mrs Gandhi's Secretary stopped answering their telegrams. No explanation for this was ever received (28).

Preliminary studies of cooperative development of the water resources of the Ganges basin had already been completed and, rather than lose the work already completed, the group continued with a study on the Pakistan portion of the Basin, with funding from the World Bank and other international agencies. From this study emerged the concept of a 'Ganges water machine' (29), a massive system for increasing underground water storage in the Ganges basin. The researchers from the Center for Population Studies quantified, possibly rather earlier than the negotiators of Pakistan and India, the dry season water shortage in the Ganges basin and suggested induced groundwater recharge as a solution. During the dry season, heavy pumping would lower the groundwater table and provide water for irrigation and other uses, and, in the wet season, various measures would increase the rate of percolation so that the flood waters would be used to recharge the underground reservoirs. By this means, the Harvard researchers estimated that nearly 30% of the annual flow of the River Ganges could be stored, providing enough water for both India and Pakistan and, therefore, undermining the basis of the dispute. (This proposal is described in greater detail in Appendix D.)

The proposal could have influenced the course of the dispute but it did not. One explanation why it did not can be gauged from the response of a civil servant in the Ministry of External Affairs. He was asked why Indian enthusiasm for the Harvard proposal had waned:

'This is my personal view. I have little trust in those who want to offer assistance of this nature. One should first consider whether the countries themselves have the expertise to tackle the problem...I do not see that Britain, the US, or Harvard have more knowledge of dam construction than India would have. Quite often the assistance does nothing more than make the developing countries into an experimenting ground. Sorry to put it so strongly. This dispute can't be solved financially, it can only be eliminated if the countries decide to eliminate it. No country, if it has any self-respect, would like to be made into a testing ground.'

(30)

This view, suspicious of the motives of aid (particularly American aid) is, however, only one of the views held in the Ministry of External Affairs. Rajeshwar Dayal, who was Foreign Secretary at the time, thinks that it is 'a very narrow outlook; one should not disregard ideas whatever their source':

'One of my last notes as foreign secretary before I retired was concerning this question. I urged government to set up a technical group without commitments to study this project, with Reville's advice if necessary, without it if possible. I spent half a night with Reville in October 1968 in Harvard going through his studies.'

(31)

For whatever reason, Dayal's view did not prevail.

#### CONCLUSION: PROCRASTINATION OR WEAK ADVOCACY?

There was no progress in the water sharing conflict during this decade; the promise of a ministerial meeting and political negotiations held out by the Nehru-Ayub agreement was denied. Why? Two possible explanations have been suggested. In 1970, the Awami League's election manifesto blamed weak advocacy:

'The criminal neglect of earlier governments has allowed Farakka Barrage to become a FAIT ACCOMPLI [ their capitals].'

(32)

On the other hand, it has been suggested in these pages that the Indian Government may have conducted a deliberate policy of procrastination.

Analysis of the Pakistan Government's response to the threat of the Farakka Barrage shows that there was a five-stage strategy starting with an offer of cooperation and ending with a threat of retaliation in kind. Short of using force, for which Israeli artillery bombardment of a Syrian barrage site provided a precedent (33), the Pakistan Government appear to have responded with considerable vigour. The Awami League's explanation must be dismissed (34).

The second explanation, however, appears to be nearer to the truth. In an interview in 1978, I put this point to Mrs. Gandhi:

BC: 'It seems odd, given that the sharing of a resource is a political issue, that the discussions with Pakistan were confined first to technical experts until 1968, and then to Secretarial meetings after that.'

IG: 'Pakistan was not willing to meet us.'

BC: 'That's not how it seems from the historical record. It looks as though they made several requests to upgrade the talks.'

IG: 'Well, I don't know. Talks can only be held if there is an atmosphere of confidence and amity. That was a period when there was acute distrust, and no respect, therefore there was no agreement even on much lesser issues.'

(35)

Mrs Gandhi is here referring to the absence in this period of what I have referred to as windows in the relationship between the two countries.

Rajeshwar Dayal, who was Indian High Commissioner to Pakistan and then Foreign Secretary for parts of this decade, is more frank on this question. In an interview with myself, Dayal has implicitly confirmed that India did not regard the talks with Pakistan as negotiations, but as a means of staving off more vigorous dispute:

RD: 'India could never have got Pakistani agreement.'

BC: 'Was it wise to go ahead without it?'

RD: 'There were only two ways to handle it. Assuming that the project was essential for the Port of

Calcutta which is what the technicians told us, if you start negotiations and come up against a stone stone wall, the first thing would be they'd apply an injunction. In that case, what would happen to the Indian economy?...'

(36)

Dayal did not spell out the second approach, which India took, but the implication is clear that India was playing for time, in order to get the project completed.

What also emerges from these two interviews is that the Indian Prime Minister and the Indian Foreign Secretary both perceived the dispute as determined by the overall state of relations between the two countries. This perception is partially contradicted by the account of Arshad Hossein, formerly Pakistan High Commissioner of India and then Foreign Minister. He says there were opportunities for progress in the conflict, but extraneous events intervened. In an interview with me, he summarised the problem as follows:

'First there was the Chinese business, then Nehru dies and we had to wait for the succession, then there was the war. All the time the issue was being raised by us but the circumstances were not right.'

(37)

According to Hossein, it was not simply hostility which prevented the start of negotiations. Although on one occasion war intervened, at other times the Indian Government's attention was turned elsewhere. Certainly Hossein implies that the state of relations was not a restraint from the Pakistan Government's perspective (38).

It seems reasonable to conclude that there was an Indian strategy of procrastination in force until at least 1971. One factor influencing India's choice of that strategy may have been the perception by India's leaders of a general state of hostility between Pakistan and India (39). In terms of legal principle, the Indian Government was adhering to a position close to absolute territorial sovereignty, as outlined in the introduction to this thesis. In Chapter 16 we shall see that this principle did not correspond with Indian practice in settling inter-state water disputes, nor with the conduct of upper riparian states elsewhere; in both those cases

equitable utilisation had been generally accepted as the appropriate principle.

The creation of Bangladesh, as we shall see in the next chapter, brought changes in Indian policy, the first phase of the conflict over the Ganges came to an end.

## Chapter Seven

### THE SHEIK AND MRS GANDHI

At the end of 1971, when the new Awami League Government of independent Bangladesh came to power, they were presented with an unusual opportunity. The strength of popular commitment to the struggle against the Pakistan Army was inherited by the new government and gave them carte blanche in their internal affairs. Popular and governmental goodwill toward India was also at a historically unprecedented high level. The political inclinations and class origins of the new government were similar to those of the government in New Delhi but, more significantly, the role played by the Indian government and military forces in the birth of Bangladesh left a debt of gratitude of which the new government was acutely aware.

The Government of Bangladesh was in a position to implement the promise they had made in their Manifesto for the 1970 election.

'Every instrument of foreign policy must be immediately utilised to secure a just solution of this [the Farakka] problem.'

(1)

Within four months of the surrender of Pakistan forces in East Bengal, it was announced that India and Bangladesh had agreed to establish a Joint Rivers Commission:

'so that the water resources of the region can be utilised on an equitable basis for the mutual benefit of the people of the two countries.'

(2)

Not only was the atmosphere propitious for a settlement of the dispute over the Farakka Barrage and for a cooperative sharing of the Ganges waters, but a forum had been created within which technical discussions could be held and the foundations created for a political settlement.

In fact, the independence of Bangladesh brought, almost unnoticed at

the time, a resolution of the first phase of the Ganges waters conflict. The Bangladesh Government accepted, in general, that India had a right to use the Farakka Barrage. In return the Indian Government recognised Bangladesh's right to negotiate the sharing of the water. The change in governmental attitudes did not take place immediately but, from the beginning of 1972, India began to concede the principle that Bangladesh had standing as a co-user of the Ganges, and Bangladesh began to come to terms with the existence of the Farakka Barrage. The Pakistan Government's ten year old request for ministerial negotiations with India was granted to Bangladesh within two months. The change of government brought considerable progress in the negotiations.

Discussions continued between Bangladesh and India for the next two years. Ministers came from India to meet their counterparts in Bangladesh. Bangladesh ministers returned their visits. The joint Rivers Commission held a series of meetings.

In 1974, when the two Prime Ministers (Sheik Mujibur Rahman and Mrs Indira Gandhi) met to discuss, amongst other matters, the Ganges conflict, an observer might reasonably have predicted that substantial progress would be made toward the settlement of this, the most important outstanding dispute between the two countries. On almost every other issue discussed there was progress. On this there was none.

This chapter attempts to explain why the promise of settlement was denied, how the best opportunity for a settlement of the dispute was mislaid.

It is an investigation into a paradox of delay. There was a long window in Indo-Bangladesh relations between 1972 and 1974/5, but there was little progress in the dispute. The delay seems to have come not, as in earlier periods, from the Indian side, but from that of Bangladesh. If India had continued the stalling and postponement characteristic of the previous two decades, the Bangladesh Government or participants on the Bangladesh side would have protested. That they did not do so is a reliable indication that the strategy of



procrastination had been relinquished. This chapter, is, therefore, an attempt to understand why the Bangladesh side may have contributed to delay in the settlement of the dispute.

From the recollections of Bangladesh participants, three possible causes of the delay can be identified.

- (i) The government was too busy with other concerns to concentrate on the solution of this dispute.
- (ii) The body of officials responsible for the technical negotiations may have chosen to prolong the dispute.
- (iii) The minister primarily responsible on the Bangladesh side for the negotiations may have had reason to prolong the dispute.

These three potential explanations correspond, to a certain extent, to Allison's three models of government decision making, outlined in the introduction to this thesis: the first corresponds to the idea of government as rational actor; the second could be made to fit the 'organisational process' model; and the third is an example of 'bureaucratic politics' where the minister was able to manipulate his ministry and the cabinet. This correspondence is not very deep because it has not been possible to show in detail what was happening inside the Bangladesh Government and, as a result, the models cannot be articulated.

However, several participants have been willing to give their personal views of what happened. On this basis it has been possible to tentatively evaluate the three explanations. This assessment suggests that the delay may be partially attributed to a leadership struggle within the Bangladesh Government.

#### From independence to the Foreign Ministers' meeting in 1974

During the first confused months of Bangladesh's independence, substantial progress was apparently made toward a settlement of the dispute, inherited from Pakistan, over the Farakka Barrage. Before the end of January, B M Abbas, who had been East Pakistan's

Table 7.1: Chronology of negotiations, 1972 to May 1974

1972	Jan	B M Abbas met K L Rao in Delhi Mujibur Rahman visited Mrs Gandhi in Delhi on his way back to Dacca from jail in Pakistan
	Mar	Indo-Bangladesh Treaty of Friendship signed
	Apr	Formation of Joint Rivers Commission (JRC) announced Water Ministers, Khondakar Moshtaque Ahmed and K L Rao met
	June	First meeting of the JRC
	Dec	JRC meeting
1973	Jul	Water Minister Moshtaque Ahmed met Indian Foreign Minister Swaran Singh in Delhi and India agreed not to operate the Farakka Barrage unilaterally
1974	Jan	Foreign Secretaries met in Dacca
	Feb	Foreign Ministers met in Dacca
	Mar	Khondakar Moshtaque Ahmed transferred to Commerce Ministry
	Apr	Tripartite conference of India, Pakistan and Bangladesh in Simla resolved many subcontinental disagreements
	May	Sheik Mujibur Rahman and Mrs Indira Gandhi met in Delhi

most influential engineer and who had played an important part in the earlier negotiations between Pakistan and India, had travelled to Delhi for talks with the Indian Government. There he met K L Rao, the Minister for Irrigation and Power. On the 24th January, Abbas told the press that suspicions which had previously hampered the negotiations between India and Pakistan had now been dissipated. On leaving Delhi he said, 'I am satisfied with the talks I had with the Government of India' (3).

Many statements of intent were signed during these early months of Bangladesh's existence. India and Bangladesh appeared to be able to co-operate in almost every sphere. The Prime Ministers met in January, February and March. The Joint Statement issued at the end of their February meeting said:

'The two Prime Ministers emphasised that the geography of the region provided a natural basis of co-operation... They discussed the problem of flood control, Farakka Barrage and other problems.' (4)

Following the example of the Treaty of Friendship which India had concluded with Russia just prior to the Indian invasion of Pakistan, an Indo-Bangladesh Treaty of Friendship Co-operation and Peace was signed at the conclusion of the Prime Minister's meeting in March. This treaty was to be valid for twentyfive years, and specifically included agreement to:

'make joint studies and take joint action in the fields of flood control, river basin development, and the development of hydro-electric power and irrigation.' (5)

In the discussions between officials which took place simultaneously with the meeting of the Prime Ministers, the decision was taken to establish a Joint Rivers Commission (6).

The Statute of the Joint Rivers Commission, signed eight months later in November, includes the following paragraphs:

'ARTICLE 4

- (i) The Commission shall have the following functions in particular:
  - a) to maintain liaison between the participating countries in order to ensure the most effective joint efforts in maximising the benefits from common river systems to both countries...
  - d) to study flood control and irrigation projects so that the water resources of the region can be utilised on an equitable basis for the mutual benefit of the peoples of the two countries...
- (ii) The Commission shall also perform such other functions as the two governments may, by mutual agreement, direct it to do.' (7)

The Joint Rivers Commission (JRC) was apparently intended to act as a forum for cooperation in all aspects of river development. The Statute laid down that each government should appoint a Chairman and three members, two of whom should be engineers, to the JRC and provide adequate secretarial and supporting staff. The Chairmanship of the Commission was to alternate between the two governments on successive years. Article 7 of the Statute ruled out public scrutiny of the JRC's proceedings:

'All meetings shall be closed meetings unless the Commission desires otherwise.'

The Farakka dispute is not specifically mentioned in the JRC's terms of reference, but the paragraphs from the Statute quoted above gave the governments freedom to refer the topic to the Commission if they so chose (8).

At the end of April, Khondakar Moshtaque Ahmed, Bangladesh's new Minister with responsibility for water and power, met Dr K L Rao his Indian counterpart. Complete agreement on power, flood control and irrigation projects was announced at the end of their talks, and Rao said that Bangladesh's misconceptions on Farakka had been cleared up. On his return from Dacca, Rao gave more details about the meeting. These are important. The sharing of the waters, said Rao,

would be settled at a meeting of the two Prime Ministers, but the Farakka Barrage was no longer a problem. The proportion of the waters to go to each country had yet to be settled, but the doubts and misgivings of Bangladesh had been removed (9). Dr Rao did not clarify the role of the JRC in these negotiations. It is possible that the two ministers had agreed that the JRC should undertake technical discussions laying the groundwork for the political discussions to be held between the prime ministers.

The first meeting of the Joint Rivers Commission was held in June 1972 (before the Statute had been signed). A press note issued at the end of the meeting said:

'The commission considered river development works in the Ganges-Brahmaputra-Meghna System in general and will take it up in detail in its next meeting.' (10)

In the same month Sheik Mujibur Rahman gave an interview in which he talked about the relationship between India and Bangladesh. 'Don't talk about a relationship,' he said, 'this is a friendship. It is close and it will grow.' Later in the interview he said, 'India will not find the people of Bangladesh to be ungrateful people.' The interviewer noted that at this point Mujib muttered, 'except Moulana Bashani.' (11)

During August of 1972, two events took place which indicated that progress was being made toward a settlement of the dispute. Political leaders in West Bengal began lobbying with the Indian central government for what they saw as their share of the Ganges water, and in the upper house (Rajya Sabha) of the Indian parliament Rao, the Minister of Irrigation and Power, made a statement confirming that the 'legitimate interests' of Bangladesh would be kept in view, and that no arrangement for operating the Farakka Barrage would adversely affect Bangladesh.

The Chief Minister of West Bengal returned from a week in Delhi with what the press reported as an 'agreement' on the operation of the Farakka Barrage. According to this 'agreement':

- o the feeder canal of the barrage would be completed by December 1973, (the main barrage structure had been completed in 1970);
- o for five years after that 40,000 cusecs could be diverted down the Hooghly and, for the following two years, the diversions would be varied experimentally;
- o at the end of seven years there would be a review. (12)

With hindsight this 'agreement' can be interpreted as the technical experts' preferred option almost entirely undiluted by political realism. Since West Bengal did not subsequently invoke the 'agreement' in their negotiations with the Indian Government, it seems likely that it was no more than a statement of that government's intent.

In 1972, the World Bank was not overtly involved in the negotiations but it was maintaining rather more than a watching brief. In 1969, the Bank had approached at least one opposition leader in East Pakistan to express its interest in the Ganges dispute and its willingness to give support to an agreed solution. Again in 1972 similar contacts were made to personnel now in the new Bangladesh Government (13). The Bank also employed an eminent consultant to, amongst other objectives:

'evaluate the water supply picture [ of the Ganges-Brahmaputra-Meghna Basins ] and to examine the possibility of maintaining or even augmenting the low flow of the rivers...[and] to examine the need and possibilities for international cooperation between the countries situated in the river basins.'

(14)

The consultant recommended that consideration be given to the establishment, under the auspices of the UN, of a Ganges-Brahmaputra-Meghna Coordinating Committee, with five member countries - India, Bangladesh, Nepal, Sikkim and Bhutan (15). The consultant's report went through three drafts but remained 'strictly confidential' (16). Whatever role the World Bank may have played behind the scenes, it made no public intervention in the dispute.

The Joint Rivers Commission met again in December. The press were informed that the Commission had:

'decided to consider a framework for preparation of long-term plans for the development of major river basins common to India and Bangladesh.

'The Commission also recommended a programme for joint survey of the river Ganges from Farakka up to the Gorai off-take to enable the planning of development works of mutual interest... Two groups have been set up for the study of certain rivers in Bangladesh and India, on possibilities of augmenting winter discharges in these rivers. The Commission also received basic data on works executed or under execution in the Ganges-Brahmaputra-Meghna river basin and decided that this should be supplemented further.'

(17)

This is an evasive press release, but it does imply that the general question of the long-term development of the Ganges, and the specific question of the Farakka Barrage and its effects were under discussion in the JRC (18). There is, however, no indication that these topics were being treated as matters of urgency or that the central question of Bangladesh's agreement to the operation of the Farakka Barrage was being discussed.

In 1973, several more meetings of the Joint Rivers Commission were held, but little was published about the subjects they discussed. It is presumed that the Farakka issue and development of the Ganges were not discussed.

Khondakar Moshtaque Ahmed led a Bangladesh delegation to Delhi, in July. It met an Indian team led by Sardar Swaran Singh, India's Minister of External Affairs. There was some surprise that Swaran Singh, rather than K L Rao, led the team, but the composition of the team, which included three Indian ministers (D P Dhar, Minister for planning, and K L Rao in addition to Swaran Singh), was welcomed in Bangladesh (19). Possibly the replacement of a junior minister having a technical background by a senior minister with a political background and experience in inter-state relations indicated that both sides were beginning to realise that even in an atmosphere of friendly bilateral relations the issue could prove difficult to resolve.

The meeting reaffirmed that a final decision on the sharing of the Ganges waters would be taken when the two prime ministers met (20). This was despite an half-hour meeting between Khondakar Moshtaque Ahmed and Mrs Gandhi (21). The press release issued after the talks belaboured the possible effects the Ganges diversions might have on flooding inside Bangladesh:

'The discussions dealt mainly with the commissioning of the Farakka Feeder Canal and its impact on Bangladesh ...Farakka Project might increase the flood intensity of Padma in Bangladesh by reducing the natural spill discharges into the Bhagirathi. This point was discussed and the Indian side assured the Bangladesh side that the feeder canal and the Jangipur Barrage will be so operated that the Bhagirathi will continue to receive during the monsoon period as much water as before, or more if possible. It was accepted by the Government of India [sic] that the Farakka Barrage Project will not increase the flood intensity of Padma in Bangladesh.

'There was discussion about the Farakka Barrage Project and its impact on both countries. It was agreed that the two sides' will meet again and continue the discussions with a view to arriving at a solution to the problem. The two sides further agreed that a mutually acceptable solution will be arrived at before operating the Farakka Barrage.'

(22)

The last sentence, though it provided no basis for a solution, was the first definite and public commitment by the Indian Government that it would not act unilaterally.

The third round of regular bilateral consultations, which had been arranged soon after the Independence of Bangladesh, took place in Dacca in January 1974. Kewal Singh, the Indian Foreign Secretary came to meet Enayet Karim of Bangladesh. The meeting was interpreted as preparation for the impending meeting of the Prime Ministers (23). Kewal Singh met Sheik Mujib and Bangladesh's new Foreign Minister Kamal Hossein, but no mention was made of Farakka in the press release issued at the end of their talks (24).

Other subcontinental concerns were dominating the Indo-Bangladesh relationship at this time; most of them appeared more urgent and were reported more prominently than the sharing of the Ganges. The most



prominent issue, in the early months of 1974, was Bangladesh's attempt to get recognition at the United Nations and acceptance at the Islamic Summit. China, on behalf of Pakistan, was successfully holding the threat of veto to prevent war crimes trials of 195 prisoners of the 1971 war.

At the talks in January, Kamal Hossein had renewed an invitation for the Indian Foreign Minister Swaran Singh to visit Dacca, and in February he came. In the words of their Joint Communique, this is what they discussed (amongst other things):

'Both sides availed of the opportunity to discuss the use of the water resources of the two countries for the common benefit of the peoples of Bangladesh and India. They agreed that to meet this objective the Joint Rivers Commission should continue, as a matter of priority, its investigation of the development of the water resources of the region. The two Foreign Ministers also discussed the question of the distribution of the waters of the Ganges between India and Bangladesh and the need for an early decision on the matter. They were confident that their discussions on this subject had advanced their common approach for an early solution to this issue. Both the Foreign Ministers agreed that a mutually acceptable solution will be arrived at before operating the Farakka Barrage Project.'

(25)

In plain words, almost no progress had been made. The agreement that a 'mutually acceptable solution' must precede operation of the barrage had first emerged, with almost identical wording, in Swaran Singh's earlier discussion with Khondakar Moshtaque Ahmed. That it was reiterated at a meeting of two Foreign Ministers can hardly be judged as substantial progress.

Five days after this meeting, a hint of dissatisfaction with the work of the Joint Rivers Commission emerged in the Times of India:

'The issue has been handled ineptly so far. Instead of getting the Commission to assess the discharge of the river in different seasons and the extent of the replenishment at different points, another infructious attempt was made to evolve a solution based on the previous data.'

(26)

In March 1974, Khondakar Moshtaque Ahmed was transferred from the Ministry of Water, Power and Flood Control to the Ministry of Commerce and Foreign Trade.

In Delhi, a few months earlier, Dr K L Rao had been dismissed by Mrs Gandhi after nearly ten years as Minister of Irrigation and Power. The correspondent of The Hindu couldn't resist linking these two ministerial changes. K L Rao, he wrote, 'was known to dig himself deep in a stance based on old arguments.' And Khondakar Moshtaque Ahmed had 'a reputation of being a 'hardliner' on the Farakka question.' The correspondent noted that there was speculation in Dacca that the transfer of Khondakar Moshtaque indicated a new approach to the Farakka question (27).

Later in this chapter the speculation surrounding the transfer of Khondakar Moshtaque will be discussed, but K L Rao's dismissal does not seem to have been related to the Farakka issue. Mrs Gandhi told K L Rao, when she asked him for his resignation, that there had been complaints from the Chief Minister of a Northern state (of India) that Rao had not looked after their interests, and Mrs Gandhi also said that she needed a place in the cabinet for an Andhra Pradesh leader (28). It seems that K L Rao had suffered from the complaints of Bansilal, the Chief Minister of Harayana, who was to emerge as an important and corrupt figure during the Indian Emergency of 1975-6. Bansilal felt that Harayana was not being well treated in one of India's internal, inter-state rivers disputes - the question of the sharing of the Ravi-Beas waters.

#### The Sheik and Mrs Gandhi

When the Sheik and Mrs Gandhi finally met in May 1974, in the immediate wake of the Simla Tripartite Conference between India, Bangladesh and Pakistan, which had successfully resolved many subcontinental issues, they and their large supporting casts were able to settle several disputes longstanding between India and East Pakistan and agree new areas for trade and industrial cooperation:

- o many small boundary disputes were settled;
- o closer trade cooperation was agreed,
- o both countries pledged to increase their exports to meet balanced trade targets set at earlier talks;
- o establishment of four joint industries, taking raw materials from one country to labour and machinery in the other, was agreed;
- o it was agreed a joint survey would be carried out for a rail link to connect Calcutta with Agartala (a district of India lying to the East of Bangladesh); and
- o protocols were signed making new Indian credits available to Bangladesh.

The exception to these successes was Farakka. The Prime Ministers publicly admitted for the first time, that the dispute had not been a figment of the Pakistan Government's imagination. There was a genuine conflict of interest. In their Joint Declaration they agreed that there would not be enough water to meet the needs of both countries:

'The two Prime Ministers took note of the fact that the Farakka Barrage Project would be commissioned before the end of 1974. They recognised that during the periods of minimum flow, there might not be enough water to meet the needs of the Calcutta Port and the full requirements of Bangladesh and, therefore, the fair weather flow of the Ganga in the lean months would have to be augmented to meet the requirements of the two countries. It was agreed that the problems should be approached with understanding so that the interests of both countries are reconciled and the difficulties removed in a spirit of friendship and cooperation. It was, accordingly, decided that the best means of such augmentation through optimum utilisation of the water resources of the region available to the two countries should be studied by the Joint Rivers Commission. The Commission should make suitable recommendations, to meet the requirements of both the countries.

'It was recognised it would take some years to give effect to the recommendations of the Commission as accepted by the two governments. In the meantime, the two sides expressed their determination that before the Farakka Project is commissioned they would arrive at a mutually acceptable allocation of the water available during the periods of minimum flow in the Ganga.'

(29)

In 1978, a senior Bangladesh official gave this account of the aftermath of the meeting:

'Mujib was not well-informed by the people he took with him. Mentally he was troubled. When he returned he chastised the officials that Bangladesh's officers could not reply to the Indian questions. Mujib had the impression he was being undermined. When he returned he asked for a report to be prepared by people not connected with the Ministry of Power, Water and Flood Control.'

The report was to answer these questions: What is the role of the Ganges in the Gangetic Delta? How much water do we (Bangladesh) actually require? What is the validity of the Indian claim? (30) It is a serious criticism of the previous two and half years of negotiation on this issue if these, the most basic questions, remained unanswered in May 1974.

This Bangladesh official's account of the meeting is partially confirmed by Mrs Gandhi's recollection; when she was asked why they were unable to reach a settlement of the issue at that meeting, she said:

'Sheik Mujib felt that his experts should look again at the issue, and they were not here.' (31)

The public record of the meeting shows that at least three of Mujib's water experts were present. Asafoduwlah, Acting Secretary of Irrigation and Power, was there. B M Abbas, Adviser to the President, was there. Even Khondakar Moshtaque Ahmed was present, though in his new capacity of Minister of Commerce.

The meeting of the Sheik and Mrs Gandhi took place several days after the Indian Lok Sabha had been adjourned sine die and the members of parliament were only able to comment two months later on the agreements the two leaders reached (32). The details of the border agreement were not released immediately for fear of criticism.

## DISCUSSION: THE PARADOX OF DELAY

This chronological account has identified the major public incidents which contributed to a paradox of delay. The paradox consists of a set of auspicious circumstances surrounding a period during which little or no progress was made toward the resolution of the conflict. There was progress in 1972, and the negotiations which followed might have built upon that to create the groundwork for a substantial advance at the Prime Ministers' meeting in 1974. Instead, the Bangladesh Prime Minister seems to have entered that meeting ill-prepared and left it in confusion.

At the start of this chapter, three potential explanations for this state of affairs were presented. They have been constructed from the accounts given by different participants in the events, and they are as follows:

- (i) The incoming government of Bangladesh either failed to recognise the Farakka question as a conflict of interest, or gave it relatively low priority.
- (ii) Bangladesh officials prolonged the dispute.
- (iii) The Bangladesh Minister in charge of the negotiations prolonged the dispute.

These possible causes for the delay do not represent rigorous formulations of the events in question, nor do they constitute a complete list of the possible alternative reasons for the delay. They are a condensation of the perceptions of different observers within the organisations concerned. The discussion which follows should be interpreted as a first attempt to analyse what happened, and a guide for future research.

### A government looking the other way?

There is some evidence to suggest that Bangladesh failed to take heed of the conflict of interest inherent in the dispute - failed, that is, to recognise that there was insufficient water in the Ganges during the driest season to meet the stated demands of both countries.

The failure of recognition might be attributed to one of two alternative explanations. Either, the government believed that the conflict was a politically-motivated fabrication of the preceding governments of Pakistan (a view repeatedly fostered by Indian publicity); or, possibly, the government was too busy undertaking other tasks to turn its attention to this question, and therefore failed to recognise the importance of conflict.

The passage in the 1970 Awami League election Manifesto on Farakka does not indicate a belief that the dispute was a fabrication:

'The criminal neglect of earlier governments has allowed Farakka Barrage to become a FAIT ACCOMPLI resulting in grave and permanent damage to the economy of East Pakistan. Every instrument of foreign policy must be immediately utilised to secure a just solution to this problem.' (33)

Senior figures in the government do, however, lend some credence to the belief that the government's priority concerns did not include the Farakka question. It could have been overlooked.

Kamal Hossein, Foreign Minister from 1973 to 1975 and before that Bangladesh's first Law Minister, responsible for the drafting of the first constitution, said this in 1979:

'People forget now, but during those first three years we were preoccupied by so many urgent issues. In that context three years should not be seen as a long time.' (34)

A less senior member of the government of Sheik Mujibur Rahman, and one less involved in this issue, Abdul Malek Ukil, then Speaker of the Bangladesh Parliament, gives a similar explanation:

'During 1972 we could only think of reconstruction... India was doing everything for us, reconstructing bridges, providing transport, giving us food... India was giving us massively.' (35)

An official of the government, who must remain anonymous, one who was closely associated with the negotiations from 1974 onwards, also lends

credibility to this explanation:

'Any kind of friendship if it is not based on firm rocks... [ sentence incomplete ]. Bangladesh ignored the basic facts which are underlying and are in direct conflict with the interest of India. As time passed they emerged. The Mujib-Indira declaration did not solve anything. In a wishy-washy manner they thought they could solve it.'

(36)

Thus, perhaps the government of Bangladesh allowed this opportunity to pass because its full attention was on other matters.

What were the officials doing all this time?

The first explanation overlooks the fact that a body of officials in the Bangladesh Secretariat and a cabinet Minister had responsibility for all matters concerning water, power and flood control. For these people, the issue of the sharing of the Ganges water and the impending completion of the Farakka Barrage must surely have thrown a long shadow. What were they doing from 1972 to 1974?

Some people certainly believe that officials with responsibility for this issue chose to maintain and prolong the dispute - perhaps by taking a harder line than the political climate justified.

A close assistant and adviser of Mrs Gandhi offers this explanation for the failure to resolve the conflict during the years of amicable relations:

'He [ Mujib ] had barely settled down when he was bumped off. In any case, his Adviser, Abbas [ B M Abbas ] is a durable character. He was also Ayub's Adviser, he continued to treat it as a technical question rather than political... If you had negotiated a peace treaty after World War II with a man from Nazi Germany, naturally he would be accustomed to thinking in that way.'

(37)

It is certainly true that B M Abbas has survived numerous changes of government, and Mrs Gandhi's adviser is not alone in his belief that Abbas's interpretation of the situation may on occasion have

determined the Bangladesh government's political response.

Kamal Hossein, the former Bangladesh Foreign Minister, agrees that technical advisers do sometimes take a harder line than political officers in the same negotiating team, 'partly because technical people do attach importance to things they think are technically important' (38).

Perhaps the relatively 'hard' positions that had been evolved during the negotiations under Pakistan - insistence that East Pakistan needed 49,000 cusecs for irrigation, for example - had become organisational goals. Similar organisations with many of the same personnel took up the cudgels after the independence of Bangladesh, and the goals may have been carried over without consideration for their continued relevance.

Enayatullah Khan, in 1978 Bangladesh Petroleum Minister, but in 1974 outspoken editor of the weekly Holiday, also appears to believe that the officials prolonged the dispute, but he puts a more sinister, and political interpretation on the possibility. Enayatullah was not in any sense a participant or policy maker for the negotiations at the time in question, but the issues were followed fairly closely by Holiday. This is Enayatullah's recollection, in 1978:

'There were tough negotiations, the political climate was changing. Some people in the [Bangladesh] Water Development Board were making it difficult...' (39)

He was asked if the 'some people' referred to Asafoduwlah, by then Chairman of the Water Development Board (40):

'Yes, Asafoduwlah, and Moshtaque was keeping the issue alive for political reasons. Mujib's feeling was similar to Moshtaque's, he more than anything reflected the views of the people at that time...' (41)

But the explanation of official intransigence must be largely discounted if, as the evidence suggests, the negotiations were not, during this period, in the hands of officials. From April 1972 until



May 1974, the question of what to do when the Farakka Barrage diversions started seems to have been a subject primarily kept at the ministerial level.

What was Khondakar Moshtaque Ahmed doing?

The first Indo-Bangladesh meeting at which the water sharing is known to have been discussed was between B M Abbas and K L Rao in January 1972. The second meeting, between Rao and Moshtaque in April of that year, appears to be the more important one. According to Rao's account, it was at this stage that the subject was set aside for Prime Ministerial negotiation and decision (42). We have seen that the Joint Rivers Commission seem to have discussed the Farakka conflict on several occasions between 1972 and 1974. A Bangladesh Government publication, however, confirms Rao's account:

'The question of the sharing of the waters of the Ganges and the Teesta was, however, kept out of the purview of the Joint River Commission, to be settled at the level of the Prime Ministers.' (43)

In view of the complexity of the issue and the agreed purpose of the JRC this was a strange decision.

Kamal Hossein recollects that when he took over as Foreign Minister, in March 1973, the question was raised: How would the Farakka issue be dealt with? The water ministry was asked to broach the matter with India, and Moshtaque reported back to the Foreign Office (presumably after the meeting in July 1973 in New Delhi with Mrs Gandhi and Swaran Singh) that little had been achieved.

Hossein became more concerned with the issue as the Farakka Barrage neared completion and in the preparations, early in 1974, for the meeting of the prime ministers. At this time he remembers noticing that: a) the problem had not been dealt with by the JRC, Moshtaque having presumably directed that it be kept out of the JRC, and b) even at ministerial level no progress had been made. In 1978, Hossein commented, in an interview with me:

'I had taken the JRC to be the instrument that would explore the technical options, but by 1974 we had just reached the point where the matter had to go back to the Commission.'

(44)

Why had the issue been removed, presumably on the agreement of Moshtaque and Rao, from the JRC's agenda? Hossein says:

'There was a question mark left in one's mind...why this opportunity should not have been taken.'

(45)

#### The transfer of Khondakar Moshtaque Ahmed

It is possible that a realisation of this missed opportunity was the reason for Sheik Mujib's decision to transfer Moshtaque to another ministry in March 1974. Moshtaque himself apparently believes that he was transferred because he was 'too hard on Farakka' (46).

There is a suggestion that Moshtaque was prolonging the dispute to further his political career. This is Enayatullah Khan's thesis:

'[Moshtaque] was not a hardliner. He was trying to make it big with the issue, trying to make his career out of it. He had almost capitalised on it...The tussle between Mujib and Moshtaque was not ideological. There was a potential rivalry. Only two people could historically have challenged Mujib: Tajuddin Ahmed [Finance Minister and leader of the government-in-exile]...and Moshtaque.'

(47)

Moshtaque was the leader of the right-wing faction within Mujib's cabinet. In August 1975, if not earlier, he gave his support to the group of majors who staged the coup d'etat in which Mujib and many of his family were killed (48). For three months in 1975 Moshtaque was President of Bangladesh, but in November he was overthrown and later jailed for corruption.

#### CONCLUSIONS

There is genuine puzzlement expressed by participants on the Bangladesh side about the failure to grasp the opportunity for progress offered by the conditions of 1972 - 1974. More could have been achieved and

it is not clear why it was not. Where was the tardiness located? We have been offered three tentative solutions: an inattentive government, 'hardline' officials, or a power-hungry minister. One crucial question has been identified: what was the Joint Rivers Commission doing in this period? The Foreign Minister thought it should be preparing the ground, exploring the technical options, ready for the prime minister's meeting in 1974. The evidence suggests that the JRC was not fulfilling this role, its brief having been withdrawn by the Water Minister Khondakar Moshtaque Ahmed.

Without further corroborating detail, the three explanations are insubstantial and unsatisfactory. Our knowledge of the events inside the JRC and during ministerial meetings is confined primarily to evasive joint communiques. How manipulation of this dispute could have served Moshtaque's ends in this struggle for power is not manifest. Such participant's accounts as we have, are those of cautious actors conscious that they are still on stage, and their accounts depend on their recollection of events two to four years previous. Nevertheless, of the three causes for the stagnation of the conflict, the third, postulating use of the conflict within a Bangladesh leadership struggle, looks the more plausible in the light of the evidence available.

## Chapter Eight

### ARRIVAL AND DEPARTURE

Two days of negotiation in April 1975 brought a brief resolution of the dispute over the Farakka Barrage. An understanding was concluded which allowed India to divert small quantities of water from the Ganges for forty days during that year's dry season. Talks to arrange a more permanent agreement were to continue. At the end of the agreed forty days India started diverting much larger quantities of water.

In August 1975 the Bangladesh Government was overthrown in a coup d'etat. A second coup and then a revolutionary mutiny followed three months later. Relations between India and Bangladesh sharply deteriorated in this period.

Throughout the 1975 monsoon season and into 1976 India continued to divert water in quantities close to the maximum allowed by the Farakka Barrage. During the months of March and April 1976 the flow in the Ganges in Bangladesh fell to 56% of the lowest flow previously recorded (see Table 10.1, Chapter 10), and Bangladesh suffered serious damage as a result of the reduced flows (Part III of this thesis is devoted to an assessment of that damage). In early 1976, with the dry season approaching, the Bangladesh Government sent a series of strong protests to India and then began seeking diplomatic support from other governments. In September 1976 Bangladesh raised the dispute in the General Assembly of the United Nations.

This chapter chronicles the conflict over the Ganges in the period June 1974 to December 1976. Unlike the preceding chapter which was about a period of stability and delay, this chapter is concerned with a spell of rapid change both in the conflict over the Ganges and in the relations between India and Bangladesh.

We shall see that the renewal of public conflict about the Farakka Barrage in 1976 brought with it a reversion by both parties to pre-

Bangladesh negotiating postures. In particular, the Indian Government re-stated the formulation that political negotiations could not take place until experts had held preparatory 'technical talks'.

As we have seen, the May 1974 prime ministerial meeting was not the success it might have been. Nevertheless, a conceptual distinction was agreed at that meeting between two fundamental elements in the conflict. The conflict was divided into a short term and a long term question: firstly, how should the existing low flow of the Ganges be shared between the two countries in the immediate future? and, secondly, by what method should the low flow of the Ganges be increased so that in the future there would be enough for both parties' needs? The prime ministers' meeting mandated the Joint Rivers Commission to discuss the latter augmentation question, but left open the exact forum in which the issue of sharing the existing flow should be negotiated. We shall see in this chapter that on neither question was there great progress, although the agreement of April 1975 temporarily resolved the issue of sharing. (Table 8.1 summarises the events of the period.)

In this chapter, I intend to examine some of the reasons why the 1975 understanding was acceptable to both parties and the reasons why renewed conflict occurred in 1976. I shall argue that the 1975 understanding was a 'holding action' made possible by the favourable state of relations between the two parties at that time, and that the renewal of open conflict was at least partly the result of a breakdown of relations of trust.

## Negotiations and an interim agreement

### The question of sharing

The May 1974 prime ministerial meeting gave the Joint Rivers Commission a mandate to discuss augmenting the flow of the Ganges. No forum or method of negotiation was laid down for settlement of the more urgent question of how to share the existing dry season flow of the river. No negotiations took place on this sharing until February 1975, when Abdur Rab Serniabat, Sheik Mujib's brother in law and the new Bangladesh Minister of Water and Power, met Jagjivan Ram, India's newly appointed Minister of Agriculture and Irrigation, in Delhi.

Table 8.1 Chronology of conflict, May 1974 to December 1976

1974	June to Dec	Six meetings of the Joint Rivers Commission (JRC) discussed alternative ways of augmenting the lean season flow in the Ganges
1975	Jan	Bangladesh's Sheik Mujibur Raham assumed near dictatorial powers
	Feb	Water Ministers A R Serniabat and Jagjivan Ram met in Dacca
	Apr	Water Minister met again in Dacca and reached an 'understanding' allowing India to divert small quantities of water for forty days
	Jun	13th meeting of JRC Declaration of Indian Emergency
	Aug	Coup d'etat in Bangladesh killed Mujibur Rahman, Khondakar Moshtaque Ahmed assumed power
	Nov	Attempted 'pro-Indian' Coup in Bangladesh followed by Army mutiny which established Ziaur Rahman in power
	Dec	Bangladesh emissaries visited Delhi
1976	Jan	Bangladesh objection to India's continued withdrawal of water at Farakka started exchange of protests
	Feb	Indian High Commissioner to Dacca returned to Delhi to see Mrs Gandhi
	Mar	Mrs Gandhi offered to reduce withdrawals
	Apr	Technical discussions began in Dacca
	May	100-500,000 Bangladeshis marched toward Indian border in protest against Farakka
	Jun	Indian Foreign Secretary led goodwill delegation to Dacca
	Aug	Bangladesh announced that the conflict would be raised at the UN
	Sep	Rear Admiral M H Khan of Bangladesh was 'snubbed' by Mrs Gandhi
	Oct to Nov	Discussions at the UN resulted in a compromise resolution which committed the two parties to meet again
	Dec	Meetings in Dacca were inconclusive

Ram brought considerable experience and political seniority to the negotiations, but the two ministers made little progress (1). Nevertheless, there are suggestions that India was testing the barrage in the early months of 1975 and keeping it in readiness for full-scale operation (2).

The ministers met again two months later. They were optimistic at the start of their meeting (3) and, within two days, an interim 'understanding' had been constructed. It was agreed that India could divert small quantities of water for the forty days until the end of May. India received only a fraction of the water demanded (see Table 8.2), but Bangladesh did concede the precedent of operation of the barrage.

The understanding settled neither of the outstanding principal questions of the conflict: discussions on both sharing and augmentation were to continue. The government-owned Bangladesh Observer noted:

'The agreement will not disturb the discussions regarding the allocation of fair weather flows of the Ganges during the lean months as was envisaged in the Prime Minister's declaration of May 1974.'

(4)

It was an interim agreement allowing experimental operation of the barrage. Joint teams were to observe the effects of the diversions at Farakka, on the Hooghly and inside Bangladesh.

The ministers' understanding was given a mixed reception. It was generally welcomed as a step forward, although there was criticism on both sides of the border. The absence of Serniabat, the Bangladesh Minister, from the official opening of the Farakka Barrage has been interpreted as an expression of Bangladesh's reservations, and a West Bengal State Minister was quoted as describing India's share of the water as 'dribblets...in quantities that do not serve our purpose' (5). Nevertheless, water started flowing down the newly constructed feeder canal into the Bhagirathi and joint observation teams set out to observe the effects of the diversions.

Table 8.2 Quantities in the Forty Day Agreement

PERIOD	INDIA'S SHARE Cusecs (1)	Percent of total (2)	Percent of India's demand (3)	B'DESH SHARE (5)	Percent of total (4)	Percent of B'desh demand (4)
April 21-30	11,000	20	28	44,000	80	90
May 1-10	12,000	21	30	44,500	79	91
May 11-20	15,000	25	38	44,250	75	90
May 21-30	16,000	24	40	49,500	76	101

- NOTES:
- (1) As defined by the 1975 Agreement, see Appendix A.
  - (2) Based on the water available in the most scarce 75% of observed years (1948-73) as given in the November 1977 Agreement (see Appendix A).
  - (3) Assumed to be 40,000 cusecs.
  - (4) Assumed to be 49,000 cusecs.
  - (5) As (2).



## The question of augmentation

Whilst the two ministers were negotiating an interim allocation of the existing flow, the Joint Rivers Commission was discussing methods of increasing that flow. Although the JRC met monthly from June 1974, its discussions had come to a standstill by December. The Bangladesh team was supporting one method of increasing the flow and the Indians another, and:

'The Joint Rivers Commission could not therefore come to any agreed conclusion on the subject.' (6)

Bangladesh proposed that the dry season flow of the Ganges should be augmented by the construction of storage reservoirs on the river's Himalayan tributaries. These reservoirs could store the monsoon flow of the tributaries for release later in the year when water became scarce. The Indian team opposed this concept, arguing that a canal to transfer surplus water from the Brahmaputra into the Ganges was a more 'realistic' alternative (7).

We shall see in Chapter 9 that the Indo-Bangladesh negotiations concentrated on these two proposals in the period 1977 to 1980 without either side substantially altering from the positions developed in the 1974 meetings of the JRC. The two proposals are described in detail in Part IV of this thesis.

## Joint observation

One of the features of the interim understanding which must have commended it to both sides was the clause providing for three joint teams to observe the effects of the experimental diversions. These three teams took up their tasks at a few days notice and jointly measured what was happening during the forty days covered by the understanding.

None of the three teams ever submitted joint findings. At least two of the teams experienced difficulty in arriving at a consensus (8), and such cooperation as they were able to muster was overtaken by

events. Before the teams finally met to draft joint reports, the leaders of the Government of Bangladesh were overthrown, and the meetings did not take place (9).

Soured relations: August 1975 - September 1976

1975 was a year of reckoning in Bangladesh. At the beginning of the year, ~~the~~ Awami League government was transformed into a one-party dictatorship. In August a coup d'etat brought a right-wing, pro-American regime to power. A second coup d'etat in November was overtaken after only a few days by a revolutionary mutiny within the armed forces. Although the mutiny was led by a left-wing party, the regime it brought to power became populist and capitalist (10).

For the last months of 1975, the Ganges conflict was forgotten in the turmoil of coup and counter-coup. From the end of the forty day interim agreement, India had been diverting almost 40,000 cusecs from the Ganges (11), and presumably this continued throughout the remainder of 1975. Bangladesh did not protest publicly about these withdrawals until the early days of 1976. Just before this outbreak of renewed, vociferous dispute, representatives of the two sides met in Delhi.

Representatives of Bangladesh's new President met Mrs Gandhi, the Indian Foreign Secretary and others but at the end of the visit only a strained and uninformative statement was released (12). On January 15 1976, a Bangladesh protest note started a year of public dispute. Bangladesh alleged that Indian withdrawals after the end of the forty day understanding constituted a breach of the agreement (13). The Indian Government's response said it was 'surprised and pained' at such propaganda, particularly because it had been agreed at the previous month's meeting that both sides would refrain from 'hostile propaganda' (14).

In February and March, the Bangladesh Government protested frequently, in several forums and by a variety of media. During all this period, and with the dry season of low Ganges flows imminent, Indian withdrawals of Ganges water were continuing at or near the maximum allowed by the

Farakka Barrage Project. We shall see in Section III that these diversions caused serious damage to agriculture, industry and ecology in South Western districts of Bangladesh. Bangladesh's sense of crisis during these months was based on reality. And, simultaneously, Bangladesh was suffering armed attacks from across the Indian border. Awami Leaguers and others, opposed to the new regime were making intermittent raids into Bangladesh (15).

Bangladesh's concern that Indian diversions at Farakka were causing economic and ecological disruption was not well reported in the Indian press. The American Consul in Calcutta has suggested there was effectively censorship on this issue (16).

Both India and Bangladesh set preconditions to be met before talks could be held. According to the Indian Foreign Ministry, Bangladesh had told them: 'Negotiations can only start when withdrawals stop' (17). The Bangladesh Government reported that India was only willing to meet if the talks were confined to sharing of the water in the period March 15th to May 15th (18). Both sides also made more positive suggestions, even at the height of the dispute. Bangladesh proposed the creation of international commissions for the Ganges and Brahmaputra (19) and, toward the end of March, after Bangladesh had relaxed its precondition for talks, India announced a concession. Mrs Gandhi reportedly told the Bangladesh High Commissioner in Delhi:

'India is taking steps to keep up the downstream flow at the March 15th level during the rest of the two-month lean season to the extent possible on the basis of the availability of the waters...It is now Bangladesh's turn to choose its response in a helpful manner to pave the way for a restoration of mutual confidence.' (20)

At the same time Mrs Gandhi told Bangladesh that an offer India had made - for the JRC to study the effects of withdrawals on Bangladesh - remained open. The offer was accepted, and talks began the following month in Dacca. They were, however, technical talks on a restricted topic. As had happened during the 1960s, India was again emphasising that political negotiations could not take place until technical talks had:

'At the suggestion of the Government of India, the Government of Bangladesh have agreed to hold technical level talks to exchange information and data and to assess the alleged effects in Bangladesh of the operation of the Farakka Barrage Feeder Canal. Opportunity will also be taken for discussing arrangements for joint observation of the effects of the operation of the Farakka Barrage feeder canal in [on?] irrigation, salinity, navigation etc the [in?] Bangladesh and on the Hooghly River for the benefit of Calcutta Port.

'In our view meaningful talks on the allocation of the Ganga waters which is a highly technical matter, can take place only after experts of the two sides have been able to study and evaluate all the relevant data.' (21)

The talks occurred in a period when relations were at a low ebb. A few days before the talks were announced, India had protested about two shooting incidents on the border (22). The officials met for two rounds of discussions, and travelled through South West Bangladesh, up the Hooghly and to the Farakka Barrage. Neither side issued details of what they had achieved, and within a few days of the return of the Bangladesh team, B M Abbas was quoted saying that the Indian figures for withdrawals from the Ganges did not tally with Bangladesh's measurements (23).

At the end of April Bangladesh's venerable peasant leader, Moulana Bhashani, had:

'called on India to dismantle the Farakka Dam...and threatened to organise a protest march of one million people.' (24)

Bhashani carried out his threat ten days after the end of the talks. Estimates of the size of the march ranged from hundreds of thousands to half a million (25). The Indian Government prepared for violence and border violations, but the march stopped six miles short of the border (26).

A few days later, Rear Admiral M H Khan, Chief of the Bangladesh Navy and a member of the ruling junta, who had become Bangladesh's main spokesman and negotiator on the Ganges issue, announced an attempt to excavate the Gorai River in the South West of the country to help

overcome low water levels (27).

India's Foreign Secretary, Jagat Mehta, led a 'goodwill mission' to Bangladesh in mid-June, and the public clamour of the dispute died down for almost two months (28). At the beginning of August, however, Bangladesh announced that it had decided to take its case to the United Nations.

One final round of talks was held before the issue was raised at the UN. M H Khan led a delegation to Delhi in September but no agreement was reached. From the statements each side issued after the talks, four main differences of opinion can be identified: Bangladesh insisted that augmentation should take place within the Ganges Basin; India did not accept that Bangladesh had a right to veto upstream withdrawals; the two sides differed over the length of the dry season; and India rejected any notion that Nepal should be a participant in the discussions (29).

According to a Bangladesh diplomat's account, a meeting between Khan and Mrs Gandhi was brief and unsatisfactory. Khan wanted to raise two issues: guerrilla attacks and water sharing, but after hearing him on the first question Mrs Gandhi turned to discuss it with Jagjivan Ram. Evidently she decided that what Khan was saying was incorrect, for she apparently ended the meeting there and then, without discussion of water sharing. According to another Bangladesh account, Mrs Gandhi took a violent dislike to Khan and at least one message was sent to Ziaur Rahman, by way of the Bangladesh military attache in Burma who was close to Zia, suggesting that progress might be possible if Khan were dropped from the negotiating team (30). Khan was one of the few officers who had played no role in the Bangladesh liberation struggle. He is therefore considered to be pro-Pakistani and anti-Indian.

#### Frustration at the United Nations

Faced with the failure of bilateral negotiations with India, and with serious and possibly cumulative damage occurring as a result of India's withdrawals, the Bangladesh Government searched for a new strategy.

The attempt to muster international support during the first half of 1976 had not been particularly successful - only China and Pakistan had whole-heartedly backed the Bangladesh position (31). Nevertheless, Bangladesh decided to raise the issue within the United Nations. The government then faced the question of how, exactly, that should be done; several courses were open to it.

The United Nations system includes a variety of different forums and a series of specialised agencies. Bangladesh could have raised their grievance in at least nine different ways:

- (a) Through the 'good offices' of the Secretary General;
- (b) by raising it in the General Assembly;
- (c) through the Security Council if the dispute was likely to endanger international peace;
- (d) by bringing the case to the International Court of Justice;
- (e) by raising the issue in the International Law Commission;
- (f) through the International Water Conference due to be held in Argentina in 1977;
- (g) by asking the Economic and Social Commission for Asia and the Pacific to investigate;
- (h) through the United Nations Environment Programme; and
- (i) by asking the World Bank to use its 'good offices' as it had done in the Indus Waters dispute between India and Pakistan. (32)

A Bangladesh diplomat on secondment to the UN recommended to his government that the final option of involving the World Bank should be chosen. He proposed that:

'at an appropriate stage of negotiations [ Bangladesh ] may agree to discuss the Indian proposal for a link canal between Brahmaputra and Ganges provided that India agrees to a World Bank role in the realization of a project involving Ganges-Brahmaputra basin development...' (33)

This course was rejected in favour of a more public confrontation in the UN General Assembly. In preparation for this meeting, first Bangladesh and then India published pamphlets setting out their cases (34).

In order to raise their grievance successfully, Bangladesh diplomats had to negotiate a course through the preparatory procedures of the General Assembly: an item had to be included in the agenda of the Assembly; the item had then to be manouvred into a committee with appropriate concerns; and, finally, that committee had to be persuaded to recommend a favourable resolution for the consideration of the General Assembly. At each of these three stages Indian diplomats could be expected to attempt to defeat or divert the agenda item. This is what happened.

In the first procedural stage India opposed consideration of the dispute, but the item was accepted. At the next stage, India pressed for the question to be considered by the Economic Committee of the General Assembly, rather than by the Political Committee. Again, India was defeated; the item was referred to the Special Political Committee, in line with Bangladesh's wishes (35). These first two stages were, however, only preparatory skirmishes. India's representatives were able to recoup their losses in the backstage war which followed.

After a postponement, Rear Admiral M H Khan put the Bangladesh case to the Special Political Committee and India's Foreign Secretary Jagat Mehta replied. At that stage the public proceedings ceased and there was what amounted to an embarrassing delay while both parties lobbied and negotiated, through intermediaries, behind the scenes. The Bangladesh resolution was withdrawn and replaced by a consensus statement which had been evolved with the assistance of an ad hoc mediation committee consisting of representatives of five non-aligned states: Algeria, Egypt, Guyana, Sri Lanka and Syria (36). The consensus resolution was, as a Bangladesh diplomat has admitted, 'a way of saving face' (37).

The Bangladesh representatives found that they were received with sympathy, to the extent that UN members did not want to send away a small state with a grievance. This sympathy carried Bangladesh through the first procedural stages at the UN, but no further. Concern could not be transformed into positive support. Most member states did not want to take sides in the dispute, least of all against a relatively important state like India. The Bangladesh delegation realised that they had a choice of either taking a militant line and moving a resolution which would gain mostly abstentions, or accepting a face-saving compromise. One factor influencing their choice of the latter course was their assessment that the major powers considered themselves to be upper riparian states, like India, and so did a majority of member states of the UN (38).

As an attempt to mobilise support, or to obtain third party intervention, Bangladesh's action at the United Nations was a mistake (39). Bangladesh did achieve publicity for its case, and the consensus resolution which the General Assembly confirmed did contain one concession to Bangladesh's objectives:

'It is open to either party to report to the General Assembly at its thirty-second session on the progress achieved in the settlement of the problem.' (40)

These were, however, small rewards compared to the diplomatic effort expended. Bangladesh returned to bilateral negotiations having tried a remedy of the last resort and found it wanting.

We shall see, in the following chapter, that the bilateral negotiations which succeeded the referral to the UN were as intractable as those which preceded it.

## DISCUSSION

1975 and 1976 were years of rapid change in the conflict over the River Ganges. A few days of negotiation in April 1975 brought a written understanding on the operation of the Farakka Barrage. The agreement covered only forty days and it was, as we shall see, a



flawed contract, but it was progress. Nevertheless, within a year, open conflict had begun again with renewed vigour.

In the same period, the framework of cooperation which had been built up between India and Bangladesh during the Mujib regime was altered radically by the changes of government in Bangladesh.

An analysis of the interaction between the changes in the 'state of relations' between the two parties and the changes in their perception of the Ganges conflict would make a valuable case study. Did the specific dispute influence the general relations or was it the other way round? The latter seems more probable. There is, however, insufficient evidence to support such an analysis. This discussion is, therefore, limited to a brief assessment of the 1975 understanding and an exploration of the two countries' motives in allowing the recrudescence of conflict.

#### Arrival: the 1975 understanding

Two participants have given their interpretations of the factors which contributed to the acceptance of the 1975 understanding by the two governments. On the Indian side, a senior Ministry of External Affairs official gave me these reasons:

'One, we did some things with Mujib which we would not do with any other leader. It was a matter of trust. He understood the context and when it comes to something else we knew he will cooperate.

'Two, tactical: the matter of over-riding importance was to open the barrage. Having invested so much money, the government would have been foolish not to use the barrage. They wanted it opened and then would discuss it further.

'Three, in the wording of the 1975 understanding the fact that it was interim was made very, very clear.' (41)

What, on the other hand, did Bangladesh gain from the agreement? The then Foreign Minister, Hossein, thinks that the agreement established three principles of benefit to Bangladesh:

- a) that the whole of the utilisable water was to be regulated by agreement, that it would not be used unilaterally;
- b) that the subsequent long term agreement would be influenced by the findings on the impact of the diversions (in recognition of the interests Bangladesh was seeking to protect); and,
- c) that the impact would be under constant review to see how the two countries' interests were being affected.

(42)

Two aspects of these participants' comments should be emphasised. The Indian participant has drawn attention to the importance of trust, that is, to the 'state of relations' between the two countries. Hossein, the Bangladesh participant, has emphasised factors which may have been implicit in the agreement, but were not written into it (see the Joint Press Release reproduced in Appendix A). This emphasis also indicates a level of trust, of cooperation, between the two countries.

The understanding, as published, is a perfunctory document confined to the few points of agreement. This too suggests a considerable degree of cooperation and trust between the negotiators. Paradoxically that trust may have laid the foundations for the renewal of the dispute. The shortcomings of the understanding may have contributed to the conflict which occurred in the following year.

The understanding was deficient in one notable respect: it made no provision for succeeding dry seasons. Hossein has argued (43) that the 1975 understanding created a precedent for succeeding dry seasons. He believes that the negotiators of the 1975 agreement anticipated that a similar agreement would be worked out for the following year, and that this is implied by the understanding (44). If a brief clause to that effect could have been agreed the following years conflict might have been avoided.

## Departure: the 1976 conflict

During 1976 both parties to the Ganges conflict reverted to postures and demands characteristic of the period before the independence of Bangladesh. The Indian Government again had recourse to the formula, 'technical talks but not political negotiations', and to a virtual denial of Bangladesh's locus standi in the sharing of the water (45); Bangladesh relapsed into a questioning of the utility of the Farakka Barrage (46). From 1972 until 1976, India had accepted Bangladesh's standing as a co-riparian state and had been willing to enter into political negotiations. Similarly, Bangladesh had not sought to veto the Farakka Barrage Project in this period; it had accepted the existence of the project and attempted to negotiate an equitable sharing of the water. In other words, the principle of equitable utilisation had prevailed between 1972 and 1975. In 1976 India reverted to a 'positivistic' theory of law and Bangladesh to a 'jusnaturalistic' one (as defined in the Introduction to this thesis). There is some evidence suggesting that the new postures adopted by the two governments after 1975 were at least partly the result of political objectives unconnected with the Ganges conflict. These independent objectives may not have been the cause of intensified conflict but they were almost certainly contributing factors.

It has been argued by an Indian participant that the Bangladesh position in the dispute was motivated by a need to create an external threat to the country in order foster a sense of national unity (47). There is no doubt that the coups d'etat and subsequent executions in Bangladesh left a deeply divided country, and that Ziaur Rahman needed to create support for his military regime. There is ~~sur~~prising, if possibly unintended, support for this thesis - that the dispute was 'used' to forge national unity - from one of Ziaur Rahman's ministers. Enayatullah Khan was a (private citizen) member of the Bangladesh delegation to the UN in 1976, and subsequently a minister in 1977 and 1978. He interprets Bangladesh's decision to raise the Ganges conflict in the UN as follows:

'We made Farakka first into a national issue. We tried to transform the issue so that it was no longer just about

water, into a symbol of national resistance...

'Then the demand arose to take the issue to the UN. The main purpose of that was not to solve the problem, it was to internationalise the issue in its totality with other relevant issues. It helped us in breaking the barriers in the international community. The Bangladesh profile was not very good after 1975. It gave us a forum where we could defend ourselves and win over other countries with similar experience of river disputes...' (48)

This quotation provides some support for the view that the Bangladesh Government had additional motives, besides obtaining a fair share of the Ganges, in promoting the dispute in 1976. Enayatullah appears to be saying that the Ziaur regime needed first a 'national issue' to unite the country and, secondly, an issue with which the new regime could introduce themselves to other members of the international community.

It has been alleged, by a senior civil servant in the Bangladesh Foreign Office, that the real cause of renewed conflict in 1976 was India's opposition to the new regime. He argues that India:

'did not like the present government, they wanted to destabilise it...' (49)

Whilst there is no direct evidence to support this allegation, a comparison of the 1975 understanding with the concession offered by Mrs Gandhi at the end of March 1976 indicates that India was approaching the dispute in a very different spirit. Figure 8.1 provides a graphical comparison of the 1975 understanding and Mrs Gandhi's ambiguous and unilateral concession (50). It is quite clear that the concession was a modest one, and Bangladesh claims that even less than the amount promised in that concession actually flowed into Bangladesh.

## CONCLUSIONS

In addition to providing an account of a period of rapid change in the Ganges waters conflict, this chapter has discussed two questions central to the understanding of what happened:

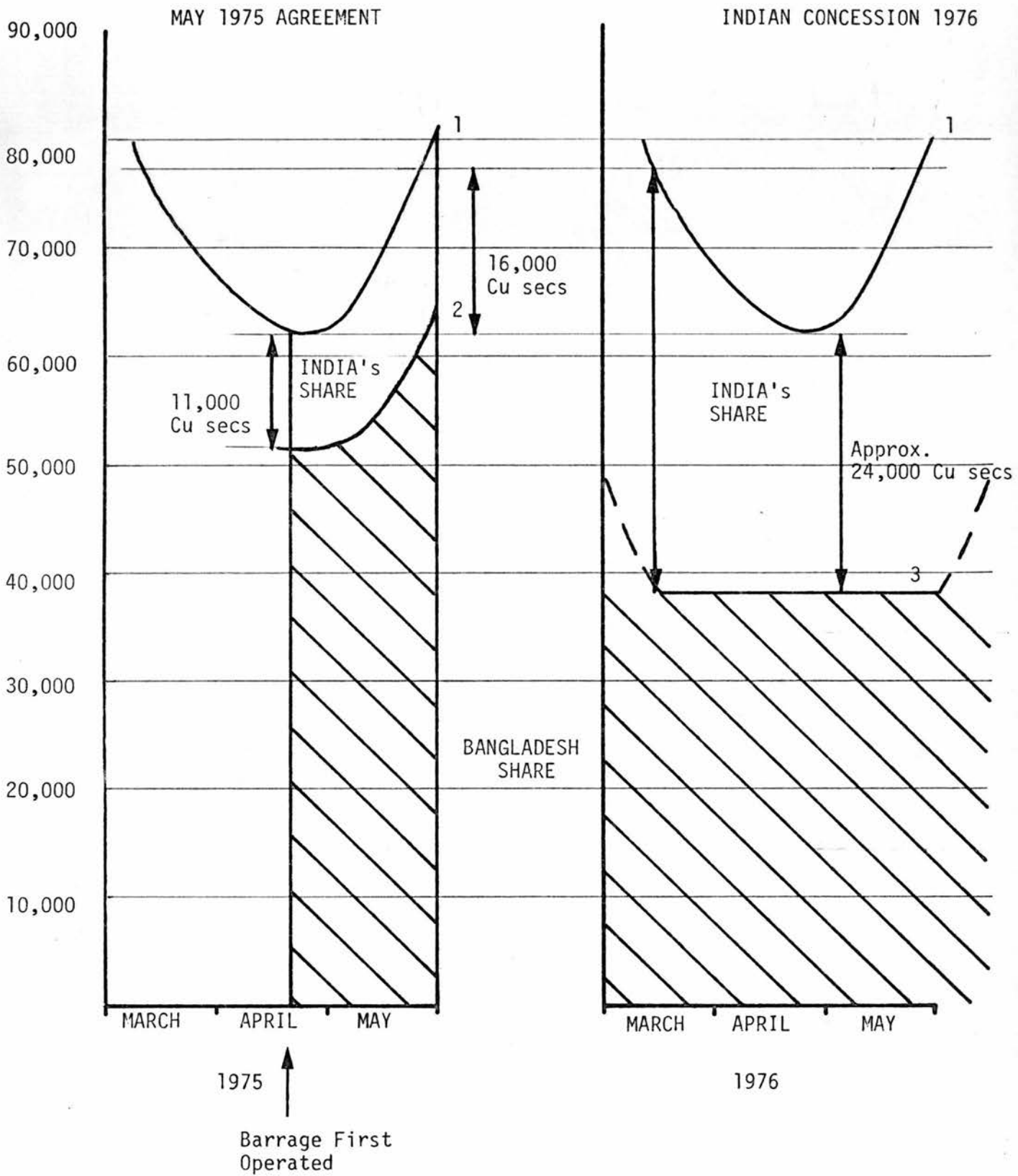


Figure 8.1 A comparison of the 1975 understanding with Mrs. Gandhi's concession

See notes overleaf.

Figure 8.1: Notes to 'A Comparison of the 1975 Agreement with Mrs Gandhi's Concession'.

- (1) This curve is based on figures for average (ten-day) discharge at Farakka. It does not coincide with the data used in Table 8.2. Those figures are for the '75% availability' discharge.
- (2) The curve represents the quantity of flow continuing to Bangladesh. It is the curve left after the quantities agreed in the 1975 Agreement have been deducted from curve (1).
- (3) This represents an estimate of the most plausible interpretation of the concession announced by Mrs Gandhi on March 30th 1976. She said India would attempt to maintain the flow at the March 15th level.

- (i) What made the 1975 Understanding acceptable to both governments?
- (ii) Why did the dispute flare up again only a few months later?

The evidence available provides only partial answers to these questions.

Participants in the negotiations emphasise the fraternal relations existing between the two governments in early 1975, predisposing them to put their trust in a temporary expedient, an incomplete and very short term contract. Trust paved the way for the 1975 Understanding; the Indian Government's impatience to experiment with the barrage in the impending 1975 dry season gave impetus to the negotiations. India therefore accepted a small and experimental diversion for initial operation of the barrage.

Whilst the Indian participant argues that the Bangladesh President 'understood the context' of the Understanding, it is clear that the Bangladesh Foreign Minister read rather more into the contract than was justified by subsequent experience. The state of intergovernmental trust in the months preceding the 1975 dry season was not replicated in 1976; Hossein's anticipation that a similar understanding could be negotiated for 1976 was not warranted. The change of regimes in Bangladesh brought a break down of trust between India and Bangladesh. Without trust it proved impossible to negotiate. In these circumstances the Indian Government interpreted the 1975 Understanding to the letter: the agreement referred only to forty days in April and May 1975, not to 1976.

In the absence of negotiations in 1976, Mrs Gandhi offered Bangladesh an ambiguous concession: that the flow of water in the Ganges should remain at the March 15th 1976 volume. This concession compared unfavourably with the 1975 Understanding; it gave India 80% more water than the average of the 1975 dry season.

Both sides to the conflict allege that the renewal of open dispute was caused not just by the absence of intergovernmental trust, but also by decisions to 'use' the conflict in furtherance of independent

political ends. The Indian participant argues that the Bangladesh Government needed an external threat to foster national unity; a Bangladesh participant argues that India was implementing a 'destabilisation' policy against Bangladesh. These are serious accusations made by serving officers of the two governments. In part, no doubt, both accusations are rhetoric generated by an intractable and passionately fought conflict. There is, however, also some evidence lending substance to both allegations.

A minister in the Bangladesh Government has said that the conflict in 1976 was 'no longer just about water [but transformed] into a symbol of national resistance...' Is this not confirmation that Bangladesh was meeting other ends by renewing the open conflict?

The Indian Government's acquiescence to guerrilla attacks upon Bangladesh during 1976 provides no proof of a conscious policy to undermine the Bangladesh Government. It was nevertheless a distinctly unfriendly act. Mrs Gandhi's concession of a slight reduction in the Indian diversions from the Ganges falls into the same category of unfriendly act. Whether or not these two unfriendly acts grew from one decision to destabilise Bangladesh is a question for future historians to decide. The facts are that Bangladesh was suffering military raids from across its borders, and at the same time was suffering ecological, agricultural and economic disruption as a consequence of unprecedented low flows in the Ganges; it is not surprising that the Bangladesh Government should interpret these facts as the consequences of an Indian decision to undermine the new Bangladesh regime.



## Chapter Nine

### THE GANGES WATERS TREATY

In November 1976, the Bangladesh Government accepted a face-saving compromise in the Special Political Committee of the United Nations because they found few members of the UN were willing to support their case. They were forced back into bilateral negotiations, having gained almost nothing and with fewer weapons at their disposal. Bangladesh's bluff had been called. The remedy of the last resort had been tried and found ineffective.

Not surprisingly, in these circumstances, the resumed bilateral negotiations did not progress. But within a few months, political changes inside India came to the rescue of the Bangladesh Government. Mrs Gandhi was ousted by the Janata Party in March 1977, and the new government were anxious to mend fences with their Eastern and Northern neighbours. Within weeks of the Janata government taking office, an understanding had been reached with Bangladesh on the sharing of the Ganges waters. Six months of detailed negotiation ensued before the understanding could be formalised in a treaty, but the Ganges Waters Treaty did emerge.

This Treaty resolved the immediate issue of sharing the water (the second phase of the dispute identified in the Introduction to Section II) but set aside the issue of how to increase the dry season flow of the Ganges (the third phase of the dispute).

This chapter chronicles the process by which the Treaty emerged, examines some of the limitations of the Treaty and records the progress of the discussions about increasing the dry season flow. It is argued that the Ganges Waters Treaty was made possible first by an Indian concession on the allocation of the flow during the driest ten-day period, and second by an agreement from India to cease giving sanctuary to guerrillas operating against Bangladesh. At the end of the chapter, a review of the conclusions of Part II is presented.

## Chronology of the settlement

The consensus statement of the UN dictated that both parties should meet again, represented at ministerial level, in Dacca. This they did in December 1976, but little progress was made. The meeting, between Jagjivan Ram, representing India, and Rear Admiral M H Khan, representing Bangladesh, was adjourned, resumed, adjourned again and then resumed in Delhi before being broken off altogether. The discussion was apparently focussed on the issue of water sharing. One report says India offered Bangladesh 'more than half' the lean season flow but Bangladesh was not willing to accept India diverting more than 15,000 cusecs (1). At the end of the talks in Delhi, the Indian Government announced that the talks had merely ended without agreement, whilst a Bangladesh Government spokesman said:

'The negotiations were not successful because the Indian side failed to recognise the urgency of the situation and the serious adverse effects in Bangladesh of continuous withdrawal of Ganges water at Farakka, especially with the onset of the dry season since November.' (2)

The details of the talks, described a month later in the Far Eastern Economic Review, reveal that the Bangladesh delegation, lead by M H Khan, apparently received a snub from Mrs Gandhi, rather similar to the one he had suffered in September 1976 (see Chapter Eight):

'Before the Bangladesh delegation arrived in New Delhi for talks, Indian Premier Indira Gandhi had announced a general election. As the Bangladeshis reached Delhi she was heading for the Kumbha Mela (fair) about 500 miles away. On arrival, the delegation's leader, Navy Chief Rear Admiral M H Khan, met the then Agriculture Minister Jagjivan Ram in what was described as the opening of formal talks. He was told that the Indians had nothing new to offer. Khan was flabbergasted. "What was the sense of asking us to come to Delhi then?" he asked Ram. The veteran Indian politician said he was sorry he could not reconsider the Indian position as the Premier was away from Delhi. The Bangladesh delegation had little left to do except sightseeing.

'Another meeting was scheduled for the following morning, but it was cancelled unceremoniously 10 minutes before the Bangladesh delegation was due to leave the hotel for the talks. An assistant protocol officer of India's

External Affairs Ministry was considered sufficiently competent to inform Khan of the cancellation. Before the Bangladesh team left for home, Ram and the head of India's Policy Planning Division, G Parthasarathy, called on Admiral Khan to tell him 'off the record' that the Indian Government could not initiate any new move on its own, and could not consider any proposal presented by Bangladesh because "such a move may have serious adverse effects on the Congress Party's election chances, especially in West Bengal." (3)

Neither side used the breakdown of the talks to generate significant levels of propaganda. The Indian Government had no reason to because the status quo suited its interests. The Bangladesh Government had characterised the UN resolution as a 'vindication' of their position; to have publicised the deadlock in the discussions so soon afterwards might have drawn attention to the limitations of the UN resolution (4). No arrangements were made for a resumption of discussions.

One insight into the discussions was provided by the US Embassy in Dacca, who cabled their government as follows:

'Khan and Jagjivan met several times separately from advisers on both January 14 and 15 but were unable to reach [the] political agreement which several Bangladeshis have hoped would emerge from discussions not 'burdened' by presence of technical personnel. The latter have been accused of splitting cusecs so minutely as to be a hindrance to a solution.' (5)

Bangladesh reached a nadir in the negotiations during these early months of 1977. In desperation, the threat of building a Ganges Barrage to flood India was revived and labour-intensive river clearances instigated in anticipation of the effects of Farakka diversions (6). President Ziaur Rahman had visited China in January, where he had received renewed declarations of Chinese support for Bangladesh and for the Bangladesh Government's stand on Farakka (7). After the failure of M H Khan's visit to Delhi, Zia visited Iran, but he did not get support from the Shah, who would only say that he hoped the two nations would be able to settle their differences (8). Bangladesh could muster the public support of only a few friendly nations. Amongst the more powerful, only

China was willing to make public declarations of support and, since China and India had not resolved the differences which had caused the 1962 war, that support could not readily be converted into pressure on the Government of India.

The Bangladesh Government's parlous circumstance was complicated by the political situation inside India. Khan had been told, 'off the record', that the Congress Party were unwilling to risk the electoral consequences, particularly in West Bengal, of a compromise settlement with Bangladesh (9). However, it was the election which rescued Bangladesh from its nadir of powerlessness. In March 1977, Mrs Gandhi's faction of the Congress was defeated at the polls by the Janata coalition. The incoming government was pledged to a policy of good-neighbourliness (10), as was its predecessor, and it chose to produce results in this area of policy in the early days of its reign. The necessary concessions were made and, within weeks of the election, an understanding of sorts had been achieved.

#### A new 'understanding'

Jagjivan Ram, now the Defence Minister of the Janata Government, rather than the Agriculture Minister of the Congress Government, led an Indian delegation to Dacca on April 15th 1977. By most accounts it was a dramatic occasion. The Indian delegation postponed their departure more than once, and angry scenes were recorded before they finally left. This is how it was reported in the Far Eastern Economic Review:

'In a rare if not unprecedented outburst of rage, India's Babuji Jagjivan Ram shouted at pressmen waiting at the state guest house here, 'Take it from me, nothing has been settled.' ...And half an hour later at the airport, while Khan and Ram remained behind closed doors in the VIP lounge, Jagat Mehta [India's Foreign Secretary] read out a one-sentence statement to newsmen: 'An understanding has been reached, the details of which are to be worked out at a meeting of the officials of the two governments to be held in Delhi as soon as possible.'

'When asked to elaborate, the irate Indian diplomat replied: 'In the interest of Indo-Bangladesh friendship, for God's sake do not ask any more questions.'" (11)

It appears that a limited, verbal understanding was reached, Jagjivan Ram's anger notwithstanding, and that India had made a concession on the quantity of water to be given to Bangladesh in the driest ten-day period of the year. The details of the understanding have never been authoritatively published but they can be tentatively pieced together from what different participants told the newspapers at the time.

In January, the Indian delegation had been willing to concede that the withdrawals at Farakka in the driest period might be reduced to 25,000 to 27,500 cusecs. The Bangladesh delegation had at that time raised the 16,000 cusecs ceiling of the 1975 understanding to 17,000 cusecs, with hints that 20,000 cusecs might be acceptable. The two sides therefore entered the April round of discussions separated by between 5,000 and 10,500 cusecs. Newspaper reports suggest that the understanding emerging from these discussions laid down that India could divert only 20,000 to 24,000 cusecs in the driest ten days, with one report stating that a quantity of 20,500 cusecs had been agreed. Since this is the quantity enshrined in the treaty signed the following November, it seems most probable that this report was correct. If that is the case, the Indian delegation had conceded between 4,500 and 7,000 cusecs, whilst Bangladesh had given away only 500 to 3,500 cusecs (12).

In addition to this main concession on the division of the waters, the Indian delegation seem to have accepted that the flows should be shared for a longer period. Earlier, India had insisted on a lean season, the period of lowest Ganges flows defined by them as the period from mid-March to mid-May, whereas Bangladesh had wanted a seven-month, November to May, dry season. In the November treaty a five-month period of sharing, from January to May, was agreed.

Certain issues were not resolved by this understanding. The division of the water during the remainder of the five month period was not decided, nor was the long term augmentation question. Also, the question of Indian support for guerrillas attacking Bangladesh does not seem to have been settled, though Ram went with the intention

of raising the issue (13), and there can be no doubt that the Bangladesh Government were enraged and seriously worried by the attacks. It is just possible that the emotional scenes which occurred when the Indian delegation departed had more to do with this unresolved question than with the Farakka discussions. Immediately prior to his departure Jagjivan Ram had had a three-hour meeting with Ziaur Rahman.

In May, B M Abbas, the most senior technical official on the Bangladesh side, led a delegation to Delhi. In discussions with an Indian delegation led by Jagat Mehta, the issue of increasing the dry season flow of the Ganges was raised. Bangladesh wanted third party technical aid to help plan projects. Then, as before and since, the Indian delegation rejected the suggestion because they believed that international technical agencies and foreign engineering consultants would tend to favour Bangladesh, and that this was why Bangladesh wanted their intervention (14). One account of this meeting, by G K Reddy, a normally well-informed Indian journalist, suggested that the meeting had reached a deadlock; each side was insisting <sup>on</sup> its own proposal for increasing the flow. The same account mentions that the deadlock could be broken by agreement in principle to study both country's proposals (15). This is the solution which was accepted finally, but not at that meeting, which was postponed. Dawn suggested that the meeting had to be postponed because agreement would have prejudiced the forthcoming legislative assembly elections in West Bengal (16), whilst The Hindu thought that Bangladesh was waiting for an agreement preventing guerrilla attacks across the border (17).

In June, Ziaur Rahman and Morarji Desai went to London for the Commonwealth Conference and, as in 1961, the Conference provided circumstances, which might otherwise not have arisen, for the leaders of the two nations to meet informally. At this meeting Prime Minister Desai agreed to 'see that no shelter was given to criminal elements from across the border, whatever might have taken place under the previous regime' (18). India had now made what they saw as two concessions, on the quantity of water and on the

guerrilla attacks, and they thought that mutual confidence had been restored by the Zia-Desai meeting. However, Bangladesh had suggested that Nepal and China should be involved in any long term development of the Ganges (19). At this time, several Members of India's upper house of parliament, the Rajya Sabha, expressed their fears that the settlement of the guerrilla issue, which was widely interpreted as a necessary preliminary to settlement of the Ganges dispute, was a 'sell-out' to Bangladesh (20). Newspaper reports suggested that the guerrillas were being forcibly returned to Bangladesh whereupon some were massacred (21).

During August and September more discussions took place. Jagat Mehta went to Dacca in August and, during talks with B M Abbas, the differences between the two sides were, according to the official statement, 'narrowed down' (22). Other accounts were less sanguine. Bangladesh was apparently sticking to its case that the long-term developments were not a matter for bilateral, but for quadrilateral, discussion (23). Nevertheless, preparations were being made for a settlement. Jagjivan Ram visited Calcutta to prepare West Bengal for a change of tune. He told the Merchant Chamber of Commerce, 'It would not be fair to flood Bangladesh during the monsoon and leave it dry during the summer months when it too needs water' (24). Ram was bold enough to use Bangladesh's interpretation of the water shortage, an argument he had himself spent many months rebutting. He told the businessmen that if India withdrew 40,000 cusecs, Bangladesh would be left with only 15,000 cusecs. As a Calcutta paper pointed out, this calculation did not tally with the sums that the central government had previously used. Where was the 25,000 cusecs of recharge? (25) West Bengal leaders lobbied the Central government, demanding the maximum diversion at Farakka, but to no apparent effect (26).

There was something of a hitch when talks resumed in September. B M Abbas led a Bangladesh delegation to Delhi, and the talks went on in fits and starts through most of September. Prime Minister Desai said, early in the month, that there was agreement and received a sharp rebuttal from Bangladesh: it was only a verbal understanding

(27). By mid-month, there were reports that the talks had broken down. G K Reddy, of The Hindu, reported 'Admiral M H Khan has ripped open the whole controversy with his latest contention that there was no such thing as a package deal under discussion..' Evidently, the problem was over the parties with rights in the long term issue. Reddy wrote, India 'cannot afford to let Nepal line up with Bangladesh and look to China for inspiration... And, whatever King Birendra's fixation, India has to display all possible patience and imagination in making him realise in his own way where Nepal's real interests lie in the geopolitics of the subcontinent' (28). (A lucid example of India's paternalism to Nepal.) Towards the end of the month, there were hints that a summit meeting between Zia and Desai would be necessary before agreement could be reached. The main details of an agreement had been achieved but the 'real hurdle' was 'lingering suspicion of each others basic intentions...' (29).

In the event, the summit was not necessary. The talks were held up whilst Desai was in the South of India and whilst Zia was in Egypt. Once they returned, the Political Affairs Committee of the Indian Cabinet met, and B M Abbas shuttled backwards and forwards between Delhi and Dacca (30) getting final instructions on what would and would not be acceptable to Bangladesh. The Hindu said there was a need to 'prepare public opinion in the two countries for a compromise' (31). The final problem seems to have been on a choice between a linear distribution of the flow or an asymmetric division (32). The verbal understanding had set the division for the leanest ten-day period. A five month dry season had been agreed. And the principle that the long term developments should be studied, and therefore set aside for the time being, had also been agreed. Much of this final discussion seems to have been on how to divide the waters in the remaining 14 ten-day periods of the five months. A linear division would presumably have given Bangladesh five eighths of the Ganges flow for the whole of the five month period of sharing. An asymmetric division, which was agreed, gave India an increasing proportion of the flow. According to one report, Desai had told Abbas that India would meet Bangladesh on an increased period of sharing if Bangladesh would agree to the asymmetrical division (33).



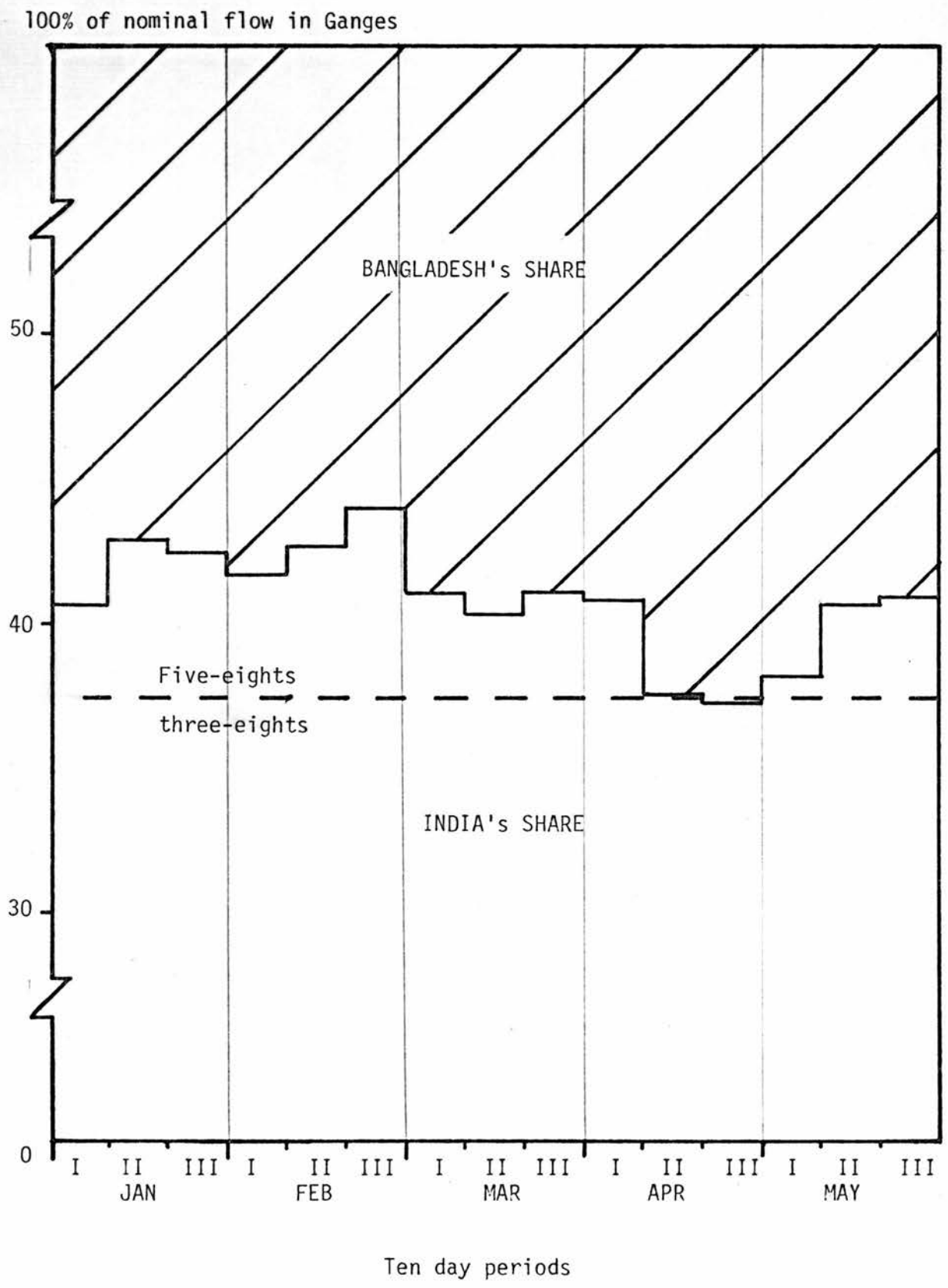
In the early morning of September 30th 1977, the agreement was initialled. The Ganges Waters Treaty (text in Appendix A) was signed on November 5th by M H Khan and Surjit Singh Barnala, the new Indian Minister of Agriculture. Certain points in the Treaty were deliberately left vague, but were covered in a confidential exchange of letters between Jagat Mehta and B M Abbas (34). The text of these letters has still not been published (35). There was something of an outcry against the agreement in West Bengal (36), but it was not as fierce as had been expected and Prime Minister Desai gave a long and detailed statement to the Lok Sabha which put India's compromises in the best light and successfully rebutted some of the more outrageous criticisms of the Treaty (37).

#### The limitations of the Treaty

The Ganges Waters Treaty resolved the dispute over the sharing of the Ganges Waters. Both sides made substantial concessions. In the driest ten-day period Bangladesh gave away 20,000 cusecs of the historical flow (38), whilst India could divert only 20,500 cusecs, compared with the 40,000 which she had demanded. But, the Treaty did not resolve the third dispute, around the proposals for increasing the Ganges River's dry season flow. However, the Treaty is, in the words of a lawyer, 'in the nature of a pactum de contrahendo' (39), or agreement to conclude a later final agreement. In Article 10, the Treaty says, 'The two Governments shall consider and agree upon a scheme or schemes...and take the necessary measures to implement it or them.' This clause provided something of an escape route from the interminable arguments which had taken place in the Joint Rivers Commission in the period of Mujib's reign.

Part A of the Treaty is illustrated in Figure 9.1, showing, graphically, the sharing of the waters. Part B of the Treaty, the 'long term arrangements', sets out bilateral technical negotiations for choosing the best method of augmenting the flow. Both sides are relying on a project or projects to make the abundant water in other seasons or other places available when and where both countries need it. The proposals under discussion, as will be

Figure 9.1 Division of Ganges Waters



described in Section IV of this thesis, have proved to be more than value-free engineering projects. The project of one side appears to the other to have political motives and mistaken assumptions.

In its assumption that the primary features of augmentation proposals are technical rather than political, this Treaty continues a tradition established by the earlier periods of negotiation. In its definition of the problems to be solved by these engineering proposals, the Treaty also builds on tradition, rather than introducing an 'ideal' solution. The sole definition of the nature of the proposals is that they should relate to the augmentation of the dry season flows in the River Ganges. On the one hand, the reasons why such augmentation is desirable are omitted and, on the other, more general objectives for development and control of the river are excluded. Sensible choice between alternative projects might be aided by a consideration of the reasons for increasing the flow - irrigation, industrial use, navigation, salinity control or ecological benefit, are all tenable examples. The two negotiating teams were not in agreement on the priority to be given to these alternative uses so they could not provide direction in the Treaty. Similarly, future negotiations may be restricted because desirable objectives for river development, for example, flood control, power generation or silt limitation, have been excluded. The Treaty cannot be interpreted as an ideal agreement for the development of an international river. It is the product of its historical circumstances, the disputes which forced the two countries to enter into an agreement. These circumstances dictated that negotiation should concentrate on only one aspect of the development of the river, augmentation of the dry season flow. Future treaties may be required to resolve disputes arising from other aspects of riverine development.

#### The negotiation of augmentation

Since the Treaty was signed in 1977, negotiations have continued intermittently, little progress has been made. During 1978 and 1979, discussions centred on the procedures to be followed; there were no substantive examinations of alternative augmentation proposals.

The Joint Rivers Commission convened several times in 1978 and 1979 without announcing any achievements. Such slight progress as occurred was the result of high-level interventions in the negotiations. At the end of 1977, President Ziaur Rahman visited India and during his visit it was agreed that the Joint Rivers Commission should be upgraded to include the relevant ministers from each government (40). The JRC was transformed from an official-level forum, dominated by technical experts, to a political and technical commission with, presumably, greater powers. The transformation of the JRC suggests that the two governments recognised that the technical and political aspects of augmenting the Ganges flow were closely intertwined. Nonetheless, the new ministerial-level commission made no more progress than its predecessor.

In March 1978, detailed proposals for alternative projects to augment the Ganges flow were exchanged (these proposals are examined in Section IV of this thesis). The negotiations did not, however, proceed beyond this preparatory stage because one important political issue remained unresolved. This issue is the question of whether only two countries, or three or more, are vitally concerned in the augmentation of the Ganges. The Indian Government has consistently argued that the augmentation of the Ganges is a bilateral concern, to be discussed by Bangladesh and India. That view is supported by the 1977 Treaty which makes no provision for the involvement of other governments. The Bangladesh Government, on the other hand, has insisted that the interests of Nepal cannot be ignored. Nepal is situated within the Ganges Basin, its rivers contribute most of the Ganges' dry season flow and Bangladesh's proposal for augmenting the Ganges would be situated mostly within Nepalese territory. For those reasons, Bangladesh argues, Nepal must be a party to the negotiation of augmentation.

Neither government moved from its stand until May 1979, when there was a slight concession from India. In the 17th Joint Rivers Commission meeting, the third since the Treaty, there was agreement that the Nepalese Government should be 'approached'. Even this slight and, as we shall see, ambiguous understanding was the result

of a prime ministerial intervention. The Indian Prime Minister, Morarji Desai, had visited Bangladesh just prior to the JRC meeting, and it was apparently his suggestion which briefly broke the impasse. However, the concession was made by India on the understanding that it did not prejudice 'the basic bilateral character of the problem of augmentation of the flow' (41). The exact status which the Nepalese Government might have in the negotiations was not publicly clarified. The Indian Government did not envisage a trilateral commission, but it did concede some form of consultation with Nepal. This was not, however, enough to instigate significant progress in the negotiations. There was no agreement to commence surveys of the alternative schemes for augmenting the Ganges' flow; without surveys, feasibility studies could not be started, and without feasibility studies there was no basis for an informed decision on building the schemes.

The intransigence of India's commitment to bilateralism can be illustrated by reference to the response given to a third party intervention which was made in January 1978. In a speech to the Indian Parliament, President Carter of the USA offered assistance for the development of the region's rivers (42). Two days later in Bangladesh Prime Minister Callaghan of Britain made a similar offer (43). The intervention was welcomed in Bangladesh but rebuffed by India, and nothing further has been heard of it.

#### The return of Mrs Gandhi

In January 1980, Mrs Gandhi's Congress (Indira) Party achieved an absolute majority in the Indian elections, and Mrs Gandhi returned to power as Prime Minister. During her election campaign she had given notice that she thought the fence-mending agreements made by the Janata Government should be undone (44). This view seems to have been expressed by India in discussions with Bangladesh in the subsequent months. The focus of Indian concern has moved from the question of augmentation back to the short term sharing of the existing dry season flow.

In February, when Ziaur Rahman visited Delhi to address a UN conference he met Mrs Gandhi. The Hindu reported the Indian position in the discussion as follows:

'The new government's policy towards the neighbouring countries is to continue to strive for a consolidation of relations with them in mutual interest. [ But ] the Indian view is that one-sided concessions do not lead to lasting friendship, but only end up by distorting the relationship and doing more damage in the long run. So it is necessary to aspire to a certain degree of reciprocity to give both sides an abiding stake in the preservation of equally beneficial relations.' (45)

In other words, the new government was not willing to accept the short-term sharing of the flow negotiated by its predecessor. When the JRC met in March, the new Indian Irrigation Minister (who had previously been Irrigation Minister for the State of West Bengal) warned that India would invoke her right to review the Ganges Treaty in November if no progress was made in investigating augmentation proposals (46). Questioned in the Lok Sabha later in the month, the minister did say: 'since it is a bilateral agreement, we stand by it' (47). Nevertheless, the minister's statement was interpreted as follows by G K Reddy of The Hindu:

'The Minister...is missing no opportunity to do some plain speaking to Bangladesh on the Ganga waters problem. He has been sounding a note of warning, presumably with the prior knowledge of his senior Cabinet colleagues, that the 1977 Farakka agreement, in its present form, will have to be scrapped if Bangladesh continued to drag its feet over the question of augmentation of the flow during the dry season.' (48)

The 18th meeting of the JRC was held in April and, although the leader of the Bangladesh delegation described the talks as 'friendly', The Hindu reported that the two sides had not been able to agree even on the minutes of the meeting (49). A 19th JRC meeting in July made no further progress. There was a suggestion that a summit meeting at a higher political level might be necessary, and the leader of the Indian delegation was reported as hoping that India would not be forced to make a 'unilateral review' of the 1977

agreement (50).

## DISCUSSION

Whilst the Ganges Waters Treaty of November 1977 was a limited and in some senses unsatisfactory one, it brought a resolution of the second phase of the Ganges conflict: the existing dry season flow of the Ganges was shared between Bangladesh and India. With the return of Mrs Gandhi in 1980, even that resolution may prove to have been temporary. Nevertheless, it is worth attempting to identify some of the circumstances which made the Treaty possible.

As we have seen, agreement was achieved in two stages. First, an understanding was reached within a month of the election of the Janata Party. This understanding almost certainly laid down the division of flow during the ten days of minimum flow, and probably also determined that the Indian withdrawals should be subject to negotiation over a five month nominal dry season. The understanding was raised to the status of a formal agreement only after a further five months of sometimes acrimonious bargaining. This second stage of the agreement fixed the division of the waters for the remaining 14 ten-day periods of the five month dry season and laid down the arrangements for negotiating the augmentation of the flow.

Without reducing a complex and protracted process of negotiations to too simple a formula, it is possible to suggest some of the factors which made each of these two stages feasible. The first understanding was achieved, obviously enough, only after the election of the Janata Party. That coincidence is suggestive, but it is not proof that the Janata-led government created the circumstances necessary for the understanding. Is there evidence that a government under Mrs Gandhi's tutelage would have acted otherwise?

There is strong evidence that it was the decisions of the Janata Government which made the understanding possible. In 1978, I was told the following by a Secretary in the Indian Ministry of External Affairs who had been closely associated with the 1977 negotiations:

'The new government was willing to make more concessions. They wanted to project an image of having achieved success in foreign policy in a short time. What they did with Pakistan and Nepal amounted to getting over some mental blocks. But with Bangladesh there was a calculated sacrifice of the national interest with a view to achieving wider purposes. We thought that if the biggest irritant was removed the climate would change.'

(51)

As we have seen, there was a substantial concession made by the Indian side during the April 1977 negotiations which led to the understanding. It was matched by a rather smaller concession from Bangladesh. It is clear from subsequent events that this is a concession with which the present Congress (Indira)-led government is dissatisfied. There are few grounds for believing that the April 1977 understanding would have occurred if Mrs Gandhi had been re-elected in the preceding month.

The second stage of the agreement was achieved less easily than the first and it is difficult to know exactly what made it possible. However, one element in the agreement is clear: an obstacle was removed from the path of the negotiations when Morarji Desai assured Ziaur Rahman in London that 'no shelter would be given to criminal elements from across the border.'

Participants on both sides of the discussion concur that this assurance was an essential prerequisite for the Treaty. In 1979, a Bangladesh diplomat told me:

'It was a package deal... it was not in the interests of those in power to keep the issue burning.'

(52)

And the Secretary in the Indian Ministry of External Affairs, in the interview quoted above, went on to say:

'More significant, if you want to see the political level, India undertook the cessation of hostilities on the border.'

(53)

There is much yet to be told about how the agreement was reached but



India's willingness to concede five-eighths of the flow during the driest period and to arrange for guerrilla attacks to cease appear to be the main elements in the 'package' settlement. Those elements were made available because the Janata Government needed to project 'an image of having achieved success'.

The Treaty itself is a product of its historical circumstances. It defines development of the water resources of the Ganges Basin solely in terms of increasing the dry season flow. The shortage of water provided conditions for the dispute to arise; the Treaty, in its 'long term arrangements', maintains that focus. There is no provision for general regulation and development of the river's resources.

Nevertheless, even with this concentration on increasing the dry season flow, subsequent discussions have not progressed. Bangladesh has refused to embark on feasibility studies of alternative schemes unless Nepal is allowed to participate in the negotiations. India has so far been unwilling to allow Nepal's participation because the Indian Government believes that augmentation is a 'bilateral' matter.

In Part IV of this thesis, the two governments' alternative proposals for augmenting the Ganges flow are examined. This examination will suggest that the proposals, and their governments' negotiating positions, express a narrowly defined concern for national sovereignty.

#### THE PRIORITIES OF SOUTH ASIAN LEADERS

This section, Part II of the thesis, has investigated the history of the Ganges conflict and some of the 'reasons of State' which have determined that history. In the process a brief exploration has been made into the political priorities of the leaders of India, Pakistan and Bangladesh as they have been expressed in this conflict. These priorities may be little different from those of political leaders elsewhere but they have tragic consequences for the population of the Ganges Basin whose future prosperity depends in part on the

harnessing of the waters of the Basin.

The exploration suggests that the development of the Ganges for the benefit of those whose lives are dominated by it is rarely the determining principle in the conduct of the dispute.

In the first phase of the dispute, from 1951 to 1971, the Government of India as the upper riparian power was able either to recognise or to ignore Pakistan's concern about the Farakka Barrage. It chose the latter. In the light of the general level of hostility prevailing between the two governments this is understandable, but less excusable. For a short period, in 1960, there was, however, relative cordiality when negotiations might have been fruitful. The Pakistan Government tentatively suggested that the principles of sharing devised for the Indus might be extended to the Ganges. The proposal was not grasped by India. Then, and for the subsequent decade, the Indian Government organised an effective strategy of procrastination. Indian claims that 'extensive consultations' were held with Pakistan are refuted by the evidence. In addition, no less an authority than a former Indian Foreign Secretary has implied that there was indeed a strategy of procrastination. There were, he said, 'only two ways to handle' the dispute: if India had started negotiations, Pakistan would have applied an 'injunction'; therefore, India did not start negotiations but only technical level 'talks'.

In this decade, the Indian Government's over-riding concern was the construction of the Farakka Barrage; the export-import trade of Calcutta had greater priority than any possible consequences to the agriculture and economy of East Pakistan. The Indian Government's responsibilities extended only so far as the border, no further. In Chapter Sixteen, Indian conduct during this phase of the dispute will be compared with Indian policy regarding internal inter-state river disputes, and with the policies of other upper riparian states. In both cases, the Indian conduct of the Ganges conflict compares unfavourably.

This first phase of the Ganges dispute was brought to a close when

a more sympathetic, perhaps even pliant, regime was installed, with Indian assistance, in East Bengal. The Indian insistence on prolonged data exchanges ceased with the independence of Bangladesh. Within months of the creation of Bangladesh, ministerial discussions on the sharing of the Ganges had taken place and the Joint Rivers Commission had been formed. However, the promise of progress, as we have seen, was denied. No doubt many factors contributed to this denial. One important factor may have been the struggle for the leadership of Bangladesh between the social democratic faction of Sheik Mujibur Rahman and the right wing faction led by Khondakar Moshtaque Ahmed, then Minister in charge of water resource development. In this phase, the development of the rivers seems to have been subordinated to the exigencies of the internecine struggle for power.

With the overthrow of the government of Sheik Mujibur Rahman, a period of renewed hostility began. During 1976 and 1977, India appropriated a significant proportion of the Ganges' dry season flow. We shall examine the consequences of this appropriation in Part III and conclude that it caused serious damage to both the economy and the ecology of Bangladesh. The Bangladesh Government's vigorous protestations during those years were, therefore, founded in genuine grievance. Nevertheless, we have seen that Bangladesh's conduct of the dispute in this period was also informed by objectives unconnected with the sharing of the Ganges: prosecution of the dispute was, in addition, an exercise in internal consensus-building and international image-creation. On the other side of the border, India's intransigence and insensitivity to Bangladesh's claims of damage and Mrs Gandhi's rather niggardly 'concession' to reduce Indian withdrawals can be seen, in the light of Indian toleration of guerrilla attacks against Bangladesh, as owing more to Indian hostility toward the new leadership of Bangladesh than to Indian concern about the Hooghly. Again, in this phase, the horizons of leadership are no more distant than immediate political needs.

The second phase of the conflict, focussed on the division of the existing flow, was terminated because it served just such a need of the newly-elected Janata Government. One interpretation suggests

that the new leadership made a 'calculated sacrifice of the national interest' in order to promote an image of success. However, the motivation for this sacrifice is the interpretation of only one Indian civil servant; the sacrifice could equally be interpreted as serving the wider interests of the population of the Ganges Basin by allowing the development of the resources to proceed.

If this latter interpretation were correct, we might reasonably anticipate progress toward agreement on augmentation during the third phase of the conflict. This third phase, dubbed in Chapter Nine as the negotiation of augmentation, has not in practice been fruitful. Between November 1977 and January 1980 the negotiators of the two governments were unable or unwilling to rise above questions of national sovereignty or the national interest to embark upon development of the region's water resources. This tends to confirm the civil servant's interpretation and suggests that the Janata Party's priorities were no more elevated than its predecessor's. The return of Mrs. Gandhi swept Janata from office and presaged a return to the second phase of dispute focussed on a renegotiation of the existing dry season flow.

There can be little doubt that the failure to develop and control the Ganges will have and is having tragic consequences, but perhaps it is unfair to lay the whole blame on the priorities of political leaders. Leaders operate under many constraints: of elections, of economics and of super power rivalry. This account assumes they are autonomous actors able to rise above the constraints on power in order to reach toward the end of regional prosperity through the means of river development. Are they so able? It is the privilege of historians to muse upon the broad sweep of what might have been; a politician's horizons are perhaps inevitably more limited by the details of what was. As Mrs Gandhi says, in a slightly pathetic explanation of what happened:

'Things took place so fast; we had so many problems'.

III

THE EFFECTS

'There should be no real injury  
caused to Pakistan by this scheme'

- Nehru, Lok Sabha, 19/8/61.

### III

#### INTRODUCTION

The purpose of this third section is to examine the consequences of Farakka diversions during 1976 and 1977. These chapters provide an assessment of the impact of the operation of the Farakka Barrage Project.

During 1976 and 1977 the Farakka Barrage was used to divert large quantities of water down the Hooghly River. As a result the flow in the River Ganges downstream of the barrage was significantly reduced for the dry seasons of those two years. It has been asserted by the Bangladesh Government that this reduction in flow caused widespread and grave damage to the agriculture, industry and ecology of South Western Bangladesh. The Government of India have denied, or minimised the extent and gravity of such damage. This section seeks a measured judgement of what happened.

The impact of the Farakka diversions is complex. Figures III.1 and III.2 show chains of cause and effect linking reduced river flows to potential consequences. Maps reproduced here as Figures III.3 and III.4 indicate the extent of the potential effects in the opinion of the Governments of India and of Bangladesh, respectively.

Three documents provide most of the evidence used in this section. The first two are thin, glossy pamphlets distributed by the two governments in September or October 1976 to diplomatic missions, delegates to the UN and interested people all over the world. These represent the views of the two governments at a time when diplomatic activity was at a peak. The Government of India's The Farakka Barrage (1), and the Government of Bangladesh's White Paper on the Ganges Water Dispute (2) are negotiating documents intended, in the first place, to impress delegates to the United Nations with the strength of their publisher's case.

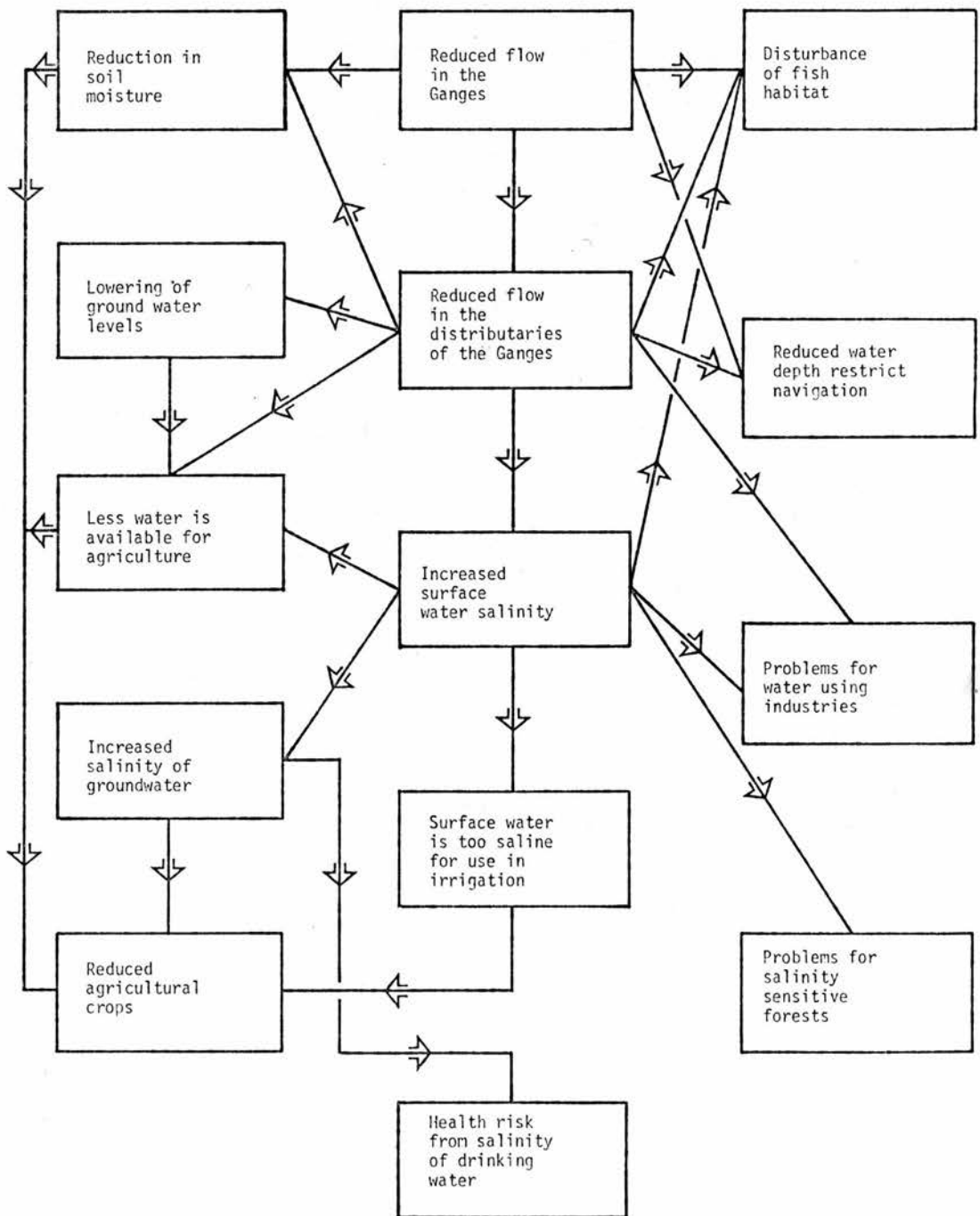


Figure III.1  
 SUMMARY OF THE IMPACT OF  
 REDUCED GANGES FLOWS  
 Source: Based on  
 Chapter 2, "White Paper  
 on the Ganges Water Dispute",  
 Government of Bangladesh.

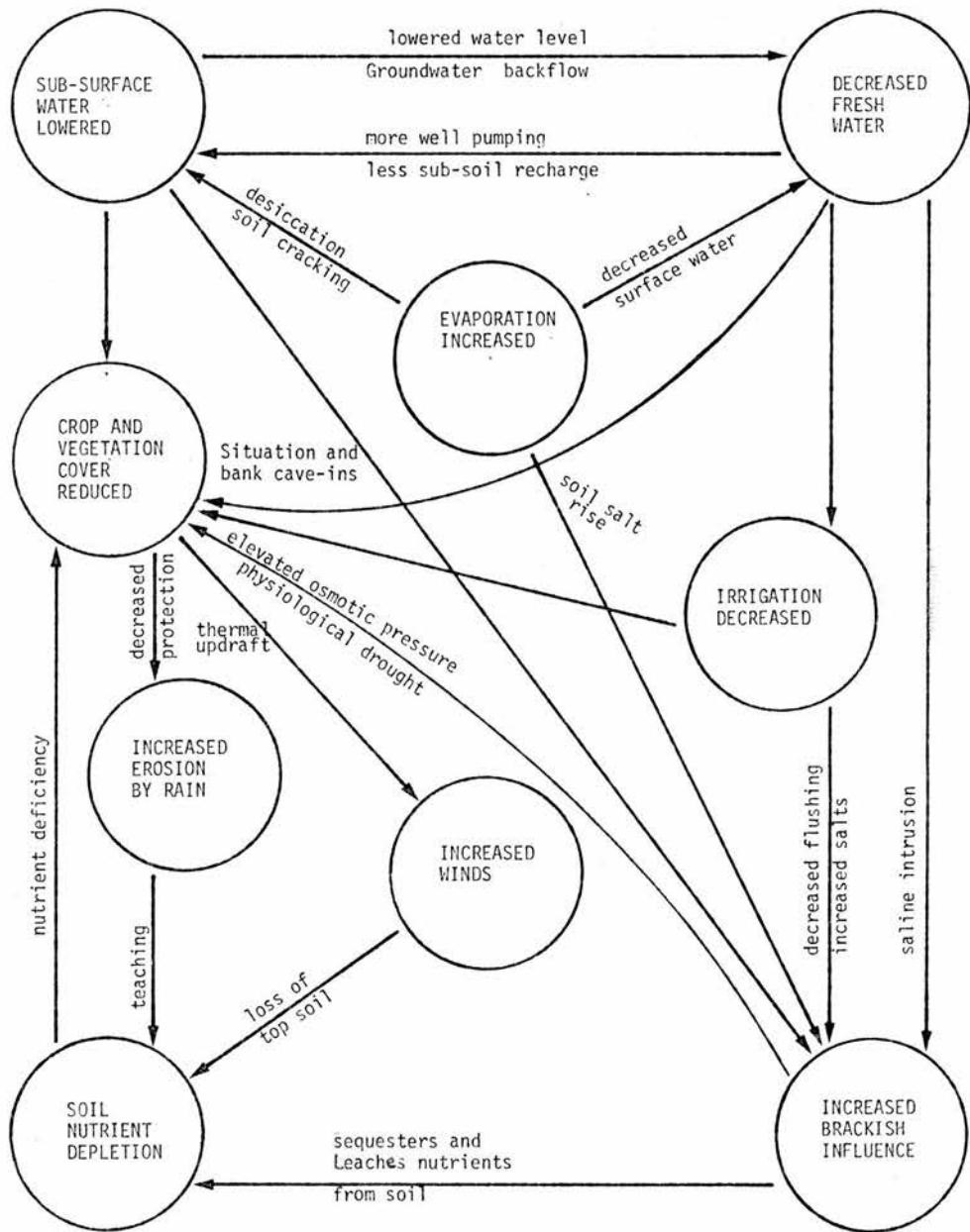
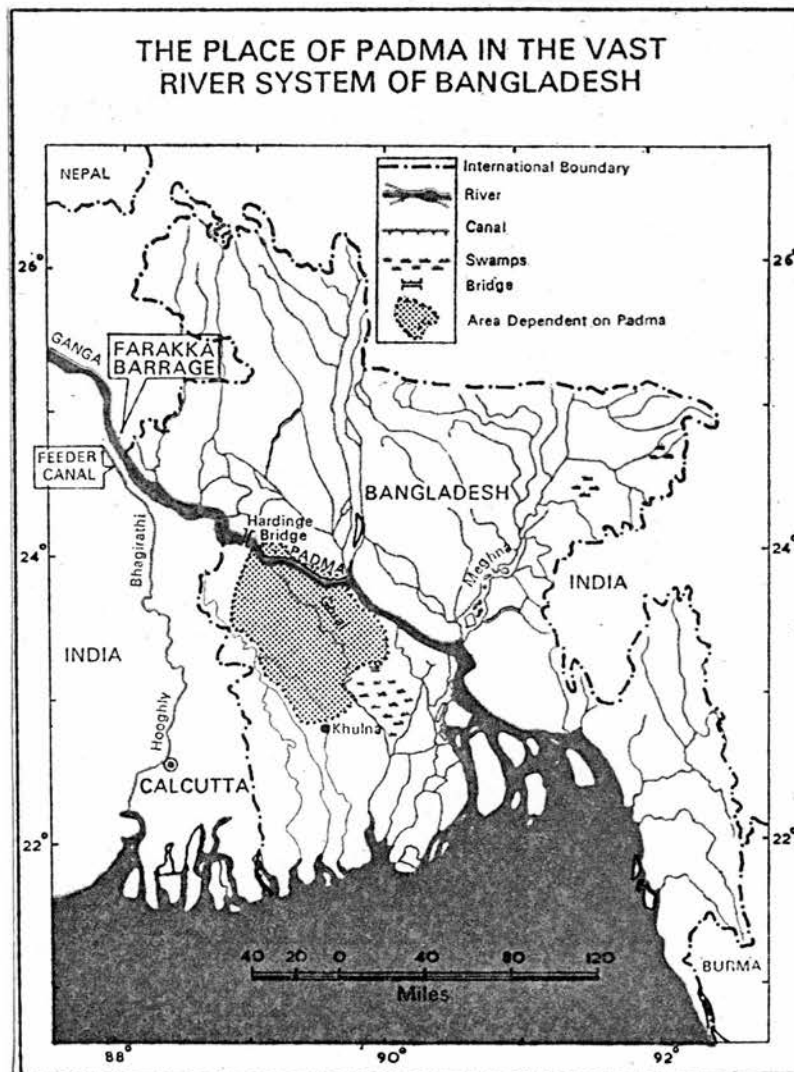


Figure III.2. 'Ramifications on the agro-ecosystem of decreased dry-seasonal Ganges flow!'

From; Special Studies.

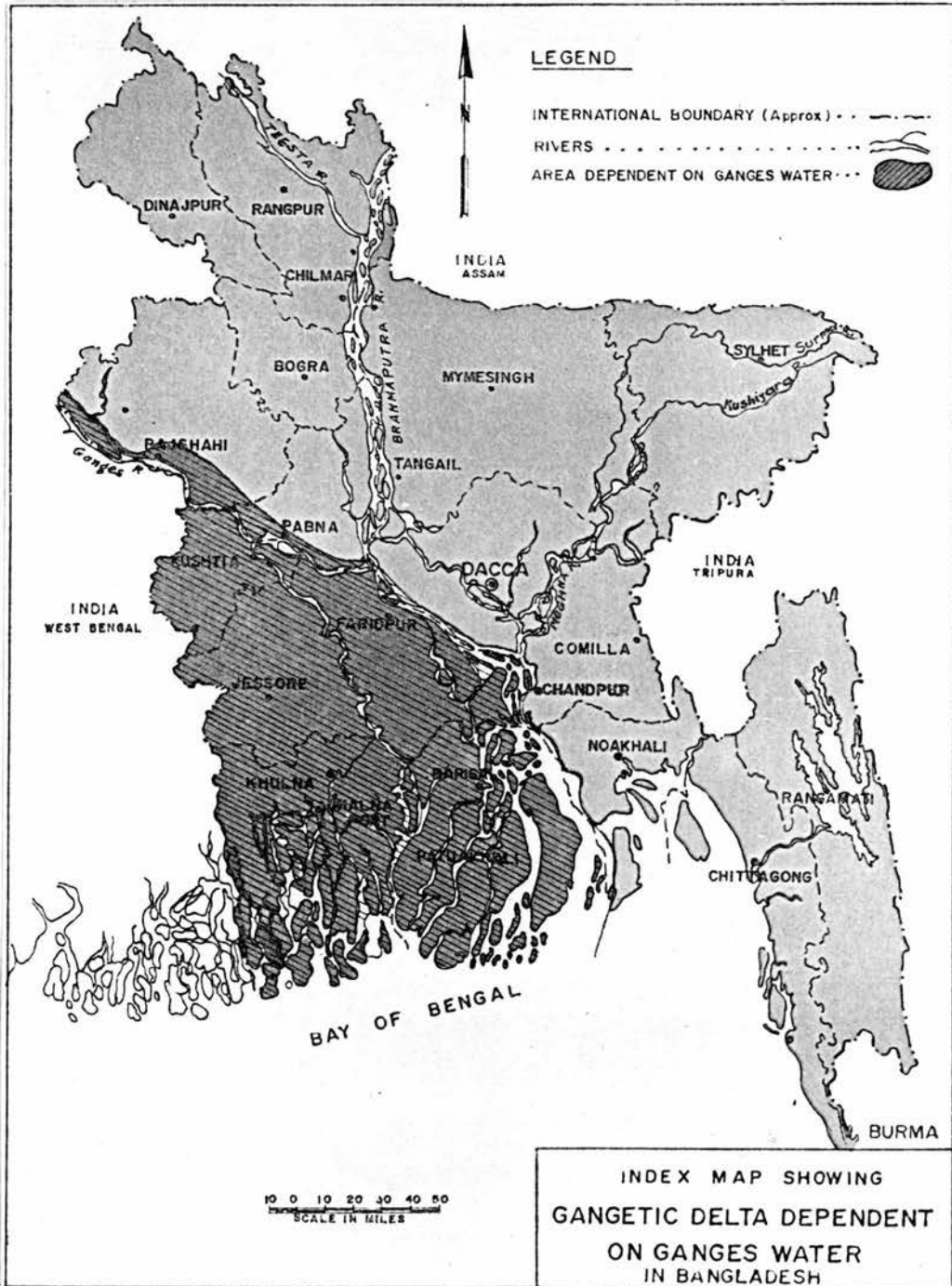


Figure III.3: The Indian Government's map of the area of Bangladesh dependent on the River Ganges.



Source: India, The Farakka Barrage, Delhi, 1976.

Figure III.4: The Bangladesh Government's map of the area of Bangladesh dependent on the River Ganges.



Source: Bangladesh, Deadlock on the Ganges, Dacca, 1976.

The third basic document is a fat, four volume work, funded by the World Bank and produced jointly by the Government of Bangladesh and a San Francisco-based firm of engineering consultants, International Engineering Company Ltd (IECO). It is called simply Special Studies (3), and it constitutes the most thorough investigation so far made into the impact of Farakka diversions on Bangladesh. At the time of writing, this document had been given only a restricted distribution.

These three documents provide descriptions of the mechanisms by which a reduction in the flow of the Ganges may cause agricultural, industrial or ecological damage, and quantitative assessments of the extent of damage caused by the reductions experienced by Bangladesh in 1976 and 1977. In weighing and comparing the different conclusions drawn in these documents, I have tried to ask four questions:

- a) Is the 'mechanism' well described? Does the chain of cause and effect provide a credible explanation of the physical processes involved?
- b) Is the method chosen for measuring the effect well designed?
- c) Has that measurement been executed satisfactorily?
- d) Have the measurements been interpreted with an awareness of the sources of error and bias? (4)

Special Studies is the more 'scientific' of the three documents. It was prepared by a group of experts who were given access and the resources enabling them to make empirical measurements of the physical processes involved. These experts, most of them from America, worked in cooperation with the Bangladesh Government's Special Studies Directorate and under the overall guidance of three eminent American hydrologists (5). The experts' professional reputations will have provided a restraint against the conscious falsification of data. Nevertheless, unconscious bias and selective interpretation of the data will have occurred (6). Special Studies has been examined and my conclusions drawn with such bias in mind.

This section is divided into four chapters. Chapter 10 lays the groundwork for subsequent chapters by summarising the information on the quantity of water flowing into Bangladesh during the dry seasons of 1976 and 1977, and estimating the extent to which those reduced flows were reflected in the hydrology of South West Bangladesh. Chapter 11 provides an assessment of the impact of reduced water availability on the salinity of surface water in the area; from that assessment an estimate of industrial disruption is made. Chapters 12 and 13 examine the consequences for agriculture and forestry, and navigation, fisheries and ecology, respectively.

The conclusion which can be drawn from Part III of this thesis is that there was damage to Bangladesh in 1976 and 1977, caused by the operation of the Farakka Barrage. The Bangladesh Government exaggerated the extent, seriousness and, in some cases, the nature of the damage, and the Government of India under-estimated the damage. One reason why the two governments were able to differ in their assessments is the complexity of the processes involved. We shall see that some questions remain unresolved even after the Special Studies team have deployed their very considerable resources to investigate those questions. Before that investigation many more issues were 'moot-points', capable of very different interpretations. Here we find another example of technical uncertainty providing a 'freedom of movement' to political dispute.

## Chapter Ten

### REDUCED FLOWS

This chapter is an attempt to assess the hydraulic consequences for Bangladesh of the diversions at the Farakka Barrage. An estimate of these consequences is a prerequisite for any assessment of other effects because all further effects are caused by, or alleged to be caused by, the changes in the surface and ground water flows in South West Bangladesh.

#### The hydrology of South West Bangladesh

South West Bangladesh, an area larger than Belgium and Holland combined, combined, is the area which could have been affected by the reduced flows in the River Ganges. It is the major part of the complex delta of three rivers, the Ganges, the Brahmaputra and the Meghna (1). The delta is bounded by the Bhagirathi (in India) in the West, the Ganges to the North and the combined River Meghna to the East. The major rivers of this area are shown in Figure 10.1.

The Western part of the delta, from the River Bhagirathi across the Bangladesh border to the line of the Gorai-Madhumati and Rupsa-Pussur rivers, is known to geographers as the moribund region of the delta. In this area the characteristic land-building activities of a delta have ceased. Most, if not all, of the many rivers and channels are no longer distributaries of the River Ganges but for most of the year have no flowing water and during the rainy season only drain the immediately adjacent countryside.

The extent to which the remainder of the delta is actively building land is uncertain. There are frequent changes in the land forms and the extent of these changes is currently being studied with the aid of both satellite and aerial photography. Land is certainly being formed in the mouth of the Meghna, sometimes, as in Noakhali, with the aid of man-made cross-dams. Land is also, however, being

eroded. As much as a third of Bhola Island has been lost to the rivers in recent years. One study has reported a comparison of early maps with more recent ones which indicates that land forms are changing but the total area of land within given boundaries is remaining roughly constant (2). It is probable that deep water and heavy tidal currents have placed limits on the extension of the delta by deposition.

There are three sources of water flowing into the South West Region of Bangladesh. They are, firstly, the flow of the major rivers coming from India, primarily the River Ganges; secondly, rainfall draining from the surrounding countryside; and, finally, there may be a contribution from water stored in the ground. For the River Ganges, the largest source is the water flowing across the border from India. Two distributaries withdraw water from the Ganges in Bangladesh, the Rivers Gorai and Arial Khan. In the upper reaches of these rivers the water drawn from the Ganges or Ganges-Brahmaputra is their largest source; lower down the rivers this may not be the case.

At different periods both the Gorai-Madhumati and the Arial Khan were probably the main channel of the Ganges or Ganges-Brahmaputra. In the late nineteenth century several writers thought the Gorai-Madhumati might again become the main channel of the Ganges, but the activity which had led to this belief subsided (3). Now these two distributaries withdraw only a small percentage of the discharge of the River Ganges.

The Ganges delta is not a stable environment. The 'normal' deltaic activities are complicated by the influences of geologically recent events. Several major earthquakes have occurred in the region in recent centuries, the most recent being one in 1950, with its epicentre in Assam. These have caused subsidence and increased sediment loads in the rivers, both of which have in turn altered the energy and channels of the major rivers. Deforestation and bad agricultural practice in the catchment areas of the Ganges, Brahmaputra and Meghna, in India and Nepal, are also widely believed

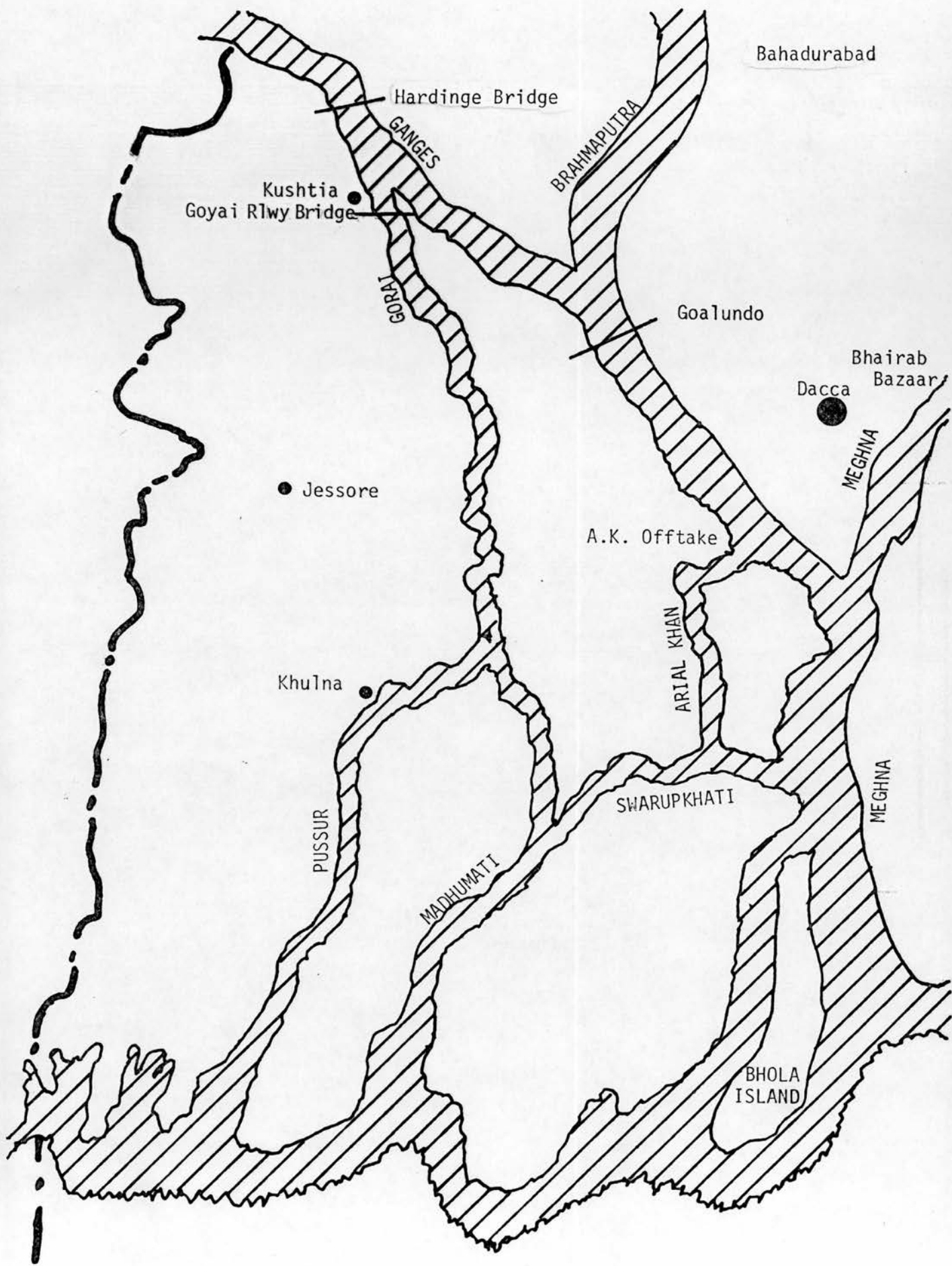
to have changed the ratios of maximum to minimum flow in these rivers and increased their sediment loads. Decreased forest area may indeed have reduced groundwater storage and percolation in the basins, and may have led to increased flooding and decreased dry season flows (5).

In these unstable circumstances the relationship between the flow in the River Ganges and the flow in its two major distributaries may not be direct. As can be seen from Figure 10.1, the flow in the River Arial Khan will also be influenced by the quantity of water brought down by the Brahmaputra. In the case of the Gorai-Madhumati, the discharge in its upper reaches, the Gorai, is influenced by the movement of the channel of the River Ganges near Kushtia and the extent to which the offtake of the Gorai is blocked by sand banks.

In some periods there has been almost no flow in the Gorai because the offtake has been blocked. One East Pakistan Government publication records negligible flows in the river in the first five months of 1951 and again in the first months of 1954 (6). This information is confirmed by Special Studies, where it is recorded that at different times an average monthly discharge of less than 1,000 cusecs has been recorded for all months between December and May (7). This natural variation complicates the assessment of the effects of human intervention.

#### The effect of the Farakka diversions on river flows

Measurement of the flow in a large river with a variable cross-section is somewhat problematic. The beds of the Ganges, Brahmaputra and Megha are of fine sand which is scoured deeper every monsoon and then re-created with a new formation during the next dry season. The quantity of flow is calculated from a measurement of the cross sectional area at a given point multiplied by the average velocity of the water at that point. In order to simplify these measurements, they are, preferably, made at points where the river banks are stable. For the Ganges in Bangladesh the longest series of discharge measurements have been made at the Hardinge (or Sara) Bridge near



South West Bangladesh: Major rivers and discharge measurement stations.  
Figure 10.1.



Kushtia. Here records have been kept since 1933.

For the Gorai River a similar set of records (starting in 1947) exist for the discharge at the Gorai Railway Bridge, also near Kushtia. On other rivers records have been accumulated at a railway bridge (at Bhairab Bazaar) on the Meghna, at a ferry crossing (Bahadurabad) on the Brahmaputra, at the offtake from the combined Ganges-Brahmaputra for the Arial Khan and at the Baruria-Goalundo transit of the combined Ganges-Brahmaputra. These stations are indicated on Figure 10.1.

The complete records of measurements at these different stations are not available but Special Studies provides the information in a partially processed form. The discharges during the two years of maximum diversions and, for comparison, the prior monthly averages, monthly maxima and monthly minima are given. These figures are reproduced here in Tables 10.1 to 10.6.

The Special Studies team were not given access to the records of withdrawals at Farakka. They were forced to deduce the magnitude of these withdrawals from the figures in Table 10.1.

A cursory comparison of the figures for the discharge at Hardinge Bridge shows that the flows in the dry season months (February, March, April and May) during the two years 1975-76 and 1976-77 depart from the historical pattern of discharge as indicated by the prior average monthly flows and the prior monthly minima. Table 10.7 provides a comparison between average flows (in ten-day periods), the average flows in the leanest 75% of years, and the average flows in 1975-76 and 1976-77. This confirms the departure from the norm of previous years and shows that during the March of 1976 and 1977 the flows in the Ganges were less than half the average flows recorded in the 75% of leanest years.

In order to make an estimate of the quantity of water diverted at Farakka, the Special Studies team developed a relationship for calculating the 'unimpaired discharge', the flow that would have been

Table 10.1: Comparison of average monthly discharge (in 1,000 cusecs) Ganges River at Hardinge Bridge

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AVERAGE
Prior average	71.4	75.5	153	628	1354	1259	611	248	?	111.0	97.2	83.4	403
1974-75	85.2	87.9	151	645	1606	1203	543	239	?	96.1	82.7	68.7	412
1975-76	66.2	60.4	123	1036	1556	1396	708	247	120	66.6	52.0	29.3	455
1976-77	25.7	46.6	156	527	1221	1594	462	163	86	50.3	38.9	32.2	366
Prior maximum	105.0	111.0	342	1045	1857	1979	1494	584	239	180.0	168.0	127.0	588
Prior minimum	44.5	49.4	82	344	782	726	284	151	101	72.7	67.1	53.1	271

Notes: 1,000 cusecs =  $28.32 \text{ m}^3/\text{s}$

? - indicates illegible digit or digits

Source: Tables 10.1 to 10.6 are from Special Studies, Table III-8.

Table 10.2: Comparison of average monthly discharges (in 1,000 cusecs) Gorai River at Gorai Railway Bridge

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AVERAGE
Prior average	5.79	7.24	21.8	87	155	144	83	32.7	17.1	11.18	8.48	6.30	49.2
1974-75	9.49	15.41	27.6	113	272	191	69	34	19.1	12.25	9.93	6.2	65.1
1975-76	5.07	6.55	18.0	139	187	171	90	29	8.5	3.27	1.75	0.1	54.9
1976-77	0.01	1.99	20.6	78	149	175	62	21	10.9	6.16	4.04	3.0	44.3
Prior maximum	10.90	21.40	39.6	139	272	222	166	68.7	37.5	29.0	21.3	14.4	72.9
Prior minimum	0	0	7.9	54	88	104	37	5.1	0.4	0.06	0.03	0	26.9

Note: 1,000 cusecs = 28.32 m<sup>3</sup>/sec

Table 10.3: Comparison of average monthly discharges (in 1,000 cusecs) Padma River (Ganges and Brahmaputra) at Goalundo-Baruria transit

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AVERAGE
Prior average	291	524	1160	1977	2462	2159	1366	567	359	258	223	220	950
1974-75	319	703	1247	2566	3619	2925	1516	667	388	268	233	219	1221
1975-76	352	544	1020	2421	2895	2674	1545	652	363	238	195	202	?
1976-77	263	437	1007	1227	2445	2408	1028	519	355	258	226	229	?
Prior maximum	339	745	1417	2303	2994	2488	1841	834	448	303	235	248	1115
Prior minimum	250	412	935	1786	2009	1655	947	462	323	229	211	203	869

Note: 1,000 cusecs =  $28.32 \text{ m}^3/\text{s}$

? - indicates illegible digit or digits

Table 10.4: Comparison of average monthly discharges (in 1,000 cusecs) Brahmaputra river at Bahadurabad

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AVERAGE
Prior average	226	481	1063	1521	1515	1216	791	356	226	163	144	157	667
1974-75	239	607	1090	1984	1729	1711	916	330	195	138	120	133	766
1975-76	251	384	866	1518	1393	1307	956	406	245	177	148	183	653
1976-77	280	439	1046	1623	1346	947	590	322	249	175	145	203	613
Prior maximum	341	849	1365	1811	2022	1816	140	529	331	233	195	228	804
Prior minimum	182	282	636	1128	970	780	477	249	180	122	117	121	530

Note: 1,000 cusecs = 28.32 m<sup>3</sup>/s

Table 10.5: Comparison of average monthly discharges (in 1,000 cusecs) Arial Khan River at its offtake

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AVERAGE
Prior average	3.55	7.81	21.3	41.1	57.1	46.8	23.4	7.83	4.26	2.60	1.94	2.29	17.8
1974-75	4.64	12.26	21.3	50.2	85.0	57.0	24.7	9.65	3.80	2.04	1.88	1.97	22.9
1975-76	3.66	7.18	15.2	38.0	49.1	42.2	23.9	8.36	1.18	2.52	0.18	0.27	15.9
1976-77	1.25	4.88	21.6	43.8	48.6	42.3	14.5	4.54	1.88	0.56	0.47	0.53	15.4
Prior maximum	6.77	12.90	28.8	57.7	100.0	75.7	37.1	13.60	7.80	4.70	3.38	3.80	24.9
Prior minimum	1.04	4.28	16.0	30.4	32.9	28.2	14.5	5.12	2.51	1.09	0.68	0.86	12.2

Note: 1,000 cusecs = 28.32 m<sup>3</sup>/s

Table 10.6: Comparison of monthly average discharge (in 1,000 cusecs) Meghna river at Bhairab Bazaar

	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	AVERAGE
Prior average			157	313	343	295	240						
1974-75			274	458	572	451	354						
1975-76	tidal		133	277	452	398	285			tidal			
1976-77			239	550	541	352	196						
Prior maximum			290	455	452	472	328						
Prior minimum			119	200	236	226	150						

Note: 1,000 cusecs = 28.32 m<sup>3</sup>/s

Source: Tables 10.1 to 10.6 are from Special Studies, Table III-8

Table 10.7: Comparison of ten-day flows at Hardinge Bridge before and after diversions (discharges in 1,000 cusecs).

Month and Period	Average flow 1934-1973	75% dry year flow	Flow during 1975-1976	Flow during 1976-1977
Nov I	309	213	317	197
II	242	186	241	197
III	201	156	181	127
Dec I	171	135	141	101
II	146	119	124	86.5
III	129	104	100	74
Jan I	108	88	77.6	50.7
II	101	83.7	65.8	49.1
III	95	80.9	57.3	45.9
Feb I	91.7	79.5	55.3	41.5
II	89.1	76.2	52.9	36.4
III	85.4	75.1	47.1	34.6
Mar I	81.7	73.2	35.3	31.9
II	78.1	69.1	28.7	30
III	75	67	24.5	30.4

Source: Table III-10, Special Studies



recorded at Hardinge Bridge if no water had been diverted at Farakka. These flows were calculated from an equation of the following form:

$$Q_1 = aQ_0^b$$

Where  $Q_1$  is the average monthly discharge to be established,  $Q_0$  is the average monthly discharge for the previous month, and a and b are constants.

Using this method, correlations between preceding and following monthly flows produced correlation coefficients in the range 0.81 to 0.95 (8). With these parameters the figures in Table 10.8 were calculated and estimates of the Farakka diversions made. (These estimates are shown graphically in Figure 10.2).

These estimates of the Farakka diversions may be conservative. They can be compared with the statement of the spokesman for the Ministry of External Affairs of the Government of India (9), to the effect that up to February 1976 diversions of the order of 40,000 cusecs had been taking place.

In order to be able to assess the likelihood of the flows recorded in 1975-76 and 1976-77 occurring naturally, the Special Studies team fitted a distribution curve to the recorded discharges prior to 1975. From this the minimum flows for probabilities ranging from 50% to 2% were calculated, as shown in Table 10.9. If the conditions which gave rise to the discharges on record are representative of conditions likely to be found in the future, then a minimum flow in the Ganges of 41,000 cusecs is likely to occur only in two years out of every hundred. In April 1976 a discharge of 25,700 cusecs was recorded. This is a very strong indication that the flow was being influenced by an unnatural intervention in the river system. Only by the postulation of the most exceptional circumstances can that intervention be identified as anything other than the diversions at Farakka.

One criticism of the Special Studies method has been mentioned in note (8). An additional criticism can be made. There is an implicit assumption that the discharge data for the Ganges at Hardinge Bridge

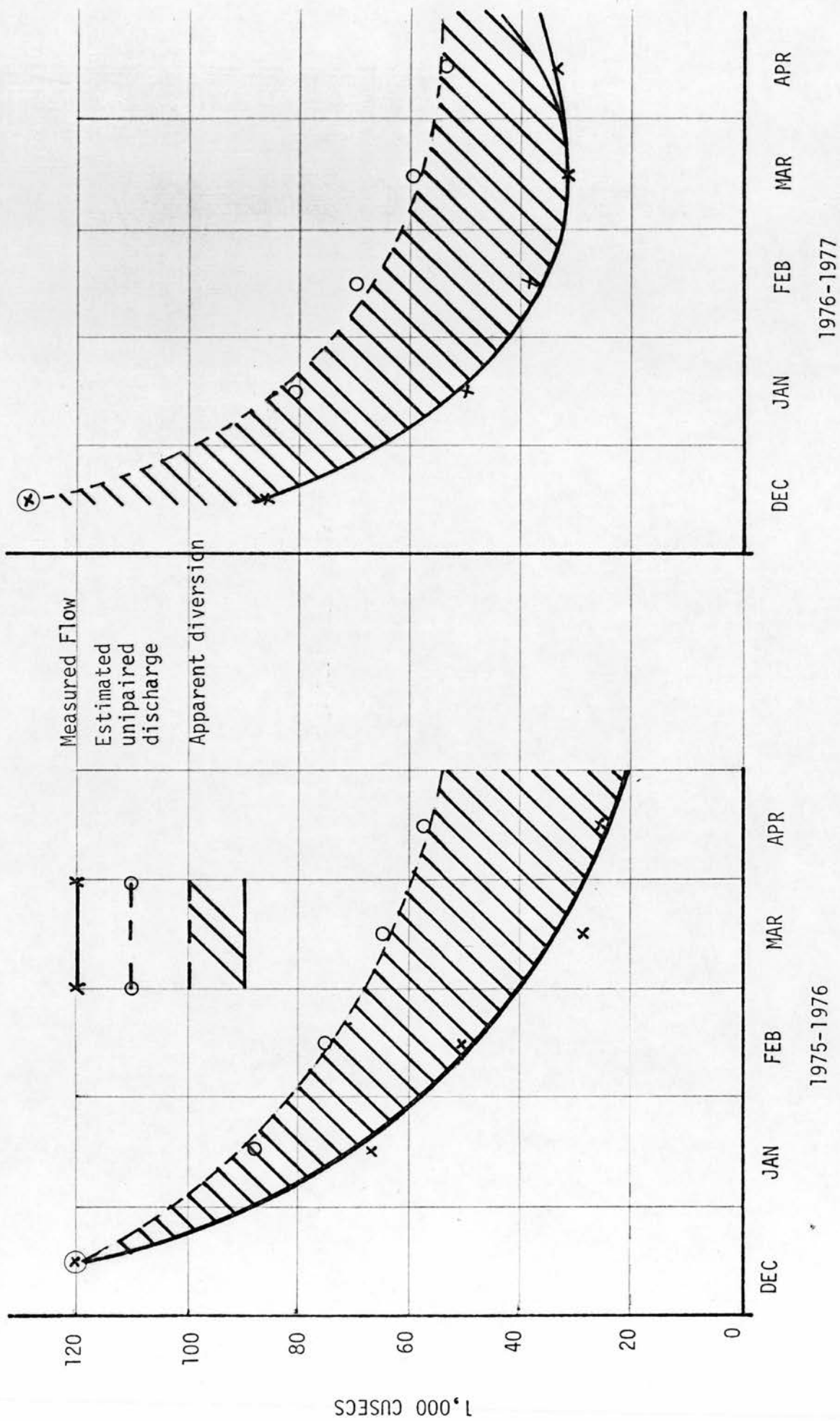


Figure 10.2. Estimate of the Effect of diversions on the Ganges discharge at Hardinge Bridge.

Table 10.8 Estimate of diversions (1,000 cusecs)

		DEC	JAN	FEB	MAR	APR
1975-76	Unimpaired discharge	120	88	75	65	58
	Impaired discharge	120	67	52	29	26
	Estimated diversion	0	21	24	36	32
1976-77	Unimpaired discharge	129	81	70	60	54
	Impaired discharge	86	50	39	32	34
	Estimated diversion	23	31	31	28	22

Source: Table III-10, Special Studies

Table 10.9: Frequencies of low flow occurrence at various stations (flows in 1,000 cusecs)

Station	Annual recurrence probability in percent				
	50	20	10	4	2
	Minimum annual flow				
Hardinge Bridge	62	52	48	44	41
Gorai Railway Bridge	1.7	0.4	-	-	-
Kamarkhali	2.3	1.2	-	-	-
Bahadurabad	132	116	110	102	-

Source: Table III-23, Special Studies

varies in an effectively random manner - in other words, that no progressive change is to be expected in the series of discharge figures. This assumption is inadequate. Two developments can be expected to introduce progressive change into the discharge data. Irrigation and other withdrawals of water must be systematically reducing the lean season flow in the Ganges. Also, as mentioned earlier, deforestation of large parts of the basin can be expected to have a significant influence on the low flows. Adequate data for assessing this trend ~~are~~ not available, but such data as ~~are~~ available indicates no discernible tendency for the low season discharge to decrease over time (see Table 10.10).

The two other sources of water in the Ganges flow at Hardinge Bridge - rainfall and groundwater recharge - may be safely ignored. Any groundwater recharge will have tended to reduce the Special Studies estimate of diversions, so making them more conservative, and rainfall in the first four months of 1976 and 1977 was not abnormal (10) so it is unlikely to have introduced a significant error.

If these estimates of the Farakka diversions are, as they appear to be, reasonable estimates, it may be concluded that during the months of February, March and April of 1976 and 1977 between 32% and 55% of the flow which could have been expected to pass under Hardinge Bridge did not do so. On average the Ganges flow was reduced by 45% for these months.

The records of discharge for the Gorai River are summarised in Table 10.2. In the years 1975-76 and 1976-77 the flow past Gorai Railway Bridge during the months from November to June is consistently below the average for those months. In the months February to May of 1976, the average flow is only 14% of the average previously recorded at that site. Nevertheless, none of the discharges recorded in Table 10.2 for the years 1975-76 and 1976-77 are below minima previously recorded.

The low flows recorded in the Gorai River during the years 1975-76 and 1976-77 cannot be so conclusively blamed on the Farakka diversions.

Table 10.10: Trend in low flows at Hardinge Bridge

Years	Average of discharge in April (in 1,000 cusecs)
1934-1943	65
1944-1953	70
1954-1963	82
1964-1973	69
	—
1934-73	71

Source: Table A III-8, EPWAPDA, Master Plan, Supplement A; with 1964-1973 average deduced from the overall average given in Table III-8 of Special Studies

As has been explained above, in some years natural events result in low flows in the Gorai. This is reflected in the figures in Table 10.9 which show that in one year in ten small flows could be expected at Gorai Railway Bridge and at Kamarkhali. This is a relatively frequent event, so the suspicion that flows as low as those recorded in the Gorai in the two years 1975-76 and 1976-77 might have occurred naturally cannot be completely dispelled. The likelihood of very low flows occurring naturally for the whole of two successive dry seasons was not apparently estimated by the Special Studies team. The fact that such low flows were recorded for the two years in question must increase the suspicion that the cause of the low flows was due to the Farakka diversions.

Table 10.11 (extracted from Table III.18 of Special Studies) shows the relative likelihood of low flows occurring naturally or as a result of different quantities of upstream withdrawal. Comparing the flows in the dry season months (January to April) of 1976 with the likely recurrences in this table, it can be estimated that these discharges would have occurred naturally once in twentyfive years, whereas with the Ganges flow reduced by 30,000 cusecs the discharges would have been expected between once in two years and once in five years for the January, February and April flows and once in ten years for the March flows. This procedure is open to criticism but it does again indicate that the Farakka withdrawals were the more likely cause for the 1975-76 and 1976-77 low flows in the Gorai than natural events.

The discharge of the Arial Khan River at its offtake is also below average in the dry seasons of the two years in question. It can be calculated from Table 10.5 that in the months January to March of 1976 the flow was only 43% of the previously recorded average and in 1977 it was only 23% of the average for these months. In the months of February and March of 1976 and January, February and March of 1977 the recorded discharge falls below the minimum previously recorded. The indications are that these unusually low flows may also be attributable to the reduction in the Ganges flows. The flow in the Brahmaputra for these months is generally above average, while the

Table 10.11: Discharge for various frequencies before and after upstream diversion (in 1,000 cusecs)  
Gorai river at Gorai Railway Bridge

Upstream diversion	January					February					March					April				
	Annual recurrence probabilities in percent					Annual recurrence probabilities in percent					Annual recurrence probabilities in percent					Annual recurrence probabilities in percent				
	50	20	10	4	2	50	20	10	4	2	50	20	10	4	2	50	20	10	4	2
0	9.5	4.6	3.1	2.4	1.5	7.2	3.4	2.2	1.6	-	5.3	1.8	0.92	-	-	4.4	1.3	0.6	-	-
10	7.7	3.4	1.9	1.4	0.72	5.6	2.3	1.3	0.93	-	3.9	1.2	0.54	-	-	3	0.77	0.32	-	-
20	6.6	2.6	1.4	0.9	0.43	4.2	1.4	0.74	0.47	-	2.6	0.6	0.25	-	-	1.7	0.34	-	-	-
30	5.6	1.6	0.52	0.26	-	3	0.82	0.37	0.22	-	1.6	0.26	-	-	-	0.9	-	-	-	-
40	3.7	0.56	-	-	-	2	0.36	-	-	-	0.76	-	-	-	-	0.25	-	-	-	-

Note: 1,000 cusecs = 28.32 m<sup>3</sup>/s

Source: Table III-18, Special Studies.



flow in the combined river (measured at the Baruria and Goalundo transit) from which the Arial Khan divides, is rather below average and in one month dips below the minimum previously recorded.

#### The effect of the Farakka diversions on groundwater in Bangladesh

It has been shown that the flow in the River Ganges in Bangladesh was significantly affected by Farakka withdrawals during the months of February, March and April of 1976 and 1977 and that the flow in the River Gorai was probably also affected. In turn, these changes in surface water flows will have had some effect on the level of groundwater in adjacent areas of Bangladesh but it is difficult to establish the size of this effect.

Figure 10.3 is an idealised section showing the sorts of water conditions which prevail below the ground's surface. An aquifer receives water both from rainfall and from surface water, rivers and ponds. Groundwater is extracted from an aquifer through wells, it flows out into the sea and it may flow into rivers and ponds. In a flat region like the Ganges delta, rivers may be effluent during the dry season - that is, they will receive water from adjacent aquifers - and the same rivers may be influent during the following wet season - that is, they may contribute water to recharge adjacent aquifers. A river will receive groundwater if the adjacent water table is higher than the water level in the river, and vice versa. These flows will be large or small and the influence of reduced river discharges will be correspondingly extensive or localised according to the permeability of the soil constituting the aquifer (11).

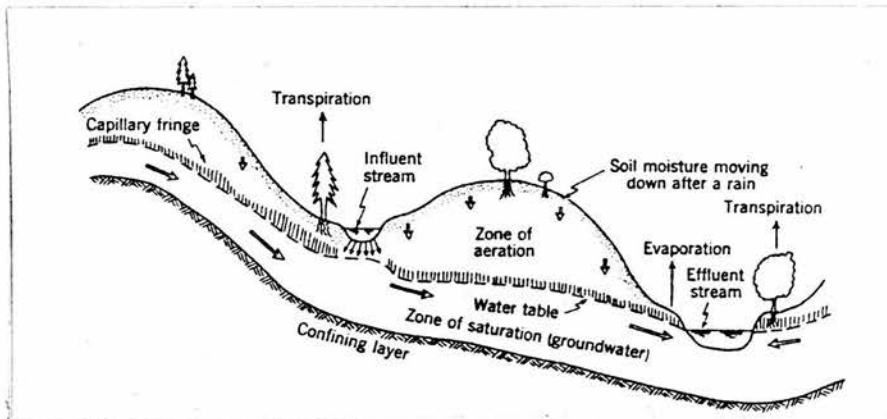
In their White Paper, the Bangladesh Government claimed:

'The hydraulic cycle of surface and ground water are interdependent. In 1976 the groundwater level in the highly affected area went down by 5 feet on average with a range of 3 to 8 feet below normal.'

(12)

The White Paper does not define the 'highly affected area', and the Government of India's publication, The Farakka Barrage, does not

Figure 10.3: Idealised section of land surface showing groundwater features.



Source: Linsley and Franzini, Water resources engineering, McGraw-Hill, Tokyo, 1972, p 83.

include a specific response to this claim.

The Special Studies report does not support the sweeping generalisation of this Bangladesh allegation, nor the implication that reduced groundwater levels were due solely to the Indian withdrawals.

Surface and ground water levels are inter-related but to say that they are interdependent is to substitute a simple, direct relationship for a complex one in which other variables, like precipitation and permeability, are generally present (13).

Special Studies does record that:

'Groundwater conditions during recent dry seasons differ from conditions that existed during the dry seasons prior to 1975. Reported changes include lower water levels in wells, increased pumping lifts, dry wells, reduced groundwater yields and increased salinity.'

'The water levels during the dry season of 1976 were at the lowest level ever recorded in many of the wells in the Study Area.'

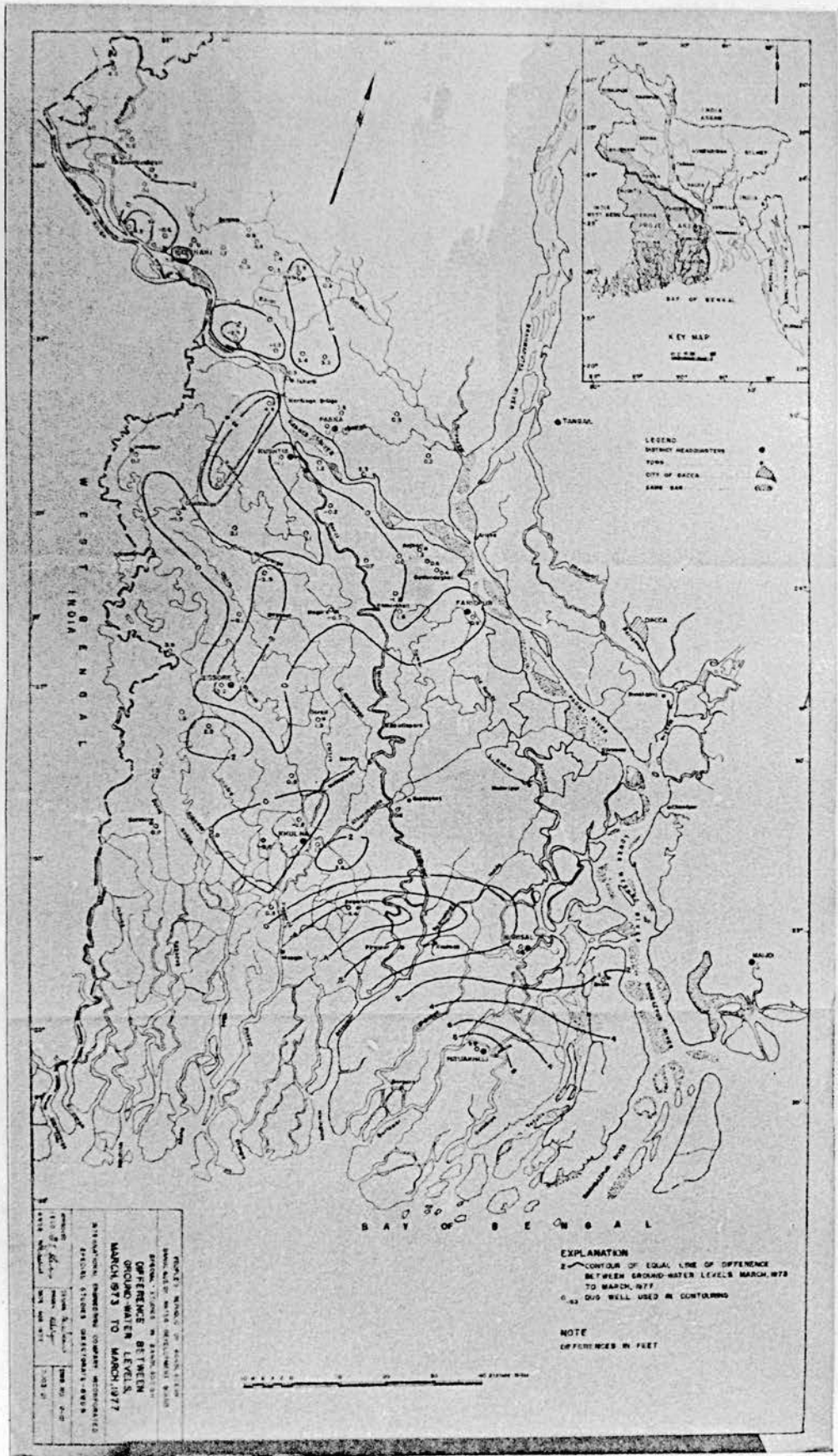
(14)

Figure 10.4 shows the differences in groundwater levels between the 1973 and 1977 dry season. These differences are substantial and Special Studies notes circumstances which made the impact of the differences devastating for users of suction pumps, which are used for the majority of wells. Suction pumps can only operate to water depths of 25-29 feet. The depths to the water table in many wells, particularly along the Ganges and Gorai are normally about 25 feet. Many of those pumps were reported inoperable during the 1975-76 dry season (15).

Three possible causes of lower groundwater levels are listed in Special Studies:

- o increased groundwater pumping for irrigation.
- o meteorological conditions, reduced rainfall combined with increased pumping to meet the shortfall.
- o upstream diversion reducing the recharge from the rivers.

Figure 10.4: Differences in groundwater levels between March 1973 and March 1977.



Source: IECO, Special Studies, Figure V-10.

In an attempt to quantify the effect of upstream diversion, the Special Studies team tried to establish relationships between rainfall, river levels and groundwater level for a number of wells for which records were available. Of the fifteen wells for which hydrographs are given, in only five cases does the level in the adjacent river appear to be the determining factor. In the other ten cases the water levels 'appear to be affected more by direct precipitation than by stream flow'. Some wells up to 1.5 miles from rivers show a good correlation between the river level and groundwater level but, the Special Studies team note, 'the effect greatly diminishes with distance from the river' (16).

Using an equation developed by Feris (17), the team calculated that the effect of annual water level fluctuations on groundwater level are reduced to 83% at 1 mile, 41% at 10 miles and 16% at 20 miles. The effect would be less in a confined or partially confined aquifer. The geology of South West Bangladesh indicates that much of the groundwater is stored in sandy aquifers partially confined by lenses of silt.

Therefore, Special Studies concludes that there have been significant changes in the groundwater levels in the years in question and that those changes have had acute consequences for many people living in South West Bangladesh. The causes of the changes are, however, difficult to establish accurately, and the blame cannot be laid wholly or even primarily on the Farakka diversions.

#### The effect of the Farakka diversions on river morphology

Major structures introduced by man into a river channel generally alter the relationship of forces present in the river. That alteration may significantly influence the river's action on the surrounding countryside.

As has been explained earlier in this chapter, the major rivers in Bangladesh have increased sediment loads as a result of recent seismic and human activity. The mechanism of sediment transport and deposition in these rivers has been only superficially studied and is

ill-understood. The Brahmaputra is a river with a braided channel and it regularly and sometimes dramatically moves the course of its main channel. The River Ganges is somewhat more stable but it, too, has a channel which changes its cross section and plan every year (18).

Undoubtedly, the construction of a massive barrage across the River Ganges at Farakka will have altered the way in which the development of the river takes place (19). In general, a dam across a river would be expected to intercept a large proportion of the sediment carried by that river. The river may then, with energy released from sediment transportation, erode its channel downstream of the dam. A barrage presents a different case because the flow is only partially intercepted and the capacity of the pond upstream of the barrage to store sediment is likely to be small compared with the annual sediment load of the river.

The Farakka Barrage includes several high velocity sluices, known as silt excluders, which are intended to allow silt to flow down the Ganges. The barrage was designed so that silt-free water would be diverted down the Bhagirathi-Hooghly and the sediment load of the Ganges would be carried by the remaining flow in that river on to Bangladesh and the sea. It might be reasonably expected, in that case, that increased sediment deposition will occur downstream of the Barrage and hence, perhaps, that the river bed will rise and the river will be more prone to spill over its banks. These effects may, however, be small. The sediment load of the Ganges is relatively small during the dry season and, during the four months of high flow, when 95% of the sediment is carried (20), the change of the discharge of the river induced by the Farakka Barrage will be slight.

The effects of the Farakka diversions on river morphology inside Bangladesh have not been emphasised by the Government of Bangladesh. Nevertheless, a chapter of Special Studies is devoted to analysis of this effect.

The following 'possible responses' to upstream diversion are identified:

- o lower water levels (stages) during low flow and marginally lower stages during high flow.
- o reduced capacity to transport sediment during the low flow season, partly offset by storage of sediment upstream.
- o increased potential for bank erosion during the low flow season.
- o increase of the lateral shifting of the main channel of the river.
- o possible release of sediment waves when the gates of the barrage are opened to pass flood flows.
- o adverse effect of water level and entrance conditions at spill channels (river offtakes).
- o reduced depth of flow in pools and crossings affecting navigation during low flow season.

The Special Studies team conclude that although these effects may be significant, they are, with the exception of lower water levels, almost impossible to evaluate.

In March 1976, the water level at Hardinge Bridge fell to an all time minimum of 16.5 feet. The previous minimum stage, in 56 years of records was 20.4 feet in April 1918 (21). Figure 10.5 (Figure IV-10 of Special Studies) shows that the river stages at Hardinge Bridge during the dry seasons of 1975-76 and 1976-77 fall well below the envelope bounded by the 10% and 90% annual recurrence probabilities.

After examination of similar low water stage frequency profiles for the other major rivers in South West Bangladesh, the Special Studies team conclude that the navigation depths of 1974-75, 1975-76 and 1976-77 'would have been rare occurrences during the pre-diversion regime' (22). (Consideration of the effect of lower water stages on navigation is given in a later chapter). The report also concludes that the changes in the River Ganges are likely to increase flooding and to have effects on the regime of the River Brahmaputra. However, no quantitative assessment of these effects is made.

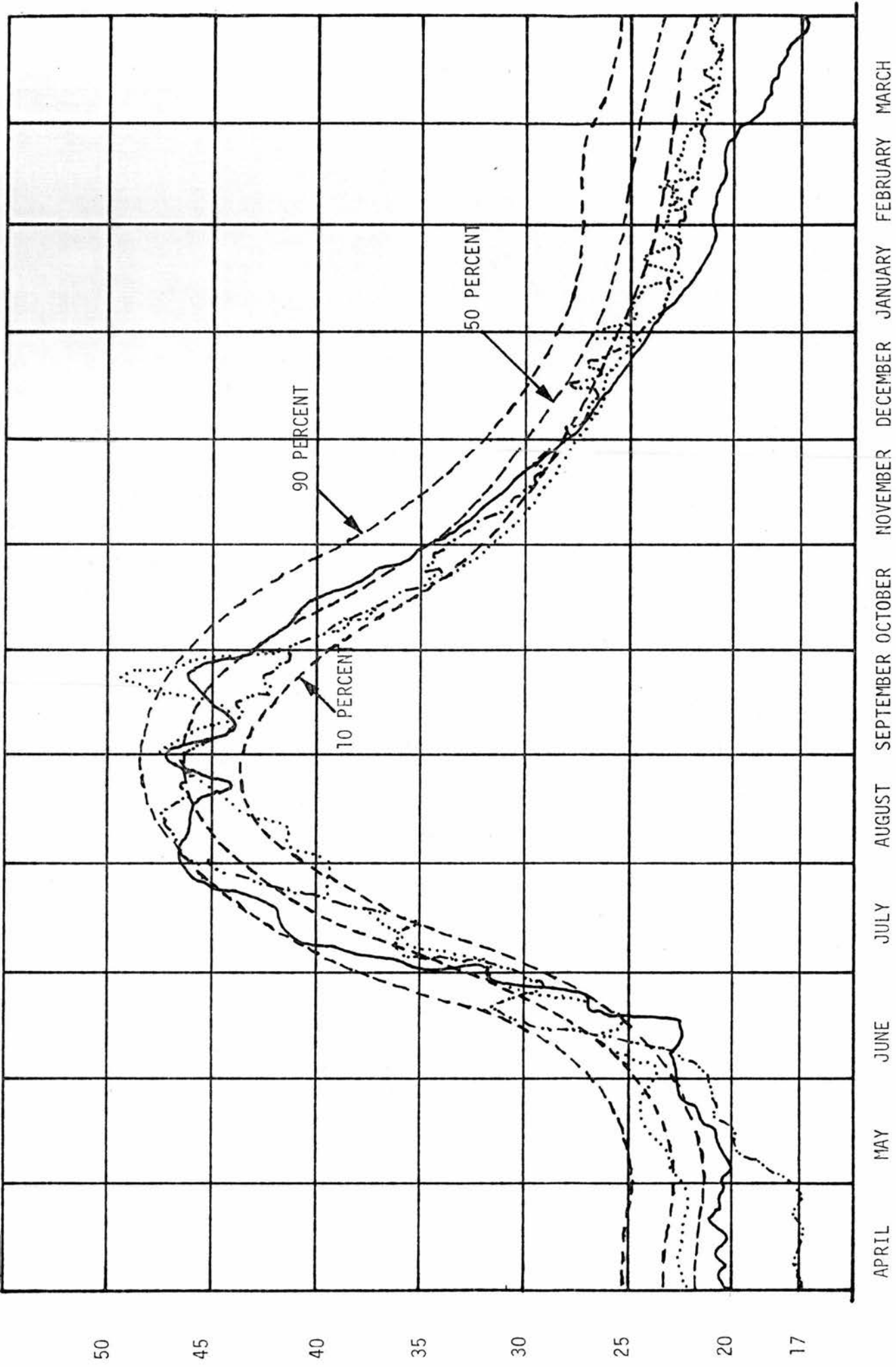


Figure 10.5 Water level of the River Ganges at Harding Bridge with annual recurrence probabilities.

Source: Special Studies, Fig IV-10



## CONCLUSIONS

Special Studies provides adequate data for an assessment of the hydraulic consequences of the operation of the Farakka Barrage. Three effects have been studied: (i) changes in the low flow of major rivers, (ii) changes in the depth of groundwater, and (iii) changes in river morphology.

The main rivers in Bangladesh likely to have been influenced by changes in the flow of the Ganges at Farakka were the Ganges downstream of Farakka, the River Gorai-Madhumati and the River Arial Khan.

There can be little doubt that the Farakka diversions significantly reduced the flow in the Ganges at Hardinge Bridge. The unusually low flows observed in the dry seasons of 1976 and 1977 were low as a direct consequence of the Farakka diversions. If a minimum flow of 41,000 could normally be expected only in two years out of every hundred, then a flow of 26,000 cusecs (April 1976) is clearly an exceedingly rare event requiring explanation. The Farakka diversions provide that explanation. On average the Ganges flow was reduced by 50% in the driest months of March and April.

The lower flows recorded in the Gorai-Madhumati would normally have been expected once every ten years. The Bangladesh case is here complicated by the natural action of the River Ganges in occasionally silting up the channel supplying the Gorai River. However, the fact that low flows were recorded in both the years of high Farakka diversions increases the suspicion that these diversions were the cause of the reduced flows in the Gorai. The unprecedented low water levels in the Ganges are the most probable cause of the reduced Gorai flows. However such reductions have occurred naturally in the past.

The flow in the River Arial Khan may also have suffered from the Farakka diversions during the dry seasons of 1976 and 1977. This is, perhaps, surprising because the Arial Khan draws its water from the combined Brahmaputra and Ganges. A change in the flow in the Ganges

might have been expected to cause only a small change in the flow of the combined river and, therefore, have little effect on the Arial Khan. However, the change in the Ganges flow seems to have had a significant impact on the combined flow and, hence, may have caused the flow in the Arial Khan to dip below the minimum previously recorded.

The Bangladesh Government's sweeping allegation of large and widespread changes in groundwater levels, as a result of the Farakka diversions, is not supported by the evidence in Special Studies. Exceptionally low groundwater levels were recorded in 1976 but it is difficult to believe that they were caused by the Farakka diversions. The Special Studies team were able to demonstrate a conclusive relationship between river and groundwater levels only for wells within a few miles of a river. However, many suction pumps were already operating close to the 25-29 ft maximum depth for the operation of such pumps. They may, therefore, have been sensitive to quite small changes in the groundwater. Pumps within a few miles of the major rivers may have been affected by the Farakka diversions.

Further study would be required to identify the causes of the widespread, exceptionally low groundwater levels of 1976. Possibly long term changes in rainfall, flooding intensity and pumping rates were to blame.

The Farakka diversions were, similarly, only one factor amongst many influencing changes in river morphology in South West Bangladesh. Clearly river stages were affected but probably little else.

## Chapter Eleven

### SALINITY INTRUSION AND INDUSTRIAL DISRUPTION

The increased intrusion of sea water into the surface water of South West Bangladesh is one of the most substantial effects claimed by Bangladesh as a result of the Farakka withdrawals. It is also the basis for several other objections. Part of the case for the effect that diversion has had on agricultural production and all of the case for the effect that diversion has had on industrial production and forests, rest on the assertion that there was unusual change in the salinity of rivers and estuaries in South West Bangladesh.

Sea water travels up an estuary for two reasons. It is first of all carried inland, against the force of the river's fresh water flow, by the tides - but, even where tides are slight, there is a tendency for sea water to move upstream because it is more dense than fresh water. The extent of saline intrusion will therefore depend on the quantity and velocity of the fresh water travelling down the river, on the strengths of the tides at a given time and also on the turbulence of the river (if the saline and fresh waters are not 'well mixed', a wedge of saline water may intrude larger distances along the river bed with relatively fresh water flowing above it).

Salt concentration in water may be measured by chemical analysis in a laboratory, but it is most conveniently measured by measuring the electrical conductivity of the water. This conductivity is generally measured in reciprocal ohms (that is, siemens) at a standard temperature of 25 degrees centigrade. Special Studies expresses this unit as micromho. For simplicity and clarity this has been changed to microsiemens ( $\mu\text{S}$ ). Increased conductivity gives a consistent measure of increased salinity.

The limits of salinity above which water becomes unusable for a given purpose are these:

water for irrigating rice	2,000 $\mu S$ (1)
drinking water	750 $\mu S$ (2)
industrial water	depends on the process and equipment.

An estimate is made in this chapter of the salinity intrusion suffered in Bangladesh in 1976 and 1977 and the extent to which this can be attributed to Indian withdrawals of Ganges water at Farakka. It will be shown that exceptionally high salinity levels were observed in the rivers of South West Bangladesh. The Bangladesh Government blames these levels entirely upon Indian diversions. Evidence will be provided suggesting that some, but not all, of the exceptional salinity intrusion was caused by Indian withdrawals.

The Bangladesh Government also alleges that considerable damage was inflicted on industry as a result of salinity changes. The extent of this disruption is estimated.

#### THE BANGLADESH CLAIM

The Bangladesh Government's claim as to the extent of increased salinity is summarised in Figures 11.1 to 11.3, reproduced here from the government's Deadlock on the Ganges. In the text of the White Paper, the cause of the intrusion is explained as follows:

'The increased salinity is totally explicable in the light of the increased withdrawal of the Ganges water. A large part of the affected region is subject to the tides of the Bay of Bengal. Historically this saline intrusion was counteracted by the upland flows. Quite logically, with a decrease in the upland flows the salinity has increased and advanced for distances inland.'

(3)

This short paragraph is the substance of the Bangladesh case on salinity and it contains one considerable assertion. Although the wording of the first sentence is somewhat inexact, the reader is left in little doubt that any increased salinity (greater than the range experienced in 'normal' years) is due to the reduction in the Ganges flow.

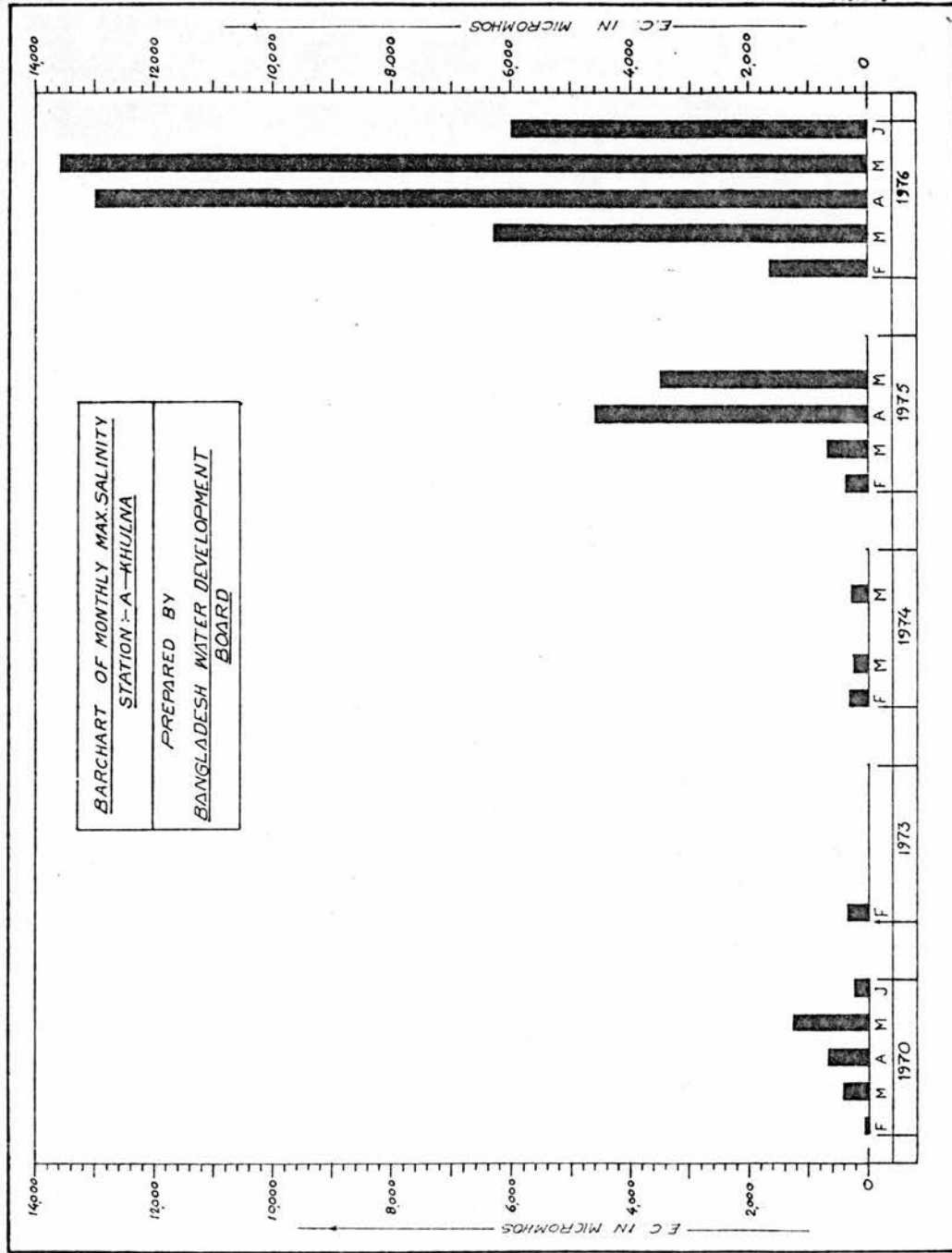
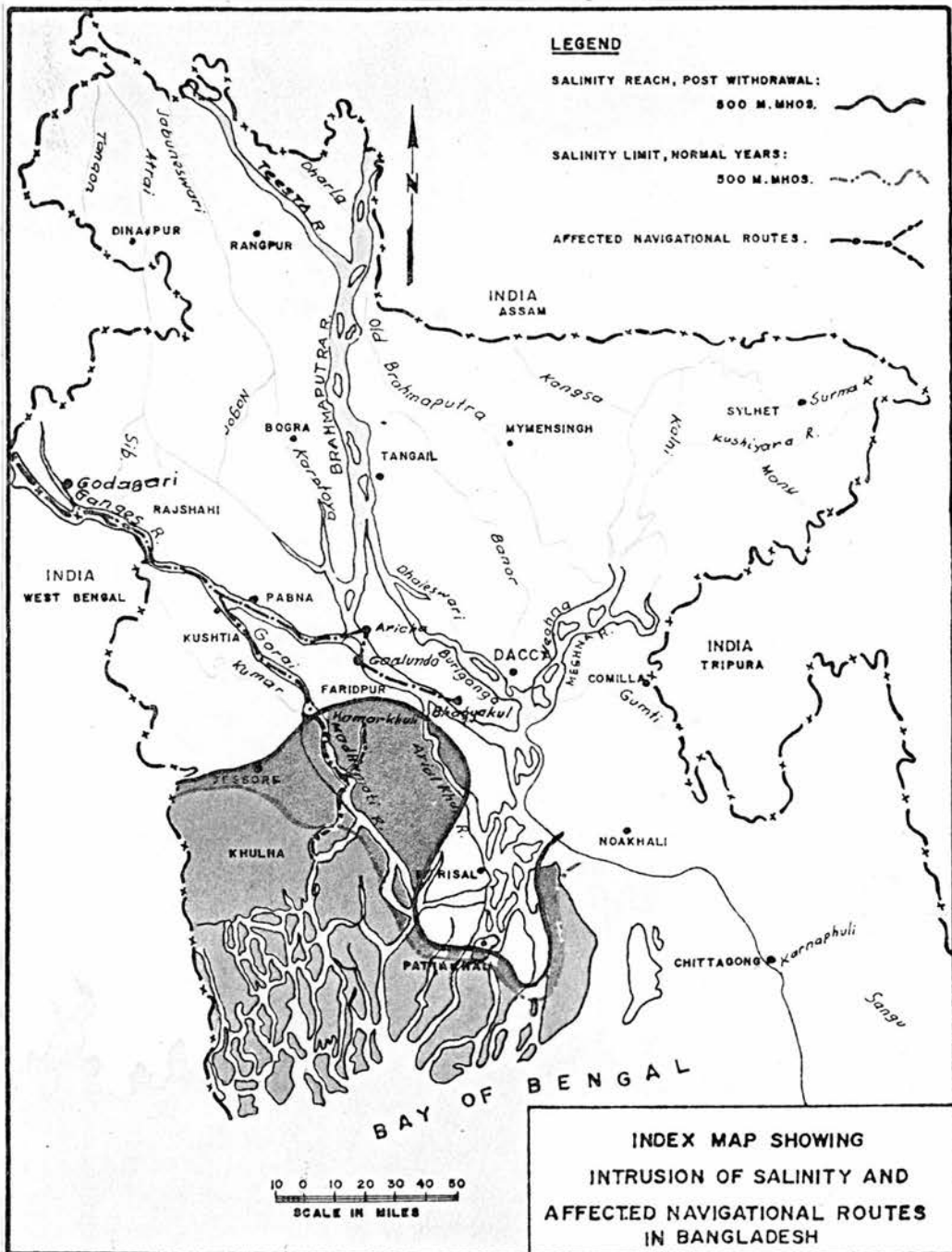


Figure 11.1: Bar Chart of maximum monthly salinity in River Bhairab, Khulna, Bangladesh.

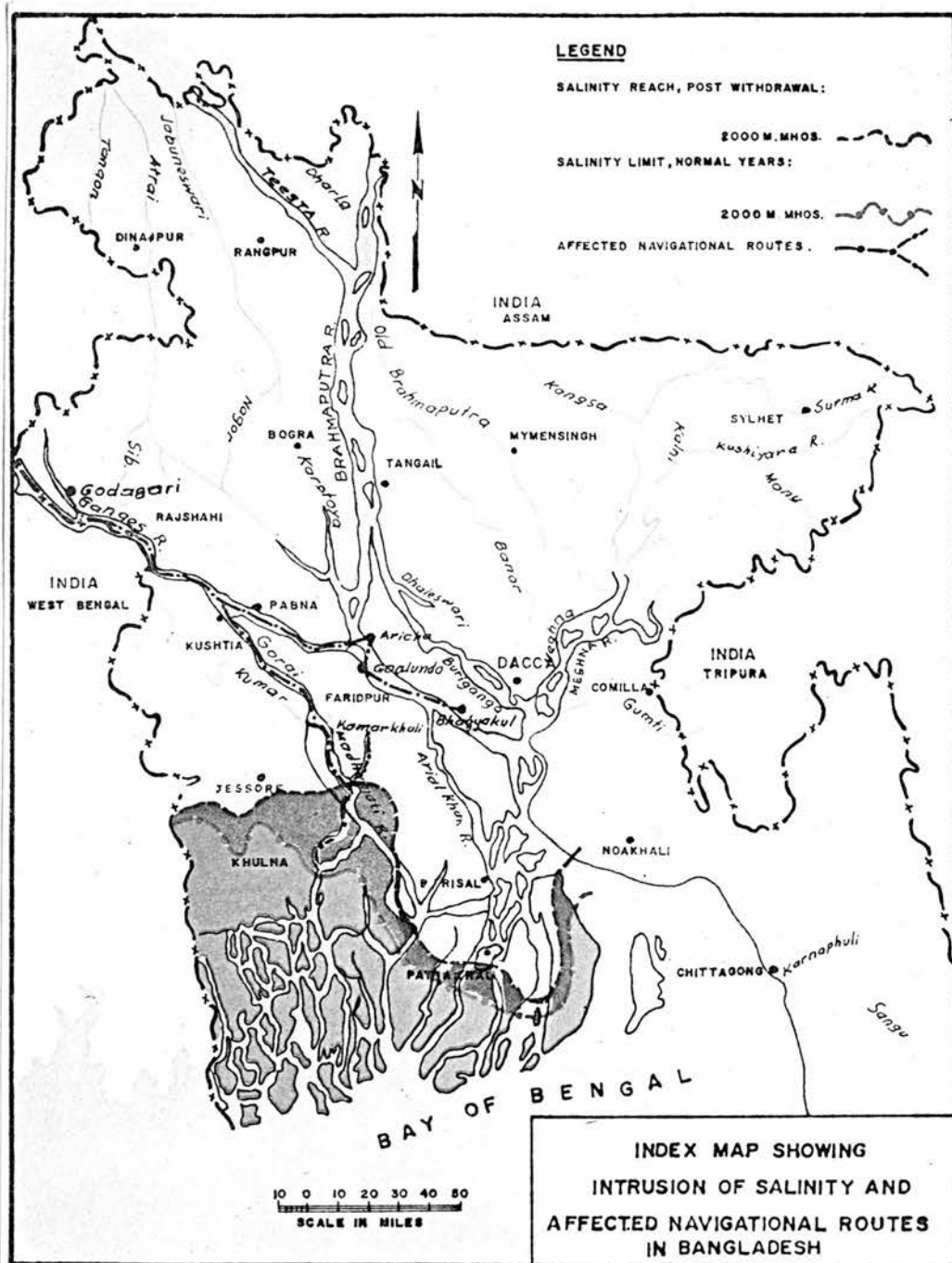
Source: Bangladesh, Deadlock on the Ganges, Dacca, 1976.

Figure 11.2: Salinity intrusion in 1976 (500  $\mu$ S contour).



Source: Bangladesh, Deadlock on the Ganges, Dacca, 1976.

Figure 11.3: Salinity intrusion in 1976 (2000  $\mu$ S contour).



Source: Bangladesh, Deadlock on the Ganges, Dacca, 1976.

## THE INDIAN RESPONSE

The response by India is rather longer:

'Indian experts who visited Bangladesh recently found that the problem of salinity had been exaggerated out of all proportions. According to technical studies carried out by experts, including those of the World Bank, the withdrawals at Farakka should not affect salinity in the Meghna estuary and Khulna area, where increased intrusion of salinity is alleged to have taken place.

'The World Bank study stated that no substantial adverse effects of salinity are likely to be felt in the lower Meghna region even if 100,000 cusecs of water are withdrawn from the major rivers out of the 250,000 cusecs or so available in the lean season.

'If a withdrawal of this order from the river systems of Bangladesh would cause no excessive salinity the withdrawal of 40,000 cusecs at Farakka would have practically no effect at all. The study also concluded that depletion of the low flow of the Ganga would not increase salinity in the Khulna region. The slight movements in the salinity margins there are associated with local runoffs and monsoon rainfall.

'The salinity problem in the areas allegedly affected is largely influenced by the penetration of saltwater from the sea. It should also be remembered that over a 1,000 million acre-feet of water drain into the Bay of Bengal from the river systems of Bangladesh and create a freshwater reservoir in the coastal areas which helps check penetration of seawater inland.'

(4)

The Indian Government has gathered, in this quotation, three observations in support of its position. They are, firstly, the observations of Indian experts; secondly, the predictions of 'independent' technical experts; and finally, a comment on the mechanism of saline intrusion. These observations are worthy of separate consideration.

First there is the visit of the Indian experts to Bangladesh. This reference is presumably to the May 1976 visit of an Indian technical team (there had been another visit in May 1975, but they only observed the effects of a diversion of 11,000 - 16,000 cusecs at Farakka). No report has been published showing the detailed findings of this team.



A short paragraph in The Hindu reported that the team had visited Khulna, Rajshahi and Bheramara (the site of the Ganges-Kobadek Project pumping station), and that the team had made a small step forward in their discussions with their counterparts in Bangladesh. This, then, is an example of a reference to observations which have not been published or recorded in any manner which would allow informed discussion. We do not know what was observed, nor the methods used.

Then there is reference to the conclusions of two or more studies carried out by experts. At least one of these was issued by the World Bank. This reference is also inadequate. If the Indian Government's draughtsmen had intended readers to be able to find the documents mentioned, they would, one imagines, have provided more information. Not even the subject matter of the reports in question is given.

Nevertheless, it is possible after a review of the literature to identify the reports they had in mind. It seems that the Indian Government was referring to a study (5) carried out by Harvard University's Center for Population Studies, and to the work of a World Bank (IBRD) team reported in the Bank's "Land and Water Resources Sector Study, Bangladesh" (6) (some of the Harvard work was also incorporated in this study).

The crucial fact that these two studies were predictions is not emphasised by the Indian Government pamphlet. The Harvard study reported an attempt to model (on a digital computer) the process of seawater intrusion into the river system of Bangladesh, whilst the World Bank study used an informed assessment of the situation (including, presumably, a knowledge of the Harvard conclusions) to judge the likely effects of reduced freshwater flow on the penetration of saline water. Neither study had the benefit of the observations of the actual effects of reduced Ganges flow, because both studies had been completed in 1972, three years before the first diversions at Farakka.

## SPECIAL STUDIES

The most substantial body of evidence which can be brought to bear on the question of the extent of salinity intrusion in 1976 and 1977 and on the extent to which this was caused by Indian withdrawal at Farakka, is contained in the Special Studies.

Chapter VI in Volume C is entitled 'Tidal hydraulics and saline intrusion'. It has this objective:

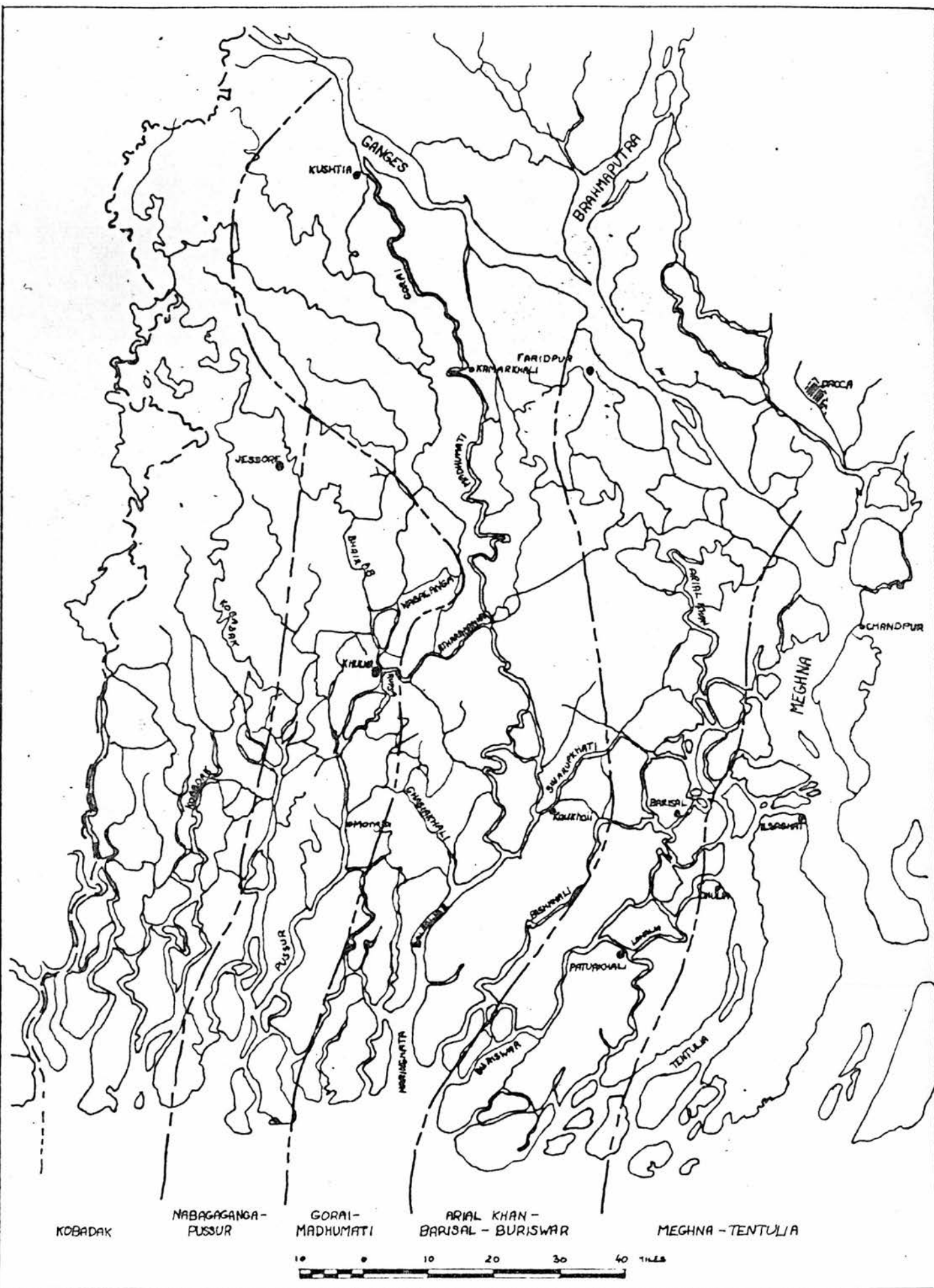
'...to assess the effects of upstream diversion on hydraulic parameters and saline intrusion in the Southwest region and to prepare a schedule of investigations required for future studies...' (7)

The Special Studies team carried out a systematic review of the methods being used in Bangladesh for observing salinity in the rivers. They collected historical and current measurements and analysed them in order to obtain the best assessments of the extent and causes of change. The 'Study Area' (the South West region of Bangladesh) was divided, for the purposes of their analysis, into five 'compartments', North-South strips of about 25 miles in width. The team thought that these strips 'could be considered somewhat independently' (8). (These divisions are marked on Figure 11.4.)

The basic method of the team was a comparison of the salinity intrusion in 1967-68 with the situation which occurred during 1976 and 1977 (see Table 11.1). The base year of 1967-68 was chosen because, 'the unimpaired dry season flows of these years were comparable and since better records were available for these years...' (9).

The conclusions which they drew from this analysis were these:

'The salinity pattern in the portion of the study area east of the Gorai-Madhumati rivers are largely independent of the flows in the Ganges and Gorai-Madhumati rivers. The reason for the rapid penetration and retreat of high salinity in the Shahbazpur-Tentulia estuaries such as occurred at Ilsaghat in 1976-77 was in conjunction with reduced flows in these estuaries. The reduction in flow in these two estuaries in 1976 and 1977 was aggravated by



KOBADAK

NABAGANGA -  
PUSSUR

GORAI -  
MADHUMATI

ARIAL KHAN -  
BARISAL - BURISWAR

MEGHNA - TENTULIA

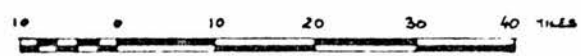


Figure ||.4 Compartments of South West Bangladesh for discussion of salinity intrusion.

Table 11.1: Comparison of maximum monthly salinities in 1968, 1976 and 1977

STATION	NUMBER	WATER YEAR	JAN	FEB	MARCH	APRIL	MAY	JUNE
Bagerhat	49	1968	-	2300	3850	6000	7000	1500
		1976	-	3000	6800	9000	9300	8100
		1977	2250	4800	10500	30000	7000	3300
Bardia	D/15	1968	-	-	-	-	-	-
		1975	-	-	-	-	-	-
		1976	-	460	880	2700	3500	500
		1977	440	480	480	420	380	410
Charfession	B/24	1976	-	15200	19000	-	-	-
		1977	-	28000	19000	18000	4000	-
Chandpur (Comilla)	-	1976	-	-	185	170	148	120
		1977	250	300	400	-	-	-
Deulatkhana	B/22	1967	-	2800	2425	2100	-	-
		1976	-	-	-	-	1300	-
		1977	-	2500	1000	650	-	-
Dumuria	K/12	1967	4000	4000	6500	8000	8000	17500
		1976	-	-	-	-	-	-
		1977	5600	3000	5200	6500	7500	-
Dasmonia	B/18	1967	220	-	350	500	-	135
		1976	-	710	2350	2350	410	170
		1977	245	240	790	1500	260	200
Golachipa	B/25	1967	500	270	700	350	235	400
		1976	-	-	-	1700	1600	300
		1977	420	440	890	2400	340	320
Hazimara Kobadak	26	1976	-	-	-	230	-	-
		1966	15000	15000	15000	32000	33000	-
		1977	17500	19900	28400	17900	-	-
Ilsaghat	B/21	1967	-	260	540	430	150	-
		1976	-	1500	2380	3400	185	220
		1977	-	1100	1750	3250	220	180
Khulna	A	1968	380	620	340	450	1000	150
		1976	364	1650	7200	13000	13600	6000
		1977	460	1950	4000	7950	1570	1000
Khepupara	B/10	1967	8000	-	-	-	-	-
		1977	11500	11500	22000	25500	13000	-
Mongla	22	1968	2300	3900	7500	11800	13500	9000
		1976	-	7100	12500	16500	18500	1700
		1977	5000	8000	11900	15600	-	-

Cont/d...

.../..

STATION	VOLUME	WATER YEAR	JAN	FEB	MARCH	APRIL	MAY	JUNE
Morrelgonj	33	1968	280	900	345	600	400	145
		1976	-	3000	4750	6500	8500	6000
		1977	2300	3750	7000	6000	4500	1700
Malianala	25	1968	-	2300	3850	6000	7000	1500
		1976	-	3000	6800	9000	9000	8100
		1977	2250	4800	10500	30000	7000	3300
Patherghata	B/5	1967	2000	2300	8000	6000	625	205
		1968	-	2300	3850	6000	7000	1500
		1977	2400	5000	12500	9800	3050	740
Rayenda	4	1968	308	350	425	360	260	155
		1976	-	570	2500	4700	740	950
		1977	550	825	2400	1750	1000	630
Tajumuddin	B/23	1967	-	8000	8000	8000	-	-
		1976	-	-	17500	17600	13100	7000
		1977	-	19500	22400	15500	2100	-

Source: Special Studies, Table VI-11 .

upstream diversion from the Ganges river.'

(10)

'The Pussur estuary to Khulna and beyond is completely dependent on fresh water from the Gorai-Madhumati to prevent saline intrusion into the Khulna area. This intrusion severely affects some 50 miles of channels of the Mongla, Daratana and Gasiakhali and even affects somewhat the Gorai-Madhumati at its intersection with the Daratana. These undesirable effects increase as fresh water flow in the Gorai is decreased...The steady state fresh water flow past Khulna that would be required to hold the salinity at Khulna below  $1,000 \mu\text{S}$  is probably something more than 3,000 cusecs but less than 7,000 cusecs. Therefore the high salinity intrusion at Khulna and on up to Bardia and into the Gorai-Madhumati above Kamarkhali in early 1976 and 1977 was the direct result of the decreased flows coming through the Gorai offtake from the Ganges at that time. The  $500 \mu\text{S}$  salinity intrusion front reached upstream past Bardia to 2 to 5 miles beyond Kamarkhali and for an undetermined distance downstream of Bardia in the Gorai-Madhumati.

'The lower Kobadak compartment is a pool of medium to high saline water in both the low flow and flood season. This condition is not related to any significant degree to changes in the low flow in the Ganges.'

(11)

These conclusions are a vindication of the more thoughtful Bangladesh claims on salinity intrusion. They do not support the impression given in much of the Bangladesh propaganda that the whole of South West Bangladesh has suffered severe salinity intrusion. Any changes in salinity intrusion in the Eastern half of the study area are not attributed primarily to the Indian withdrawals. Similarly, the Westernmost compartment is excluded. But, as shown in Figure 11.3, Bangladesh claimed only a small advance of salinity fronts in these areas. The central claim that a serious increase in salinity incursion occurred in the Pussur river and immediately adjacent estuaries is upheld.

#### The method used in the Special Studies investigation

Having established data for comparable years, the Special Studies team attempted to relate the flows in the different creeks, channels, rivers and estuaries, to the changes between the base year and the two years in which Ganges withdrawals were large (1976 and 1977). The team evidently did not consider that a contour map of the salinity

advance adequately reflected the processes involved. They included in their report figures which show the maximum saline penetration in individual years as statistics on the map of the study area (see Figure 11.5) but not contour maps. Instead of producing a graphical representation they described the processes involved in each compartment of the study area.

From these descriptions they were able to reject the influence of the Ganges withdrawals as an explanation of saline penetration in the two Easternmost and one Westernmost compartment.

They concluded that the Meghna-Tentulia compartment was dominated by the combined flows passing Chandpur. Although in April 1976 a salinity of  $4,000 \mu\text{S}$  was observed at Ilsaghat and high salinities in areas to the West of that point, the Ganges withdrawals could not be held to be the sole or major cause. In 1976, the flows passing Chandpur in February, March and April averaged 218,000 cusecs, 233,000 cusecs and 337,000 cusecs. These flows were less than the mean for these months but not less than the minimum recorded (12).

Similarly for the Tentulia estuary, they concluded, it 'appears to receive enough fresh water from the Meghna estuary to prevent severe intrusion of bay water up the estuary' (13).

In the next compartment (going West), the Arial Khan-Barisal-Burishwar compartment, the study team decided that fresh water from the Arial Khan (taking off from the combined discharge of the Brahmaputra and the Ganges) and fresh water from cross channels connecting the compartment with the Meghna and Tentulia estuaries were the main forces combating saline intrusion. Again such salinity as had been noticed in the compartment could not be blamed on reduced Ganges flows. The saline pocket which had been recorded at Patuakhali had apparently travelled across from Ilsaghat and down the Lohalia. (Figure 11.6 shows the directions of saline advance and fresh water flow, as indicated by the study team for 1976 conditions).

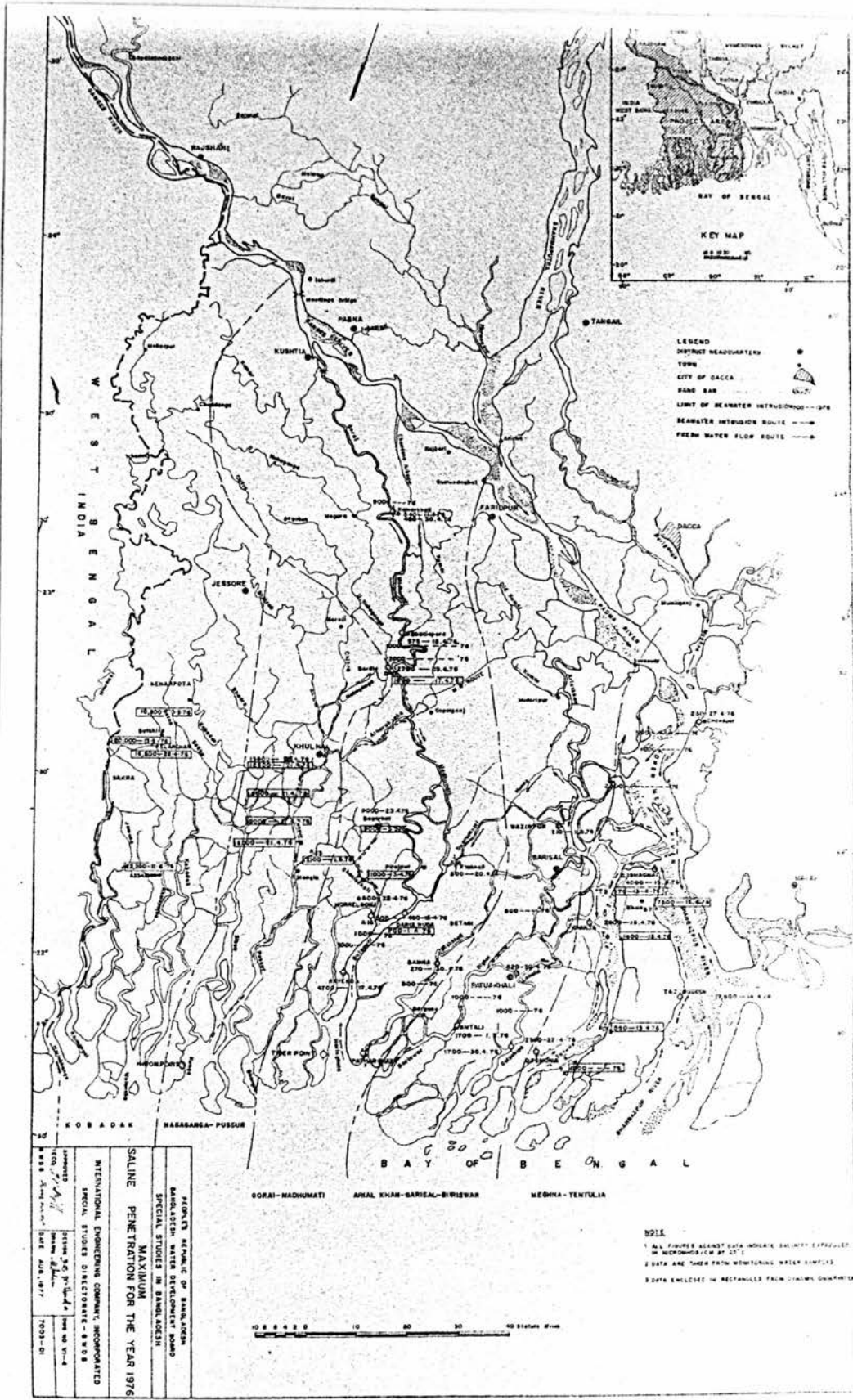


Figure 11.5: Maximum salinity levels recorded in Bangladesh in 1976.

Source: IECO, Special Studies, Drwg No VI-4.



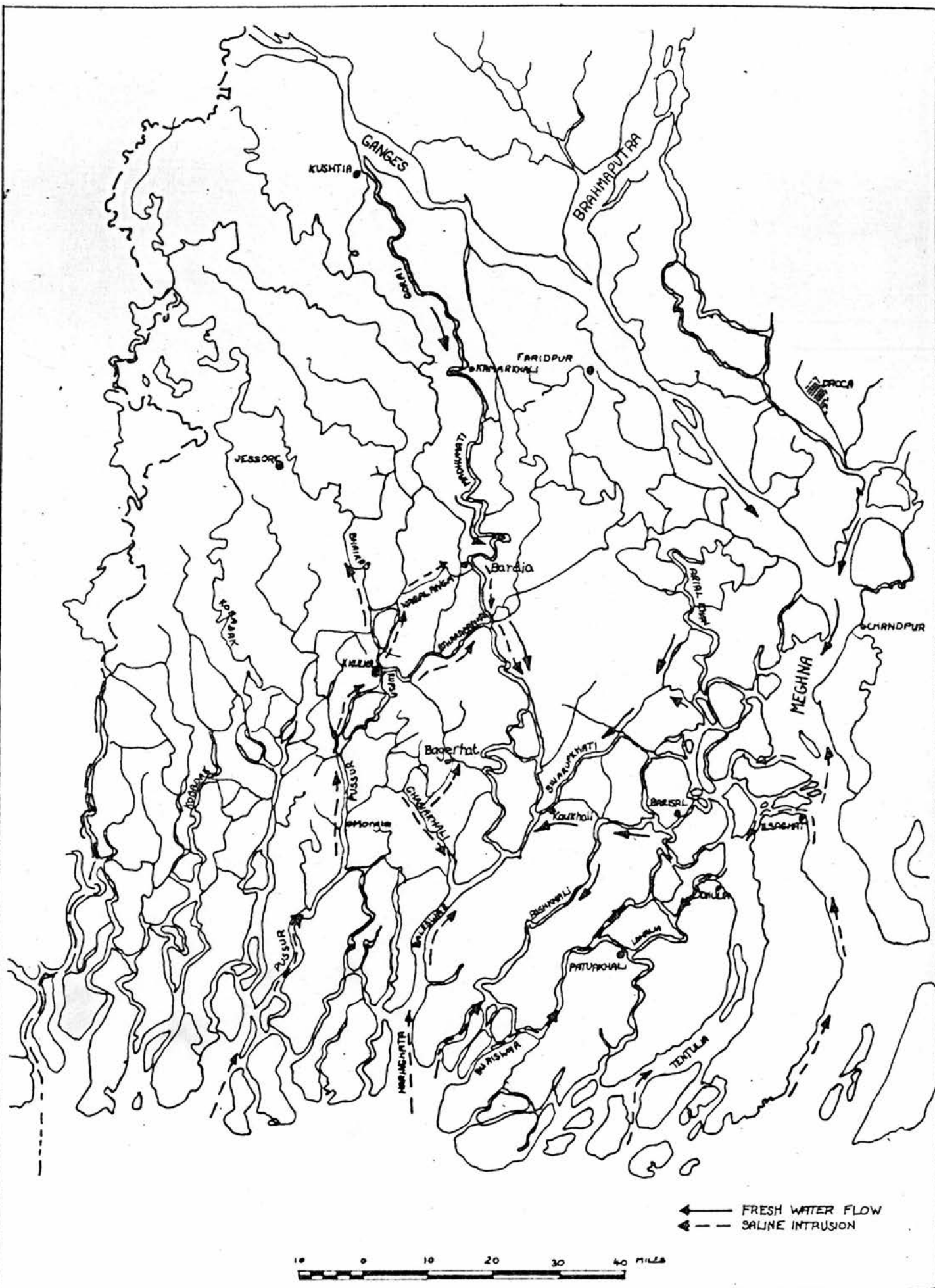


Figure 11.6 South West Bangladesh - Main directions of fresh water flow and saline advance in 1976 (from Special Studies Drwg No VII-4)

The relatively large cross flows in the channel passing Kawkhali (Kawkhali) were identified by the study team as one of the main factors limiting saline intrusion in the Arial Khan-Barisal-Burishwar compartment including the Balewar estuary (see Figure 11.7). They estimated dry season flows of the order of 26,000 cusecs past this point and commented: 'The importance of this flow past Kawkhali is shown by the fact that during the months of March and April, 1976 with essentially no flow down the Gorai-Madhumati, the Kawkhali flow prevented severe saline intrusion up the Baleswar-Madhumati to some extent' (14). The team concluded that in the low flow season the water flowing past Kawkhali is the dominant factor in the lower part of the Baleswar (that is, Gorai-Madhmati) and Bishkhali estuaries.

The Kobadak compartment is in the far West of the study area. The report concludes that, 'this compartment received almost no fresh water flow in the low flow season and only the local rainfall plus a limited flow from the Pussur in the wet season' (15).

These are the reasons the report gives for excluding the influence of Ganges withdrawals in those areas. The more important section of this chapter is the study team's evidence for the salinity intrusions up past the town of Khulna and the reason why they connect this to Ganges withdrawals.

The most dramatic saline intrusion during 1976 and 1977 occurred in the Pussur estuary and up the Rupsa-Pussur to the Nabaganga, the Atharabanka and the upper Gorai-Madhumati. It so happens that the second city of Bangladesh and its industrial centre, the town of Khulna, is situated by the Rupsa-Pussur. It is there that the increased salinity of the river water has been most pronounced and where the industry (and therefore the economy) of Bangladesh is least tolerant to such increased salinity.

The Special Studies team identified a quirk of nature which made the river beside Khulna particularly sensitive to changes in the flow of the Gorai-Madhumati, and hence sensitive to changes in the flow

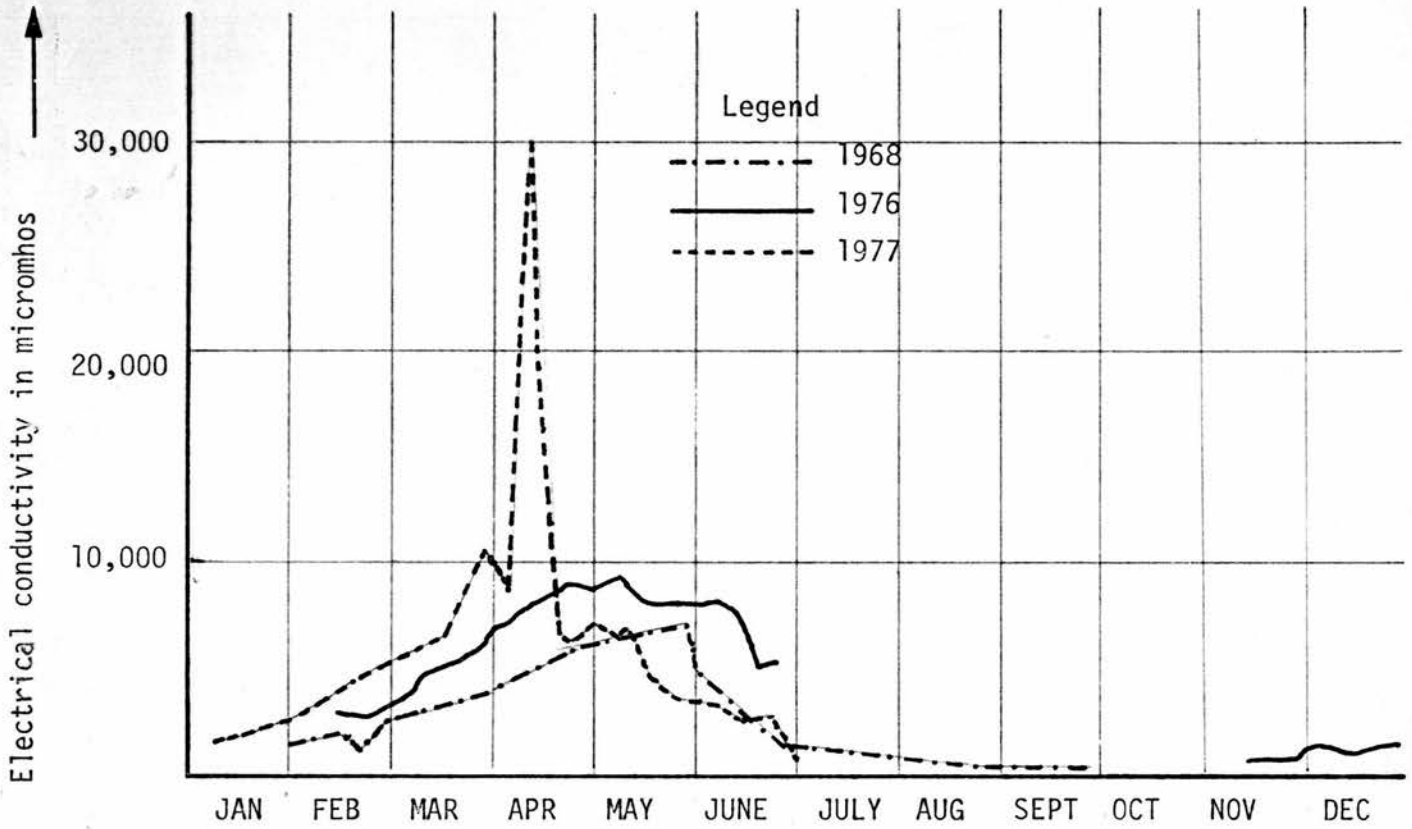


Figure 11.7 Superimposed graphs of electrical conductivity in the Daratana-Ghasiakhali River at Bagerhat in the years 1968, 1976, 1977.

of the Ganges. Their explanation of what happened in this region is very important. It justifies some of Bangladesh's apparently outrageous claims (see the bar chart in Figure 11.1, and the relevant electrical conductivity records in Figure 11.8), and explains why the reports of the World Bank, Harvard University and the team of Indian Government experts appear to have underestimated salinity changes in this area. These three different groups did not have the detailed data to enable them to analyse the specific features of this small but very significant sector of the delta.

The Special Studies description of the process involved in saline intrusion in the Nabaganga-Pussur compartment is here quoted in full:

'The estuary depends entirely on fresh water of the Gorai at Bardia to prevent saline intrusion. These spills in the low flow season have never been sufficient to defend the Pussur against severe saline intrusion to Chalna [Mongla], 50 miles from the Bay and to within a few miles of Khulna. For example, in 1968 when the average monthly flow in the Gorai in the dry season exceeded 3,600 cusecs, salinities of 3,800 Mmhos were registered at Station B four miles below Khulna.

'Due to the channel arrangement at Khulna, the fresh water flow is confined to this single channel in front of Khulna and therefore has a higher average velocity than five or six miles downstream where the flow is divided into two channels and is later divided again. These higher average velocities at Khulna are more effective in holding back the saline bay water. Thus, in 1968 with 3,800  $\mu\text{S}$  registered only four miles downstream, the maximum salinity registered at Khulna was about 1,000  $\mu\text{S}$ . But when the Gorai flows dropped to almost zero in 1976, the high salinities moved past Khulna and on up to Bardia. The maximum salinity measured at Khulna in 1976 was about 13,600  $\mu\text{S}$ .' (16)

In other words, the higher river velocities at Khulna maintained a steep salinity gradient. But it was a salinity gradient which in normal years allowed the river to maintain relatively low salinities just adjacent to Khulna. The industrial water offtakes at Khulna could therefore operate without difficulties. The fairly small change in the Gorai flow in 1976, however, resulted in a dramatic

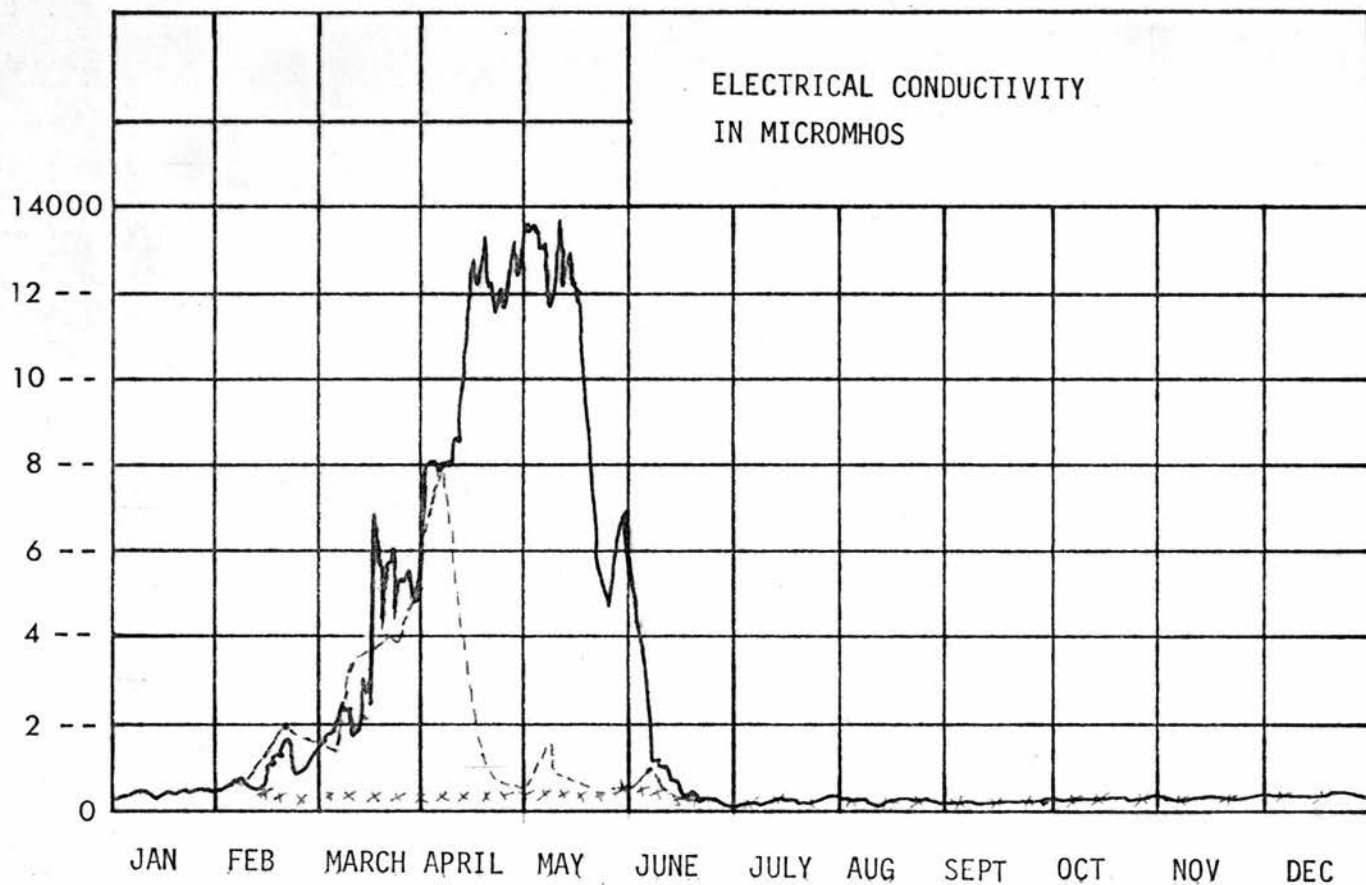


Figure 11.8. Superimposed graphs of electrical conductivity in the Rupsa-Pussur River at Khulna for the years 1968, 1976 and 1977.

Legend: 1968 -x-x-x-x-x  
 1976 —————  
 1977 - - - - -

change in the salinity in this the most sensitive stretch of river for Bangladesh's industrial production (17).

The Special Studies report also contains the results of a regression analysis which attempted to indicate the relationship between the maximum monthly salinity at a given station and the average monthly discharge in the Gorai-Madhumati river (at Gorai Railway Bridge, near Kushtia). The results of this analysis are reproduced here as Table 11.2.

These correlation coefficients do not show a very striking relationship, but the report comments:

'As mentioned in paragraph 6.5.3 the salinity in the Nabaganga-Pussur compartment is completely dependent on the flow at the Gorai Railway Bridge. However, the functions that define this relationship at any one point along the channel may not be a simple linear function of concurrent salinity and flow.'

(18)

#### Discussion of the Special Studies results

The descriptive analysis adopted by the Special Studies team does not rely on sophisticated techniques. It is no more than a common sense investigation of the process of the delta. Its accuracy relies on the adequacy of the data and the rigour with which the team have approached the subject. The data is reasonably consistent over the three methods of observation used: central laboratory analysis of collected water samples; static (in situ) observation; and dynamic observation (from a boat drifting with the current).

The interpretation put upon the data is plausible. The Special Studies team have rejected the unlikely claim that the saline intrusion all along the South West coast of Bangladesh had increased solely because the Ganges flow had been reduced by India. They have indicated not only that the combined flow in the Meghna is dominant in the areas adjacent to that estuary, but also that substantial quantities of water flow West along cross-channels to dominate large areas as far as the Madhumati and prevent the influence of the

Table 11.2: Results of correlation analysis between flow in the Gorai River and maximum salinity intrusion

Electrical conductivity station	correlation coefficient					
	Jan	Feb	March	April	May	June
Khulna (Rupsa-Pussur)	0.209	0.504	0.713	0.673	0.887	0.588
Mongla (Pussur)	0.373	0.553	0.399	0.724	0.571	0.693
Morrelganj (Ghasiakhali)	0.220	0.627	0.645	0.170	0.266	0.652

Regression analysis made using the following equation:

$$EC_A = aP_G^b$$

where  $EC_A$  is max monthly salinity at station A  
 $P_G$  is the corresponding average monthly discharge at Gorai railway bridge and,  
a and b are parameters determined by the regression

Source: Special Studies, pVI-28 to VI-29.

changes in the flow in the Ganges having a significant effect. They have also provided a reasonable explanation for the apparently anomalous rise in the salinity in the Rupsa river at Khulna.

One source of doubt remains, however. The report does not indicate the extent to which the flow in the Gorai-Madhumati river is recharged from the groundwater of adjacent areas. It is nevertheless unlikely that this element could explain increased salinity. Reduced flow in the Gorai from the Ganges would tend to result in increased recharge from the groundwater, though the effect would probably only be small.

The Special Studies analysis provides a thorough investigation of the causes of the exceptional saline intrusion experienced in parts of South West Bangladesh during 1976 and 1977.

#### INDUSTRIAL DISRUPTION

Bangladesh's major centre of industry is at Khulna in the middle of the South West. As we have seen, the rivers near to Khulna were subject to large salinity changes in 1976 and 1977.

In its White Paper the Bangladesh Government claimed:

'The increased salinity has already injured the industrial sector. There has been only one source of power for the south-west region, the Goalpara Thermal Power Station. The salinity levels of the river went too high for the tolerance of the power station equipment. As a result the power station had to close for some time and operated intermittently at increased cost on the basis of fresh water brought by barges from long distances. The impact of the loss of power to the industries dependent on the power station was significant. Actually the paper mills and the newsprint mills suffered because the saline water was unusable for processing the end product, as well as from its loss of power. But jute industry, Bangladesh's biggest export earner was hampered in its operation in a major way.'

(19)



The Government of India responded as follows:

'No data have been furnished to show how the Farakka withdrawals have been directly responsible for these adverse consequences. The available facts however show that the Khulna reach used to have higher salinity levels in the past. These levels might have increased as a result of human activities in the region. In this context India has been asking Bangladesh for data to enable it to study the results of salinity jointly with Bangladesh. But these have not been furnished.'

(20)

The Bangladesh Government asserts that serious industrial disruption occurred because a power station, paper mills and jute processors were unable to use highly saline water, or used it and suffered damage. India argues that the chain of causation is unproven. A survey carried out by the Bangladesh Water Development Board is reported in Special Studies (21). The results of this survey are summarised in Table 11.3. If the survey has accumulated reliable data, salinity changes caused industrial losses to a value of at least Taka 120 million (US \$8 million).

The disruption is plausible. The shut-down of the Goalpara Power Station would have serious consequences. Industries facing unexpectedly high salt content in their cooling or process water might well suffer production delays, mechanical failure, and increased corrosion. During 1976 and 1977 some industries shipped fresh water by barge from upstream sources to their factories.

The causes of increased salinity have, earlier in this chapter, been established: the evidence suggests that the Farakka withdrawals were to blame.

However, the survey of industrial disruption is open to question. The questionnaire used is not reproduced in Special Studies. The reader is left in doubt about the wording of the questions and may reasonably imagine that the industries concerned tended to submit a pessimistic assessment of their losses in hopeful anticipation of government compensation. Special Studies reports that some of the industries were visited to verify the losses, but at the time

Table 11.3: Estimate of industrial losses in Bangladesh due to withdrawals at Farakka between December 1975 and June 1976

INDUSTRY	WATER DEMAND 10 <sup>6</sup> Gallons Per Day	EXPLANATION	UNITS	LOSSES	
				PRODUCTION QUANTITY	MONETARY 10 <sup>6</sup> Taka
Goalpara thermal Power Station, Khulna	100.8	Increased consumption of chemicals and hauling sweet water 40 to 50 miles by cargo	MWH	73.2	39.52
Khulna newsprint mills	25.0	Increased corrosion of boilers, Turbines, Condenser tubes and other accessories	Tons	24000	.70
Khulna Hardboard mills	.24	Increased corrosion of Boiler and other parts; increased blow down of boiler	1000 SF	520	.36
Crescent Jute mills, Khulna	.10	Increased corrosion of smoke tube requiring use of coal	Tons	437	2.51
Peoples Jute mills, Khulna	.03	Power failures	Tons	279.81	1.693
Star Jute mills, Khulna	.20	Power failures	Tons	331.26	2.024
Eastern Jute mills, Khulna	.008	Power failures	Tons	243	1.500
Platinum Jute mills, Khulna	.30	Power failures	Tons	250	1.600
Afil Jute mills, Khulna		Power failures	Tons	130	.86
Ajax Jute mills, Khulna		Power failures	Tons	128	.79

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INDUSTRY	WATER DEMAND 10 <sup>6</sup> Gallons Per Day	EXPLANATION	UNITS	LOSSES	
				PRODUCTION QUANTITY	MONETARY 10 <sup>6</sup> Taka
Aleen Jute mills, Khulna		Power failures	Tons	115	.713
Daulatpur Jute mills, Khulna		Power failures	Tons	102	.633
Sonali Jute mills, Khulna		Power failures	Tons	180	1.117
Jessore Jute mills, Jessore		Power failures	Tons	201	1.247
Noapara Jute mills		Power failures	Tons	112	.695
Moshin Jute mills, Khulna		Power failures	Tons	59	.364
Furbachal Jute mills, Jessore		Power failures	Tons	56	.347
Rajshahi Jute mills, Rajshahi		Power failures	Tons	76	.471
Quami Jute mills, Pabna		Power failures	Tons	228	1.414
Bangladesh Match Co, Khulna		Increased damaged quality of matches	Lac Gross	1.5	2.70
Khulna Ice and Storage Co.	.54	Increased corrosion of equipment and Power failures	Hours	200	.700
Khulna Water Works	.40	Increased salinity required installation of new water supply system	Lac Gallons	1460	1.00

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INDUSTRY	WATER DEMAND 10 <sup>6</sup> Gallons Per Day	EXPLANATION	UNITS	LOSSES	
				PRODUCTION QUANTITY	MONETARY 10 <sup>6</sup> Taka
Bangladesh Cable Shilpa Ltd, Khulna	.15	Increased corrosion of Boiler, Pipes and Machinery	Conductor Kilometre	5000	1.20
		Manufacturing Total	-	-	64.160
Chalna port Authority		Design change related to saline intrusion	-	-	50.000
G K Pumping plant		Clearing intake channel	10 <sup>6</sup> Tons	26	3.708
		Grand Total			117.808

Source: Special Studies, pp VI-39 to 41

Special Studies were written surveys of damage were still continuing. There can be little doubt that industrial damage occurred (22), but, perhaps, the Tk 120 million estimate of loss should be interpreted as an upper valuation of the actual loss.

## CONCLUSIONS

This chapter has provided an assessment of the extent and causes of the salinity intrusion experienced in Bangladesh in 1976 and 1977, and of the industrial disruption which resulted from that intrusion.

The Bangladesh Government claimed that exceptional salinity levels were experienced in these years, and that these exceptional levels were caused by India's Farakka diversions; the Indian Government responded that the problem had been 'exaggerated out of all proportion'. The Special Studies team investigated and upheld the Bangladesh Government's central claim of significantly increased salinity in the Pussur River and immediately adjacent estuaries.

We have seen in this chapter that the descriptive analysis employed by Special Studies appears sound, and the data they have accumulated appears reasonably consistent. Special Studies therefore provides a basis for judgement.

There appears to have been unprecedented saline intrusion during the years of maximum Indian diversions. However, only in the central 'compartments' of the Nabaganga-Pussur and Gorai-Madhumati estuaries is this attributable to the reduced flows in the Ganges and Gorai Rivers. In the Eastern compartments the flows and tides of the Meghna River, cross-connected to other estuaries by the Westward flowing Swarupkhati channel, seem to be the predominant influence on salinity intrusion. The Farakka diversions cannot be blamed for salinity changes in this area. In the Westernmost compartment little salinity change was observed.

In the important Khulna region Special Studies identifies a quirk

of river channel formation which may explain why small changes in the flow in the Gorai caused large changes in the salinity at Khulna. There was a particularly steep salinity gradient present in previous years in the river just downstream of Khulna. This may have made the River Pussur at Khulna prone to a large change in salinity as a result of a relatively small change in flow. This quirk of nature may partly explain why the significance of the salinity changes was overlooked not only by the Indian Government but also by other investigators.

If the Farakka diversions caused the reduction in Gorai flows then the salinity increases observed in the central compartment are also a consequence of Indian withdrawals. Chapter Ten concluded that the Farakka diversions are the most likely cause of reduced Gorai flows and, therefore, they are also the most likely cause of the exceptional salinity levels experienced in the central compartment.

Industrial losses totalling Tk 120 million are claimed by the Bangladesh Government. The total value of those losses may be over-estimated, but there is little doubt that damage took place as a direct result of increases in salinity. The chain of causation is long, but it seems to lead back to the Farakka diversions. The weak link in the chain is the connection between the Farakka diversions and the reduced Gorai flows. If that is taken as the 'most likely' connection, then the industrial damage suffered by Bangladesh can be attributed to India's operation of the Farakka Barrage.

## Chapter Twelve

### AGRICULTURE AND FORESTRY

Chapters 10 and 11 assessed the primary physical consequences of the Farakka diversions - exceptionally low river flows and unexpectedly severe saline intrusion. This chapter builds on the conclusions of those chapters in an attempt to follow the chain of causation as far as the influence of Indian diversions on agriculture and forestry in Bangladesh.

Agriculture in Bangladesh employs about 75% of the labour force and contributes some 56% of the Gross Domestic Product (GDP). Approximately 30% of the GDP comes from the growing of rice (1).

There are three main rice crops, Aus, Aman and Boro, corresponding with the three rice-growing seasons. For each crop there are a large number of local strains and also some recently introduced high yielding varieties (HYVs). Aman is the largest crop, and is sown in April and May, to be harvested between November and January. Some varieties of Aman are adapted to deep water flooding. Aus, the second largest crop is sown in March and harvested in August. Both Aus and Aman are generally rain-fed crops, although increasingly these crops are irrigated, and in some areas the crops may depend on water from nearby channels or natural inundation. The third crop, Boro, is an irrigated winter crop, sown in December and January, and harvested in April and May (2). Between 1960 and 1974, rice production grew at an average rate of 1.9% per year, but Boro output rose 15% annually during the same period (3). Other food crops include wheat, pulses, oilseeds, sugar and vegetables.

Bangladesh's major cash crop is jute which provides 77% of the value of the country's commodity exports (4). Bangladesh produces 75% of world jute exports. Other cash crops include tea, tobacco and cotton.

Forest industries contribute 5% of the country's GDP. The wood is used for house and boat construction and in the making of newsprint and matches (5). In the South West of the country, most wood comes from the Sundarbans, a large area of mangrove forest and swamp, where the main species is the Sundri tree which can thrive in mildly saline water.

In its White Paper, the Bangladesh Government asserted that India's diversions had resulted in a loss of rice output of 236,000 tons in 1976. Bangladesh argues that there are three ways in which the Farakka diversions reduce rice and other agricultural production: Firstly, reduced river flows cause depleted soil moisture levels, with the result that crop yields are lower. Secondly, increased salinity in river water may preclude irrigation or, if the water is used for irrigation or inundation, crops may be damaged by the salinity. Finally, Bangladesh farmers may perceive increased salinity levels or decreased water availability and may, therefore, choose to delay planting their crops. If this happens, crop yields may be reduced because the crop has a shorter growing season.

We shall see that Special Studies concludes that rice losses were under-estimated by the White Paper. However, it will be argued in the following pages that the agricultural consequences of the Farakka diversions are poorly estimated by Special Studies. Agricultural damage almost certainly occurred, but that damage is difficult to prove and to quantify.

The estimation of adverse effects on forestry production is also problematic. In this case the Special Studies investigation is more rigorous, but the Special Studies team were not able to wholly discount influences other than the Farakka diversions. In this aspect, as in others, there is a strong presumption that observed deterioration was caused by Farakka diversions. However, that presumption stops just short of proof.



## THE BANGLADESH CLAIM

### (i) Agriculture

The Bangladesh White Paper argues that there are two quite different effects to be accounted for in agriculture. There is the concurrent and relatively tangible effect on agriculture in the years of withdrawal; and there is a potential or pre-emptive effect in reducing the water available for future irrigation projects. The White Paper does not attempt to assess this pre-emptive effect but it comments that the potential benefits of dry-season irrigation could not have been foreseen twentyfive years previously when the waters of the Ganges first became an issue. The development of high-yielding varieties (HYVs) of rice and wheat with their need for accurately controlled and large quantities of water was subsequent to India's decision to proceed with the Farakka Barrage (6).

On concurrent, though in some cases cumulative, effects on agriculture the White Paper has this to say:

'The dangers of salinity for agricultural production are well-known. However, the real hazards of increased salinity only began to be appreciated in practice by the farmers themselves. Fresh water is required not only to flush salinity from the soil but also to counteract the onrush of saline water from the sea. As the soil becomes saline, productivity is reduced and eventually the soil becomes barren. Another negative input of increased salinity is that the water itself becomes less suitable for irrigation purposes. The combined effects of such increased salinity have both immediate counter-productive effects and produce damage over the longer term, which is irreparable.

'When the natural balance has been upset to the extent that it has been, one cannot attribute crop loss only to salinity, for the problem of the low flow combines with salinity as an equally important damaging factor. A very preliminary and conservative estimate shows that during the 1976 dry season over four hundred thousand acres of land were affected in the area dependent on the Ganges due to soil moisture deficiency and increase of salinity. More than 4000 low lift pumps in the area suffered due to scarcity of water in the sources and increase of salinity in the area. All the shallow tubewells were adversely affected. A large

number of deep tubewells in the area were affected due to fall in the sub-soil water level. The subsidiary pumps of the G K Project ceased to operate as the Ganges water level fell below the lowest operation limit. Three main pumps faced operational difficulties for increase in lifts and decrease in head on the suction side. Rice production alone fell short by 236,000 tons (20% of Bangladesh's food imports).

'This loss does not take into account the loss or the reduction of the second crop arising from delayed planting of the crop...'

'The repercussions of...reduced water availability on agricultural production were severe. It reduced the capacity to irrigate. It is estimated that approximately 33% of the irrigation facilities could not operate because of the decreased availability of water. Second, it militated against the planning of non-irrigated crops which depend upon the residual moisture of the soil. Third, it delayed the planting of the crop which decreased the yield, shortened the growing season and affected the planting and productivity of the subsequent crop.

'It is estimated that delayed planting reduced high-yielding variety yields by 30% and the inability to provide supplemental irrigation reduced the crop yield by roughly 10%. A country attempting to emerge from subsistence agriculture is confronted with man-made handicaps. For the effect of reduced yields is not only the immediate reduced income, but also the disillusionment of the farmer with modern agricultural practices; a disillusionment that takes years to overcome.'

(7)

In other words, as a result of increased salinity, decreased water availability and delayed planting of crops, Bangladesh's rice output was 236,000 tons less than anticipated. Longer term and cumulative consequences have also to be taken into account, but they are even more difficult to quantify.

A second document, circulated within the Bangladesh Government, asserts that the White Paper assessment is an underestimate. This second document is a typewritten note produced by the Bangladesh Special Studies Directorate and entitled A short note on the loss of agricultural crops in Bangladesh due to withdrawal of Ganges water at Farakka (8). According to this note, Bangladesh's loss of rice, wheat and vegetables in 1976 totalled nearly 640,000 tons. We shall see that this latter estimate is in close agreement with the

conclusions of Special Studies.

(ii) Forestry

The White Paper asserts that Farakka diversions will reduce the quantity of water flowing into the Sundarban forests. Surface and ground water salinities will rise and, as a result, the quality of the trees will deteriorate and the yield of timber will fall. These changes will threaten the employment of 45,000 people (9).

THE INDIAN RESPONSE

Having argued that Bangladesh really only needs 9,000 cusecs of Ganges water, compared to a dry season flow, after Farakka diversions, of 23,000 to 26,000 cusecs, the Government of India's The Farakka Barrage makes these specific responses to the Bangladesh claim:

'Bangladesh has alleged that 400,000 acres of land were adversely affected in the dry season of 1976 because of soil moisture deficiency and increased salinity. It is well known that soil moisture depends entirely on the characteristics of the soil and local rainfall. Soil moisture has hardly anything to do with the groundwater table. As for adverse effects of salinity on cultivable area, the Padma reach is totally unaffected by salinity and in the Gorai reach salinity effects cannot be significant.

'About one third of the Ganga's riverine bank lying below Farakka falls within India and is subject to the effects of withdrawals at Farakka. But careful studies of the groundwater table as well as the functioning of tubewells and lift pumps have not disclosed any such adverse effects.

'A high-level technical delegation from India visited the Ganges-Kobadak headworks in April 1976 and found that the project's full requirements of irrigation were met by the pumps in operation. The old subsidiary pumps have been suffering from several deficiencies ever since they were installed and the Bangladesh Government are reported to have decided to scrap them and install new ones. There is also conclusive evidence, including a World Bank report of March 22 1976, to show that failure to use the existing pumping and tubewell capacity is due to a variety of other factors such as poor maintenance and repairs, lack of spare parts and low demand for

irrigation water.

'Bangladesh has further stated that the Farakka withdrawals have brought about a decline of 236,000 tons of the production of rice. This has been related among other causes to fluctuations in the water level in the Ganga in the lean season of 1976. The water level in the lower reaches of the Ganga is said to have fallen 0.9 to 1.2 metres [3 to 4 ft] as a result of the withdrawals. But according to data furnished by the Bangladesh Government fluctuations of a much higher order have been frequent in the past because of silting and shoaling of the river bed.

'There is also no mention of the target or the base level of production from which the alleged decline is supposed to have taken place. Bangladesh harvested a record rice crop in 1975, and official documents on the country's future economic prospects project another record production of foodgrains in 1976. How therefore can one believe that the Farakka withdrawals have had, or are likely to have, any adverse effects on food production in Bangladesh?'

(10)

On forestry, The Farakka Barrage comments that the quality and productivity of the trees depends on local rainfall and the depth and spread of the tides, and:

'The lean season flows in the Padma cannot reach any part of the Sundarbans and the Farakka withdrawals cannot thus have harmful effects on forestry in Bangladesh.'

(11)

#### ASSESSMENT OF AGRICULTURAL EFFECTS

##### The Special Studies method

Sadly, although the effect of upstream withdrawals on the agriculture of Bangladesh may have been serious, the chapter on these effects in Special Studies is one of the weakest in the report. The processes by which Farakka withdrawals caused agricultural damage are inadequately described, and the method chosen for estimating the quantity of damage was not satisfactorily implemented. Before setting out the conclusions of the Special Studies team, I shall describe and criticise the manner in which they arrived at those conclusions.

The Special Studies method is summarised in this quotation:

'The study of the effect of upstream withdrawals of Ganges water on agriculture was initiated by the Special Studies Directorate of Bangladesh Water Development Board by sending agricultural questionnaires to 131 thanas of the Study Area. This was followed by field trips to specific areas by the officers of the Special Studies Directorate and then by expatriate personnel. Field Officers of the Department of Agriculture, Bangladesh Agricultural Development Corporation and Bangladesh Water Development Board were contacted to collect first hand information of the problem. Agricultural data including long term records and research findings of the Study Area were collected from different agencies for study of the base period 1973-74...The survey unit of the Special Studies Directorate has been engaged in monitoring soil salinity agricultural properties and sampling the socio-economic conditions of the farmers of the Study Area. The accumulated data was compiled, processed and comparisons were made for period before and after upstream diversion to evaluate the impact of this diversion.'

(12)

The reduction in agricultural production was caused by moisture stress, increased salinity and delayed planting. In turn, each of those factors, it is alleged, was the result of reduced flows in the Rivers Ganges and Gorai-Madhumati. As earlier chapters of this thesis have shown, there is little doubt that the reduced flows in the Ganges were caused by the Farakka withdrawals, but, the reduced flows in the Gorai-Madhumati might have occurred anyway. It is probable but not certain that the reductions were caused by the Farakka diversions. This remains an unavoidable uncertainty in the assessment of agricultural effects.

Having established, as far as is possible, that Farakka diversions did cause reduced flows, it is then necessary to establish that there are links between:

- a) reduced flows and moisture stress,
- b) reduced flows and delayed planting, and
- c) salinity and reduced agricultural production.

These links are not authoritatively established by this chapter of Special Studies. The core of the method used to assess the agricultural effects is a questionnaire survey. That in itself is a reasonable way to approach the problem. The only alternative method would have been comprehensive observation of a representative sample of farms. For the questionnaire method to be convincing, however, the processes about which questions are being asked must be well-described, the questions must be well-chosen and, there must be an awareness of the possibilities for error being introduced. Without these three attributes the result of a questionnaire survey will be meaningless and, on none of these points does Special Studies give assurance.

The description of the processes involved requires that the causative links a), b) and c), mentioned above, should be at least sketched. In order to quantify the extent of moisture stress, it is necessary to establish that in 1976 irrigation was reduced in areas where crops are normally irrigated, that moisture available to crops was reduced in non-irrigated areas and that both these problems were caused by reduced flows in the major rivers. This was not done in Special Studies.

The statistics of irrigated area, given in Table VII-27, do not indicate that the area irrigated in 1975-76 was substantially below previous years. It was 98% of the area irrigated in the preceding year but 10% above the average of the irrigated areas in the preceding three years. The area irrigated by powered pumps in 1975-76 is slightly above the average for the period 1972-3 to 1974-5. Only in canal irrigation is there a substantial drop from the preceding year. That was presumably attributable to the problems of the Ganges-Kobadak Project (13).

If the area irrigated was not affected, then, perhaps, the availability of irrigation water was. There is good reason to believe this was the case. In Chapters 10 and 11 of this thesis the evidence for reduced flows and increased salinity has been summarised. An estimate could have been made of the effect these factors would

have on the availability of irrigation water. This is not done in the Special Studies. The absence of such an estimate deprives the reader of a possible check on the results of the questionnaire survey.

In order to establish the effect of reduced flows in producing moisture stress in non-irrigated areas, the link between reduced groundwater levels and reduced soil moisture has to be, at the very least, described. This is not done in Special Studies. As has been shown in Chapter 10 of this thesis, the effect of reduced flows on groundwater levels is difficult to establish and, in all probability, is restricted to the land in narrow belts on either side of the major water courses. In any case, the depths to the water table in the Northern part of South-West Bangladesh, the Districts of Kushtia, Faridpur, Jessore, Rajshahi and Pabna, of greater than 10 feet, are such that it is most improbable that groundwater contributes significantly to the moisture available to rice or wheat crops (14).

Thus, although it appears probable that there was reduced rice and other crop production in 1976 caused by moisture stress, the mechanism by which it occurred is not well described or estimated by Special Studies.

It is difficult to provide conclusive evidence of delayed planting by farmers except, perhaps, in the relatively controlled conditions of the Ganges-Kobadak Project. Special Studies describes how different varieties of rice in use in Bangladesh are heat and light sensitive and in some cases intolerant of excess water, and how delayed planting may therefore have reduced yields of these varieties. It is not difficult to imagine that farmers, seeing the reduced level of water in major rivers and in local channels, or testing the increased salinity of the water, may have decided to delay sowing in the hope that better conditions would come. It is, however, equally easy to attribute such a delay to the slightly below average rainfall of the first months of 1976. In this case we are studying complex questions of individual motivation and perception within which it is

difficult to identify a chain of causation. This chapter of Special Studies provides little help in identifying such a chain. There is no indication that the authors of the report were sufficiently aware of the problems involved, and the difficulty of investigating such a process with a questionnaire.

As far as salinity is concerned, the Special Studies description is brief but relatively convincing. In the Southern portion of South West Bangladesh large areas of land are tidally inundated. In part of this area the water remains fresh all the year round - or did so until 1976. During the dry season of 1976, the water in this fresh water zone is reported to have become saline. Rice and other crops ill-adapted to saline water may have suffered severe damage as a result. In other parts of South West Bangladesh, normally fresh river water became saline. If this water was used for irrigation, reduced yields will have resulted.

These three sources of reduced agricultural production - moisture stress, delayed planting and salinity - were investigated by sending Thana Agricultural Officers out into the field to question the farmers of South West Bangladesh. Special Studies does not include a copy of the questionnaire, nor does it describe the instructions given to the Thana Agricultural Officers (TAOs). What the reader is told is this:

'In order to make a preliminary estimate of the loss in agriculture that occurred in 1976 calendar year, a special questionnaire was prepared and sent to each of the 131 TAOs of the Study Area to collect a complete history of agricultural development for the past five years.'

(15)

This appears, from the context, to be the questionnaire on which this chapter is primarily founded. If that is the case, then the



TAOs were not given any training in the complexities of this task; they were simply sent some written instructions. Apparently, different officers of the Special Studies Directorate visited the field and may have checked on the survey methods of the TAOs. The way in which natural climatic variations was eliminated from the study does not inspire confidence that this did happen:

'There are climatic adversities that are natural in Bangladesh. One of these is natural dryness in the months of November through May. From one year's data it is very difficult to separate the effects of natural adversities and upstream withdrawals of the Ganges water. So, for assessment of loss of production of agricultural crops in dry season, it was assumed that the loss due to natural adversity would not be more than 20%. Accordingly, information sent by Thana Agricultural Officers and other agencies regarding the loss of agricultural production was mostly corrected and 20% of estimated reduced yield was subtracted.'

(16)

This is unsatisfactory. It may be that natural climatic variation accounts for a variation of 20% in overall crop production, although evidence is not given to support this assumption. In individual cases certainly - and, for aggregated Thana production, probably - the variation from year to year is likely to be much larger. If the last sentence in the above quotation is correct, not even 20% of variation in production was discounted. '20% of estimated reduced yield', is not a 20% loss of production due to natural adversity: it is 20% of the figure which the Thana Agricultural Officer estimated was the reduction in 1976.

One further factor casts doubt on the figures reported in this chapter of Special Studies. The figures finally accepted by Special Studies (Table VII-26 and VII-36 of Special Studies) are, with a few minor corrections, the figures which the Special Studies Directorate included in their report of February 1977, A short note on the loss of agricultural crops..., mentioned at the beginning of

this chapter. Within a month of agreement to bring an expatriate team to study this problem, the figures which finally emerged in their report had been calculated. The expatriate experts employed by International Engineering Consultants appear to have added only padding to this chapter of the Special Studies. Their critical assessment of the methodology used to estimate the effects of Farakka diversions on agriculture did not cause them to modify either the estimate of the area affected or the estimate of the quantity of lost production.

#### The conclusions of Special Studies

Nevertheless, despite all these doubts and criticisms, can any support be mustered for the figures calculated by the Special Studies Directorate? Are they of the right order of magnitude?

Table 12.1 shows the area affected by different processes, according to Special Studies estimates; Table 12.2 shows the estimated tonnages of lost rice production by district and cause of loss; and Table 12.3 provides a summary of the total crop losses.

From Table 12.2 it can be seen that the districts of Khulna, Barisal and Patuakhali suffered the largest losses. These three districts suffered 81% of the total lost rice production. But Barisal and Patuakhali are areas which did not suffer significant changes as a result of Farakka diversions. We saw in Chapter 11 that these districts, falling as they do in the Eastern compartments of the study area, did not experience excessive salinity intrusion as a result of the Farakka diversions. The salinity and river flows in these districts are primarily influenced by the flow in the combined River Meghna which was not changed dramatically by the Farakka diversions. Farmers may have delayed planting rice either because they perceived there was insufficient water in the soil or in nearby rivers, or because they perceived that the salinity of their water source was too high for irrigating their crops. Reduced harvests may also have resulted where crops were irrigated by water which was too saline. But, in none of these cases can the blame be laid on the

Table 12.1: Summary of the area affected in South West Bangladesh due to upstream diversion in 1976

Name of District	Moisture Depletion		Salinity-alkalinity		Delayed Planting	Total of Cols 4, 7 & 8
	Non-Irrigated	Irrigated	Non-Irrigated	Irrigated		
Rajshahi (Part)	14,590	14,716	Nil	Nil	-	29,306
Pabna (Part)	30,985	8,044	Nil	Nil	-	39,029
Kushtia	12,436	14,572	Nil	Nil	60,000	87,008
Jessore	91,905	2,509	94,414	5,033	34,000	143,647
Faridpur	61,455	29,268	90,723	8,625	NR	99,348
Khulna	9,015	NR	9,015	10,773	380,952	433,876
Barisal	NR	28,002	28,002	62,005	333,333	423,340
Patuakhali	NR	NR	-	25,227	285,715	310,942
<b>Total:</b>	<b>2 20,386</b>	<b>97,111</b>	<b>317,497</b>	<b>134,026</b>	<b>1,094,000</b>	<b>1,566,496</b>

Note: NR = Not reported

Source: Special Studies, Table VII-26.

Table 12.2: Lost rice output by district and cause 1975-6

DISTRICT	NON-IRRIGATED		IRRIGATED		DELAYED PLANTING	TOTAL
	Salinity	Moisture Depletion	Salinity	Moisture Depletion		
Rajshahi	-	0.5	-	10.5	-	11.0
Pabna	-	0.3	-	5.7	-	6.0
Kushtia	-	0.8	-	8.5	24.0	33.3
Jessore	0.6	10.7	3.3	1.9	14.4	30.9
Faridpur	-	5.5	6.9	27.4	-	39.8
Khulna	0.7	0.6	32.8	-	139.5	173.6
Barisal	-	-	62.0	28.0	122.1	212.1
Patuakhali	-	-	23.7	-	104.7	128.4
						<u>635.1</u>

Note: All quantities are in  $10^3$  tons

Source: Special Studies, Tables VII-30 to VII-35

Table 12.3: Summary of the Special Studies estimate of lost Agricultural production in South West Bangladesh due to upstream diversion in 1976

CAUSE	AFFECTED AREA 10 <sup>3</sup> acres	AREA BY CROP 10 <sup>3</sup> acres	LOSS 10 <sup>3</sup> tons	VALUE 10 <sup>6</sup> Taka
<b>SALINITY</b>				
Irrig. area	134	Rice 146	130	420
Non-irrig.	20	Pulse 8	1	1
<b>MOISTURE DEPLETION</b>				
Irrig. area	97	Rice 268	100	324
Non-irrig.	220	Wheat 14	2	4
		Pulses 31	2	5
		Potatoes 4	5	6
		Vegetables	1	1
<b>DELAYED PLANTING AND SOWING</b>				
Irrig. area*	94	Rice 1,094	405	1,310
Tidal**	1,000	-	-	-
Non-irrig.	NR	NR	NR	NR
<b>TOTAL FOOD GRAINS AND RABI CROPS</b>				
	1,566		647	2,074
<b>STRAW</b>	1,507		382***	57

- Notes: NR - not reported  
 \* - Ganges Kobadak Project in Kushtia and Jessore Districts  
 \*\* - In the tidal zone single transplanted Aman is cultivated extensively with river water  
 \*\*\* - Production loss of straw was calculated on the basis of 40% of paddy

Source: Table VII-36, Special Studies

Farakka diversions. There may have been excess salinity and insufficient moisture for crops in Barisal and Patuakhali but it was probably not caused by the Indian withdrawals. Therefore, the 341,000 tons of rice production lost in Barisal and Patuakhali must be omitted from the total of Farakka-caused losses.

Table 12.4 provides a comparison between Bangladesh Government statistics for rice output in the districts of the South West for the years 1973-4 to 1976-7, with the totals of lost rice output which Special Studies attributes to Farakka diversions. It can be seen that the total rice output for 1975-6 does not reflect the substantial losses calculated by Special Studies. It can be calculated that total rice production in these five districts averaged 2.5 million tons in the period 1969-70 to 1977-8, with a standard deviation of 0.32 million tons (17). If the 'lost' output is added to the recorded rice production in 1975-6, then that 'potential' output exceeds the average by more than three standard deviations. This is unlikely: either the total output, or the lost production figures are incorrect. Bangladesh Government agricultural statistics are unreliable, but they probably come from the same Thana Agricultural Officers who supplied the Special Studies estimates. There is no obvious way of choosing between them.

When all the doubts about the understanding and description of the processes involved, and the criticism of the methods used to estimate their extent, are taken into account, little reliance can be placed on the estimates of lost production. This is not the same as saying there was no effect. There certainly was an effect. But the processes involved are not sufficiently well documented for that effect to be accurately measured. The estimate of 650,000 tons of lost food output calculated by Special Studies represents an upper limit to the loss.

Table 12.4: Rice production by district compared with claimed losses

DISTRICT	TOTAL RICE PRODUCTION				CLAIMED LOSS
	1973-4	1974-5	1975-6	1976-7	1975-6
Kushtia	197	223	192	195	33
Jessore	480	572	589	553	31
Khulna	448	491	556	537	174
Faridpur	446	428	477	407	40
Barisal	655	527	692	697	212
Patuakhali	239	283	379	362	128
	<u>2,465</u>	<u>2,525</u>	<u>2,885</u>	<u>2,751</u>	<u>618</u>

Note: All quantities are in  $10^3$  tons

Sources: Cols 2-5: Bangladesh Bureau of Statistics, 1979 Statistical Yearbook of Bangladesh, 1979, p 166.

Col 6: Special Studies, Tables VII-30 to VII-35.

## ASSESSMENT OF THE EFFECTS OF FARAKKA DIVERSIONS ON FORESTRY

The contrast between Chapter VII of Special Studies, on agriculture, and Chapter X, on forestry, is considerable. Whereas the chapter on agriculture fails to substantiate some of the more probable effects of upstream diversion, the chapter on forests is successful in suggesting a link between the Farakka diversions and damage which, at first sight, appears unlikely to be related. The forestry observers had an advantage over those investigating agriculture because not only could the damage to forests still be seen (by the time the expatriate members of the Special Studies team arrived in Bangladesh, most agricultural crops which they were to study had been harvested) but to some extent the date when the damage had been caused could be deduced from the trees themselves.

The Sundarbans are the world's largest single tract of mangroves, covering one million acres. The forest has been managed as a productive industry since the late nineteenth century. It is completely flushed with fresh water every monsoon season and, we are told by Special Studies, 'the major forest species do not possess an adaptive tolerance to high salinities, resulting in their dominance in areas of the forest with the lowest salinities' (18).

From water budgets for the areas of the Sundarbans, the authors of this chapter show that during the six-month dry season precipitation falls short of evaporation and transpiration by twenty inches. This water is made up from the rivers and khals of the area but, in the dry season, water levels are at their lowest and the brackish water becomes increasingly saline as upstream flow reduces. The authors comment that if the fresh water flow is reduced further than normal the equilibrium of the forests can be destroyed and a long period of change may ensue before a new equilibrium is established with different species taking over areas of increased salinity (19).

Members of the Special Studies team visited the Sundarbans to verify the extent of the deterioration reported by the Bangladesh Government



and to evaluate all the possible causes of the deterioration. Their observations are summarised in this paragraph taken from the report:

- '1. The forest showed evidence of recent extensive damage in localised areas.
2. The damage appeared to have been initiated at some previous time, possibly as long as five years ago, and deterioration of the forest was continuing.
3. The damage appeared to be most severe in the north-central portion of the forest influenced by the Sibsa River.
4. Moderate damage was observed at several places along the Pussur River.
5. The north-eastern portion of the forest, influenced by the Baleswar River, showed only slight to moderate damage.
6. In the affected areas, seedling mortality appeared to be close to 100 percent and individuals of the youngest year's class were largely absent .
7. Local discontinuities in the presence and severity of the damage appeared related to local differences in land elevation.'

(20)

On the seedling mortality, the authors comment:

'The high incidence of Sundri seedling mortality approaching 100% is highly significant in terms of the future production of the Sundri forest, as regeneration would cease to keep up with harvesting and mortality. The present failure of Sundri regeneration contrasts markedly with observations made by Curtis (1933): "Natural regeneration is so satisfactory and easy in the Sundarbans that one is inclined to omit any reference to it..."'

(21)

Three possible causes of deterioration are cited: insufficient fresh water, increased salinity and chlorinity, and insufficient nutrients. The authors reject the possibility that changes in the availability of these elements could have occurred naturally:

'In the natural condition the forest is liable to injuries by a number of agencies but the extent of the damage is minor in nature.'

(22)

The authors conclude that:

'Upstream diversion of the Ganges water is responsible

for the accelerated deterioration of the Sundarbans. Consideration of the observations made during the survey together with an intensive perusal of the literature lead to the following conclusions:

1. The Sundarbans forest is in a state of relatively rapid deterioration evidenced by the decline of Sundri and the failure of Sundri regeneration. With increase of salinity, excess salt accumulates in the soil. This excess salt may influence seed germination either by diminishing the absorption rate of the water or by facilitating the influx of ions in quantities enough to make them toxic...
2. The primary cause of deterioration is insufficient fresh water during the dry season to control soil salinities during that period.
3. Even though the cause may be insufficient fresh water, the effecting mechanism(s) is unknown, but with decrease of fresh water flow, water stress will prevail which limits plant growth.
4. The geological history (Williams, 1919) and associated changes in the vegetation (Curtis, 1933; Blascoe, 1975) uniformly indicate that the Sundarbans is in a period of slow decline and the results of this survey indicate that the decline has rapidly accelerated during the past few years due to shortage of fresh water.
5. To the extent that the newly initiated processes occurring in the Sundarbans and leading to its decline continue unabated, a point in time will be reached when the situation becomes irreversible and the current production value of the Sundarbans is lost...
7. It can be postulated that significant portions of the Sundri forest will enter into an irreversible decline within five to ten years if no immediate measures are taken to reverse the process.'

(23)

The variation in volume which can be harvested from the forest is from 1500 cubic feet<sup>\*</sup>, in the best quality (Class I) forest in the fresh water zone, to 20 cubic feet<sup>\*</sup> in the worst forest (Class III) in the saline zone. Special Studies contains a calculation for the annual average lost production based on the pessimistic assumption that current deterioration will continue to the extent that at the end of a twenty year felling cycle all Class I and II forests will have been replaced by Class III. The loss is then 350 Million Taka per year (US \$23 million).

This analysis of the deterioration of the Sundarbans is a great deal more rigorous and, therefore, more convincing than the analysis of the reduced production of agriculture. Nevertheless it falls short of proving that the deterioration of forests was directly caused by the reduced flows in the rivers of South West Bangladesh.

Doubts are raised by the observation, quoted above, that the deterioration may have started up to five years prior to the Special Studies field trip in early 1977. The first Farakka diversions were only two years prior to that trip. It is certainly true that the salinity of the Pussur river seems to have increased more substantially during 1976 than the salinity of the Baleswar. This fits with the observations of lesser damage in the area of forest fed by the Baleswar River. But, although there are no observations of salinity on the Sibsa River, where the forests deteriorated most, it seems unlikely that salinities in this river would have changed more as a result of reduced Gorai flow than did salinities in the River Pussur itself.

A rejection of natural explanations for the deterioration which simply states that, in the past, natural damage has only been minor, is not adequate. There are possible alternative explanations of the deterioration. One of them is mentioned, in passing, by the authors of this chapter of Special Studies. In an area of severe forest deterioration adjacent to the Pussur River, South of the confluence of the Mirgamari Gang and the Chachan Gang, they noted that the Chachan Gang 'had recently silted-in to the point that it was partially blocked and unnavigable' (24). It is not impossible that recent silting of these rivers could be a contributory cause of fresh water shortage and increased salinity.

#### CONCLUSIONS

The consequences of Farakka diversions for the agriculture of South West Bangladesh can only be proved by following a series of long and exceptionally complex chains of cause and effect. The chains described in Special Studies have several weak links.

The first weak link is the possibility that the negligible flow of the River Gorai in 1976 might have occurred naturally. I have concluded that the Farakka diversions are the most likely cause of the reduced flows, but it can be established no more strongly than that. A second weak link is the description of the processes by which reduced river flows cause moisture stress and delayed planting and by which salinity reduces agricultural productivity. There can be no doubt that such processes exist, but there is doubt about the magnitude of each effect. A clear description of the processes involved would aid the estimation of the size of each effect. In the absence of such a description, estimates must rest primarily upon the survey of agricultural losses.

That survey, unfortunately, constitutes a third weak link. Several doubts have been raised in this chapter about the implementation of the survey reported in Special Studies. The Thana Agricultural Officers who carried out the work appear to have been inadequately briefed and the survey results only cursorily checked.

Of these three weak links, only the first casts doubt upon the existence of agricultural losses. The second is a criticism of the work of the Special Studies team and the third suggests that agricultural losses may have been over-estimated in Special Studies. The crux of the matter is the extent of the over-estimate. Special Studies establishes that there were serious agricultural losses, but the Special Studies estimate of 650,000 tons of lost foodgrain production represents an upper limit of the loss.

The Indian Government's dismissal of agricultural damage is mistaken. It appears to be based primarily on the Indian assessment of likely salinity changes. The Indian Government did not believe that Farakka diversions would or did cause significant changes in salinity patterns in Bangladesh. Therefore, they rejected the possibility of agricultural damage.

The investigation of forestry carried out by the Special Studies team is more convincing than that made into agriculture. There is

clear evidence of recent, serious deterioration of trees in the Sundarbans. Although the consequences of this deterioration are less serious than those caused by agricultural losses, a threat to 45,000 jobs and of up to US \$23 million of production cannot be ignored. The authors of Special Studies concluded that 'upstream diversion of Ganges waters is responsible for the accelerated deterioration of the Sundarbans'.

Three doubts can be cast on this conclusion. It depends, as does so much else, on a direct link between reduced flows in the River Gorai and upstream diversion. That link can be presumed but not proven. A second doubt is raised by the failure of Special Studies to investigate and reject alternative explanations of forest deterioration, notably recent siltation. Finally, a third doubt is introduced by the time scale of the deterioration. The authors of Special Studies note that the decline started 'possibly as long as five years ago'. Farakka diversions commenced only two years prior to their visit to the area.

These doubts are largely allayed by the rigour with which the Special Studies authors dealt with this subject. They knew of these possibilities but, evidently, did not attach great importance to them.

The Government of India's rejection of claims of forestry damage is inadequate. India says that water from the Ganges does not reach the Sundarbans. The evidence suggests that the flows in the Gorai may influence the salinity of water in the Sundarbans, and that the flow in the Gorai may have been reduced by the Farakka diversions. This being so, the decline of the Sundarban forests in Bangladesh may be attributable to the Farakka diversions.

## Chapter Thirteen

### NAVIGATION, FISHERIES AND ECOLOGY

Professor B L C Johnson, in his book on the geography of Bangladesh, succinctly describes the communication problem of Bangladesh:

'Bangladesh suffers more than most countries from geographical handicaps to communications. Not only is the territory quartered by great rivers, exceedingly expensive to bridge, but for several months of the year these rivers and the deluge of monsoon rainfall on the near-level surface of the delta plains cause floods which further aggravate the problem. The extremes of seasonality add greatly to the costs of transportation. Much motor transport is rendered immobile by floods and heavy rain in the wet season when boats can ply in almost any direction across country. Alternately in the dry season river boats are limited to the deeper channels and the roads come into their own again.'

(1)

Was this communication problem greatly increased by the Farakka diversions? Were the ferries, passenger launches, mechanised cargo boats and indigenous 'country boats' disrupted? The first part of this chapter is concerned with this question. It is argued that reduced river levels in the Ganges are a direct and undeniable consequence of Farakka diversions. Lower water stages in other rivers are also likely to be the result of Indian withdrawals. There can be little doubt that inland navigation was hampered by unusually shallow river depths in 1976 and 1977. However, the Bangladesh Government's estimate that transport costs increased by 1 million Taka (US \$65,000) is an over-estimate.

The fishery sector of the Bangladesh economy contributes approximately five per cent to the Gross Domestic Product, four per cent to export earnings and, provides a livelihood to eight per cent of the population (2). Was the life-cycle of the fish in the rivers of Bangladesh so affected by the reduced flows that the yield of fish fell drastically? This is the second question to be discussed in this chapter.

The Bangladesh Government claims that fish catches went down by 25-66% as a consequence of upstream withdrawals. The Indian Government dismisses this claim, arguing that fish catches were already declining. The evidence presented in this chapter supports the Bangladesh claim.

Finally, did the whole eco-system of Bangladesh suffer such a dramatic change as a result of the Farakka diversions that the micro-organisms of human disease began to thrive as never before and the emblem of Bengal, the Royal Bengal Tiger, began to suffer from salinity? According to Bangladesh, widespread changes in disease propagation and ecology generally were beginning to be felt in 1976 as a result of Indian withdrawals. The evidence for these effects is slight and it is concluded in this chapter that the Bangladesh argument on these effects is unproven and in some places improbable.

#### NAVIGATION

Bangladesh has asserted that:

'The reduced flows of water seriously impeded inland water navigation. The role of inland water transport is critical in Bangladesh, since it has a poorly developed transport infrastructure and since it is making every effort to minimise its energy import bill. It is not really possible to monetize the loss from the impeded ability to navigate. However, the following disruptions of normal flows indicate the losses that Bangladesh suffered.

'Two major ferry terminals had to shift their operations: one four miles and one five miles. The major disruptions to navigation were as follows. Ninety miles of navigation routes on the Ganges (from Godagari to Aricha) went out of commission, 45 miles on the Gorai, and 15 miles on the Padma. These are significant distances in a vital development section in Bangladesh. In addition to these three specific reaches, navigation throughout the entire region was hampered.'

(3)

To which the Government of India replied as follows:

'Hardly any mechanised vessels ply on the Padma in Bangladesh up to its confluence with the Brahmaputra.'

According to transportation studies carried out by an independent group of experts the annual traffic in the Ganga varies from 2,000 tons upstream to about 28,000 tons near the confluence of the two rivers. Navigation is possible only in the months of high flow from June to November and practically ceases in the lean months.

'Given the unpredictability and negligible tonnage of navigation, the withdrawal of 40,000 cusecs at Farakka will make no material difference. Moreover the configuration of the bed of the Padma is such that there are only a few sandbars with deep pools between them. With a little dredging of the bars and river training measures it should be possible to sustain navigation on this river.'

(4)

#### Assessment of disruption of inland navigation

Despite referring (on page XI-2) to large-scale hydrographic surveys, the authors of Special Studies do not cite empirical data on the navigable depths in the rivers of the region before and after diversions from the Ganges. Instead, they have deduced, from stage-discharge relationships, the change in depth to be expected for a given change in discharge. The answers produced by this procedure are plausible, but the method does not seem to be appropriate for rivers subject to large cross-sectional changes. Where is the data from the hydrographic surveys? In lieu of that data, Special Studies informs the reader that depths of less than three feet were observed on the Rivers Ganges and Gorai-Madhumati during the low-water seasons of 1975-76 and 1976-77. The reader is also told that:

'Navigation was suspended in 1975-6 during the low flow season in the Ganges upstream of Raita, at the Gorai offtake, at Shilaidah and from Daulatdia to Tepurakandi. In 1976-77 the traffic was again disrupted upstream of Talbaria, at Shilaidah and at Satbaria. In these two years navigable waterways of about 105 miles length in the Ganges River between Godagari and Goalundo became unserviceable. In these two years, traffic by vessels drawing three feet or more was impossible in the Gorai River in the low flow season between its offtake and Kamarkhali, a distance of 45 miles.'

(5)



Though these claims are not adequately supported by field measurements, they are not unreasonable. At first sight, however the subsequent claim that, as a result, over ten million ton-miles of cargo traffic was disrupted, seems unlikely. The authors of Special Studies are not claiming disruption to the heavily trafficked waterways of Khulna, Barisal and Pathuakhali Districts, but they are nevertheless claiming that large tonnages of cargo could not be carried on the rivers adjacent to Kushtia and Faridpur Districts. Their claims are reproduced here in Table 13.1.

Unfortunately, the chapter of Special Studies dealing with this issue contains no estimate of the usage of the waterways of South West Bangladesh for navigation. In this case, a comment by the Indian Government appears to be valid, not only for the White Paper (for which it was intended) but also for the Bangladesh Government's more thoughtful presentation, Special Studies:

'The Bangladesh Government have refused to provide the base or benchmark data from which the alleged declines or deteriorations are said to have taken place. This failure suggests that the 'facts' and 'figures' they have quoted in support of their case are unfounded.'

(6)

The rivers of the South West Region of Bangladesh to the North of Khulna do not appear to be commercially important water routes. The rivers to the South and East of Khulna are, on the other hand, heavily trafficked both by mechanised cargo boats and by cargo-carrying country boats.

Bangladesh's waterways are classified by the Inland Water Transport Authority (BIWTA) into three categories. The navigability and depth of Class I waterways are guaranteed by BIWTA. All feasible aids are provided for Class II, but depths are not guaranteed. Class III routes are only marked for information, depths are not guaranteed (7). These classifications indicate the commercial importance of different routes.

The River Ganges above Ishurdi is unclassified, and between Ishurdi and Aricha, where it joins the Brahmaputra, it is only Class III

Table 13.1: Alleged inland water transport cargo reduction due to Farakka diversions

REACH	LENGTH AFFECTED miles	REDUCTION Ton-Miles	TRAFFIC Tons	COST Taka*
GANGES, Godagari to Aricha	90	8,571,330	95,232	2,571,399**
GORAI, offtake to Kamarkhali	45	1,750,320	38,896	525,096**
PADMA, Daulatdia to Tepurakandi	15	100,190	6,679	30,057***
TOTAL	150	10,421,840	140,807	3,126,552

Notes: \* freight cost is Taka 0.3 per ton mile  
 \*\* alternative is rail  
 \*\*\* alternative is road

Source: Special Studies, Table XI-2

with a draught of 4.5 ft. The upper reach of the Gorai, between Kushtai and Kamarkhali, is also Class III with a 4.5 ft depth. Between Kamarkhali and Bardia, just above the offtake of the Atharabanka River, the Gorai is unclassified. It is only the lower reaches of the Gorai-Madhumati which achieve Class I status, indicating importance (8).

These BIWTA classifications appear to support the Indian Government's contention that navigation on the Ganges and Gorai is negligible during the dry season. However, the Special Studies team asserts otherwise. Table 13.1 indicates the Special Studies estimate of cargo diverted from the Ganges and upper Gorai to other routes.

An approximate check can be made on the cargo carried on the Ganges during a normal dry season. From a survey carried out by the Economist Intelligence Unit, it is possible to identify dry season country boat cargoes from Rajshahi and Pabna Districts to Dacca and Chandpur. These cargoes are clearly going to use the Ganges route. In a ninety-day dry season approximately 26,500 ton of cargo is carried by country boat between these destinations (9). This is something of an underestimate because other points will be served by this route, though the size of that traffic cannot be identified from the EIU data. Annually, a further 50,000 tons is carried on this route by mechanised cargo boat (10). The proportion of that traffic carried in the dry season is difficult to determine, but 5,000 tons is unlikely to be an over-estimate. In two dry seasons, therefore, a traffic of at least 63,000 tons can be expected along the Ganges. The 95,000 ton estimate of Special Studies, therefore appears to be of the right order of magnitude. That traffic is not, however, carried 90 miles, as the calculations of Table 13.1 imply. Some of it travels the full 90 miles of waterway, some less. An average distance of 45 miles might be a closer estimate.

This confirmation of the Special Studies estimate suggests that, although the Ganges and Gorai are not amongst Bangladesh's most important waterways, nevertheless significant disruption of inland navigation was caused by Indian withdrawals of Ganges water.

There is a further Bangladesh claim that the terminals of the major ferries across the Ganges had to be moved as a result of reduced flows. This is improbable. Special Studies records the claim but does not provide evidence of the stability of the terminals in years when there were no diversions. Special Studies states that the Aricha terminal was moved four miles downstream to Daskandi, the Goalundo terminal was moved, 3.5 miles East to Daulatdia, and that terminals at Paksey and Bheramara, near the Hardinge Bridge, had to be moved 1,000 ft because of lower water levels. The cost of moving these terminals is estimated at two million Taka for 1975-6, and a similar estimate is given for 'increased maintenance' in the following year (11).

My observation of the terminals in question casts doubt on these estimates. The terminals are simple floating wharves, joined to highways by crude earth and brick roads. They are apparently intended to be relocated from season to season and year to year. Seasonal variation in river levels, and natural river course changes, mean that the terminals have to be mobile. The costs of relocation cannot be attributed to the Indian withdrawals.

#### FISHERIES

In its White Paper, the Government of Bangladesh has claimed:

'Fish is by far the largest source of Bangladesh's protein as well as one of its major export products. The reduced water availability significantly reduced the landing of fish probably because of the disturbance of the historic food chain and the inability of the fish to tolerate shallow depths and the unprecedented levels of salinity. At three key landing points namely, Khulna, Goalundo and Chandpur, the percentage of reduction in the landing of fish during February to June, 1976 compared to the corresponding period of 1975 was 75%, 34% and 46% respectively. Fish prices increased approximately by 25%, 13% and 31% respectively at those landing docks. The near and long term effects on the spawning cycles and fish size and population need also to be recognized. The effect of depletion in the water level of the Ganges in the dry season registered its effect on the migratory 'Hilsa' that comprises 40% of the total fish catch, in the very insignificant catch of this variety of fish in 1976.' (12)

The Indian Government's The Farakka Barrage contains this reply:

'The Farakka Barrage cannot have harmful results for the monsoon Hilsa catch in Bangladesh as it does not alter the flow pattern in the monsoon months. All the sluice gates of the barrage remain open in that season. In addition, a special lock to facilitate the movement of fish has been provided in the barrage in consultation with fishery experts...

'It is commonly known that the migration of the Hilsa varies widely from year to year. According to figures available, landings of this fish in India declined from 3441 tons in 1964 to 404 tons in 1973. In 1976 too catches have been very meagre in West Bengal in spite of the Farakka water releases through the Hooghly.

'It may be added that over several years Bangladesh has been experiencing a decline in fish production. This may be due to a variety of factors such as: indiscriminate netting on account of the existing system of leasing fishing grounds; conversion of ponds into agricultural land; uncontrolled use of insecticides and pesticides in farms, resulting in serious losses of the fish population; construction of embankments in estuaries in the coastal districts, thus impeding the movement of fish; and industrial pollution of water systems.'

(13)

Countrywide statistics of fish catches in Bangladesh are apparently as unreliable as statistics for agricultural production. Despite the Bangladesh Government's claim, above, the Directorate of Fisheries recently issued figures which show the catch of Hilsa fish uncannily constant at between 382,000 tons and 384,000 tons for the four years from 1972-73 to 1975-76 (14). The latter year is one in which large scale Farakka diversions took place. In the same period the total annual catch from inland waters varied only from 731,000 tons to 734,000 tons.

The Special Studies investigators of this sector were reasonably methodical and they did avoid using the Fishery Directorate's statistics. They first described the processes by which the Farakka diversions could have affected the fish catch, and then presented their statistics to show that fish catches had fallen.

Landlocked water areas, they wrote, suffered from lower water levels and in some cases dried up. These areas of ponds and ponded water in

river channels normally provide habitat for fish. 'The lowered level', they wrote, 'may cause an environmental change, in which the habitat is not favourable to fish life'(15). In open fisheries, they claimed, 'the decreased flow and shallow depth of fresh water in the Ganges and its distributaries severed the fish run from the Bay of Bengal to the spawning areas'(16). In addition they claimed that the barrage itself, fish-lock or no fish-lock, would prevent Hilsa fish from reaching their spawning grounds. In support of this claim, they cite the effects on Hilsa migration of dams or barrages across four Indian rivers, the Cuvery (Cauvery?), Coleroon, Kistna and Godavery and, similar effects on the Sardine fisheries of the Nile after the construction of the Aswan High Dam.

Having described how they think that the Farakka diversions affected the tonnage of fish caught in Bangladesh, the authors then produce their evidence of reduced fish catches. If national fishery statistics are unconvincing, there is at least a possibility that a local fishery will keep reliable records which will accurately reflect the national pattern of fish catches. Co-operatives in Bangladesh are not normally noted as bastions of accounting rectitude but the Nawabganj Fishermen Co-operative Society of Rajshahi may be an exception. Their figures (Table 13.2) do not look unreasonable and, if they are believed, they show fairly constant monthly catches between 1968 and 1973 (with the exceptions of 1971 and 1972 when the co-op did not function), a slight drop in 1974, followed by dramatic reductions in 1975 and 1976, when average monthly catches were only 19% and 7% respectively of the preceding years catches.

The statistics for Minkur-Jafarabad Fishery are supported by figures for the tonnages of fish transported from selected Faridpur District railway stations (Table 13.3). These statistics are less satisfactory because they cover only the dry season (November to June), because they are only annual, not monthly, figures, and because only four years of data are provided. Nevertheless, they show a similar pattern to the figures from Nawabganj. The 1973-74 shipments are substantially down on the preceding years and in subsequent years only negligible tonnages of fish were transported.

Table 13.2 Catch of Hilsa in the Minkur-Jafarabad Fishery in the River Ganges

MONTH	<u>Catch of Fish</u>								
	<u>Pounds</u>								
	1968	1969	1970	1971	1972	1973	1974	1975	1976
January	6150	8200	1020	-	-	8200	10250	492	164
February	4100	4920	6150	-	-	5330	2050	410	164
March	-	-	820	-	-	410	-	-	-
April	820	1230	2050	-	-	1230	-	246	82
May	2050	4100	4920	-	-	2050	820	856	162
June	4100	6150	6150	-	-	2870	2050	820	410
July	8200	2050	7380	-	-	820	820	1230	820
August	820	410	1640	-	-	164	246	246	164
September	410	410	1230	-	-	820	410	246	82
October	2050	820	2050	-	-	2050	820	328	164
November	4100	4100	4920	-	-	8200	2460	574	328
December	8200	10250	7380	-	-	7380	10400	2050	246

Source: Special Studies, Table IX-9

Table 13.3: Hilsa transported by train from railway stations in Faridpur District, November to June 1972-76

STATION	QUANTITY TRANSPORTED BY TRAIN NOVEMBER TO JUNE Tonne			
	1972-73	1973-74	1974-75	1975-76
Surjanagar	56.3	74.8	3.9	3.9
Belgachi	108.0	94.4	8.8	4.4
Kalukhali	173.9	45.6	7.3	4.5
Pangsha	778.2	104.0	11.7	8.7

Source: Special Studies, Table IX-10



The authors of this chapter also claim that increased salinity will have affected the supply both of phytoplankton, on which the fish feed, and of fresh water fish. In the summary, which appears to be different in tone to the chapter which it summarises, the authors conclude:

- '1. Upstream withdrawals can lead to problems of water shortage and saline intrusion.
2. Part of the Ganges and Gorai riverbeds emerge from the water and form shallow pools.
3. Intensive fishing in the pools cause a reduction in fish production during the following years and a decline of fish seed industry and seed supply for fish culture in impounded fisheries.
4. The Ganges Ilisha [ Hilsa ] which is well liked by the people and is the most important fish will suffer extinction because of the decrease in its main spawning ground.'

(17)

The only plausible and informative statistics in this chapter are those from the Nawabganj Co-operative. If those statistics are reliable, two conclusions may safely be drawn. Firstly, the Indian suggestion of variable and declining Hilsa catches appears to be incorrect. Secondly, something happened in 1975 and 1976 which dramatically affected the catch of Hilsa. The Farakka Barrage itself was actually completed in 1970 but, diversion of water began possibly at the end of 1974, certainly in April of 1975. If the problem is that the migration of the Hilsa is interrupted by the Barrage it is surprising that the effects were not noticeable earlier than 1974. Nevertheless, there does seem to be a case that the diversions have disrupted the catch of Hilsa. There could, of course, be other explanations for the dramatic fall of the Nawabganj catch, and the Indian Government has suggested several such explanations. However, the Farakka Barrage and the Indian withdrawals from the Ganges appear to be the most dramatic human interventions in the ecology of the Ganges in the period of declining catches. New embankments, pesticides, industrial pollution, indiscriminate netting - these are all possibilities. But there is no particular reason why these factors might suddenly have caused declining fish catches in 1975 and 1976. The Farakka Barrage is a much more likely cause of damage to the ecology supporting inland fisheries.

## ECOLOGY AND HEALTH

The chapter in Bangladesh's White Paper on 'the impact of India's unilateral withdrawal of Ganges water' ends with these two paragraphs on health and ecology:

'Increased salinity also has an adverse effect on health. The ill effects result principally from increased salinity in the drinking water. Roughly 5% of the drinking water tubewells were rendered inoperative during last year's dry season and substantial part registered high salinity. The effect of salinity on health occurs when the body is incapable of absorbing any more sodium. The manifestations are hypertension. The shorter term system of disease is dysentery. In addition, the propensity to fall prey to cardiological illness is increased. The problem of saline effects on human consumption can be serious anywhere in the world. It is of a much larger order of potential threat in Bangladesh since the nutritional standards already made the bulk of the population tremendously susceptible to all forms of illness.

'Finally, it is necessary to consider the total ecocycle and ecology of the region. It is also necessary to consider more than the economic aspects of ecology. The wild life of the Sundarbans are already endangered species. It is hard to reconcile to this abrupt change in the balance of nature when the awareness of the necessity for taking full account of its own ecosystem, that of its neighbour, that of its region, and that of the world, is ever growing in countries all over the world.'

(18)

India's response to these claims (treated in reverse order) is as follows:

'Bangladesh has stated that the existence of wildlife, and recently even some species of birds, have been endangered in the Sundarbans. India shares the natural forest wealth of the Sundarbans together with its wildlife and birds, but no such adverse effects have been noticed on the Indian side. If the animal and bird life of this region is endangered because of other reasons such as ineffective measures for their preservation and man-made activities it is a matter of concern to India.

'The eastern region, the Indian part of it as well as Bangladesh, has always faced environmental problems related to climatic and geographical factors. Because this region is close to the sea the problem of salinity, with its adverse environmental implications, has always

been present. Floods of the kind which devastate the region every year during the monsoon constitute a threat to its environment. Withdrawal of water from time to time for beneficial uses is also likely to have some impact on ecology, but this cannot provide a justification for allowing the river waters to drain into the sea unused.

'Ecological and environmental problems are complex and call for a comprehensive, integrated and multi-disciplinary approach. Such problems cannot be solved on the basis of an exaggerated emphasis on only one factor such as withdrawals at Farakka, or on the problems of only one area to the exclusion of others. Insistence on a single-river approach and a reluctance to examine all available and feasible technical alternatives cannot also lead to a solution.'

(19)

The Government of India does not attempt to answer the allegations regarding the effect on the health of Bangladeshis.

The authors of Chapter VIII, 'Environment and Ecology', of Special Studies, might profitably have read the Indian Government's comments quoted above before they started researching and writing their chapter. It contains useful descriptions of the ecology and population of Bangladesh but it adds little to the Bangladesh Government's assertion of damage.

The archeological sites of South West Bangladesh are listed and we are told that they are liable to damage by 'the aggressive environmental conditions created by the upstream withdrawals' (20). Humidity, temperature and salinity changes, it seems, will be attacking these structures. Without more detailed evidence indicating the peculiarity of the conditions introduced by Farakka diversions this is difficult to believe.

Various diseases are discussed in the same chapter. Specifically, malaria and cholera are expected to increase as a result of the Farakka withdrawal. Increased areas of stagnant water, we are told, may provide added mosquito breeding grounds and saline intrusion will provide new habitats for those mosquitoes which thrive in saline water. 'Cholera has reached its peak severity as a result of

inadequate sanitary water availability during the dry season. A further reduction in this availability', say the authors, 'has been caused by upstream diversion which increases the danger of a major cholera epidemic' (21). Are these changes all in favour of disease propagation? Is the change in water availability caused by Farakka diversions significant? Special Studies does not say. It is difficult to believe that the changes resulting from Farakka diversions have a significant effect on either of these diseases. If there has been a reduction in food and water available to the people of the South-West Region, clearly their health will have suffered as a result, but second-order disease effects cannot reasonably be attributed to Farakka diversions in an area subject normally to large climatic variation.

The authors of Special Studies would have us believe that even the Bengal tigers are opposed to the Farakka diversions:

'The tigers in the Sundarbans will be adversely affected by upstream withdrawals of Ganges water. The tigers' inclination to attack humans is related to the availability of food and fresh water...Saline intrusion resulting from upstream diversion will cause deer to migrate to other areas, and the tiger will follow the deer. The deer is the tiger's principal food and he also needs fresh drinking water. There is a theory that tiger ferocity is increased by drinking brackish water, but this has not been conclusively proved. Either of these reasons, or both, will result from any increase in frequency, duration, degree or extent of saline intrusion in the Sundarbans because they will intensify human-tiger interactions to the detriment of both.'

(22)

It is not clear who will suffer most in these intensified human-tiger interactions, but it is very clear that, whichever party it is, they may blame the Farakka diversions.

#### CONCLUSIONS

According to the Bangladesh Government, diversion of water at Farakka made navigation difficult or impossible in many of the river channels of South West Bangladesh, and enforced the removal of several ferry terminals. Special Studies provides support for the first claim and

records the second.

The authors of Special Studies estimate that there was a reduction in commercial navigation, attributable to Farakka diversions, of ten million ton-miles, at a cost to the Bangladesh economy of three million Taka (US \$200,000). Most of this loss occurred as a result of reduced water depths in the Ganges. There can be no doubt that these lower water stages were a direct result of Indian withdrawals. The Special Studies estimate of the loss appears to err on the side of pessimism but the surveys of the Economist Intelligence Unit suggest that the order of magnitude is correct.

The Bangladesh claim that expenditure of a further two million Taka was incurred relocating ferry terminals is doubtful. The terminals are designed to be mobile, to allow for seasonal and other natural changes in the river's course.

The consequences of the Farakka Barrage on fish catches are less easily identified. Bangladesh Fishery Directorate statistics record a static annual national catch, but even the Indian Government accepts that the catch of at least one fish, the Hilsa, is declining. However, the records of one fishery show fairly consistent monthly amounts of Hilsa being caught until the dry season of 1975 when a sharp decline took place. These records are confirmed by the statistics of Hilsa transported from railway stations in the area, although these quantities start to decline earlier.

The cause of this decline in the Hilsa catch has not been fully identified. The Farakka Barrage itself may be interrupting fish migration, or the reduction in water volume may be the cause. It is impossible to wholly discount other explanations for the decline but the most substantial intervention into the ecology of the Ganges in recent years is the Farakka Barrage. There is a strong presumption that it is this which has caused declining fisheries.

Finally, we have seen that the assertion of the Bangladesh Government that there have been serious adverse consequences for the health of

the people and the ecology of South West Bangladesh is poorly supported by the available evidence. There may have been a shortage of drinking water in parts of Bangladesh during parts of 1976 and 1977 but evidence of this hardship is not documented in Special Studies.

It is doubtful if changes in water flow and salinity will invariably have increased disease propagation; in some cases these changes may have brought reductions. There may be long term ecological and health changes occurring as a result of the Farakka diversions but they may be difficult to detect at this stage. And it is also possible that the ecology of South West Bangladesh is more stable than Special Studies implies. Certainly, on the evidence so far available, there is little reason to sustain the Bangladesh claim of serious damage to ecology and health in the South West of the country.

IV

THE PROSPECTS

## INTRODUCTION

The Ganges Waters Treaty of November 1977 set aside one major area of dispute for settlement at a later date. The Joint Rivers Commission was deputed to discuss and then to recommend to the Governments of India and Bangladesh a project or projects for increasing the dry season flow in the River Ganges. As has been described in Chapter Nine of this thesis, the Commission's discussions had made little progress by the beginning of 1980.

This section of the thesis investigates the technology and politics of the two proposals on which the negotiations have so far focussed. The Indian Government has proposed the construction of a canal to carry water from the River Brahmaputra to the Ganges, whilst the Government of Bangladesh has suggested that a large number of reservoirs should be built to store the flood waters of the Ganges for use later in the year. Chapters 14 and 15 deal with these two governmental proposals. (A number of other suggestions have been made for the general direction which development of the Ganges should take. Some of these suggestions are briefly explored in Appendix D.)

The scheme chosen by the two governments may dominate development of the Ganges and Brahmaputra for many decades to come. The choice may thus be an important factor determining the future prosperity of more than 350 million people, nearly a tenth of the world's population, living in the two river basins. The two governments' proposals are also likely to be very expensive to build. Indian Government engineers estimate that their scheme will cost in excess of US \$6,000 million. This is equivalent to the whole of Bangladesh's Gross National Product for 1978 or to almost one tenth of India's for 1976. The Bangladesh Government's proposal is unlikely to be significantly less costly.



Although the Indo-Bangladesh talks have so far been slow to progress, there is a growing body of opinion within both countries favouring large scale development. For example, B G Verghese, a respected former Indian newspaper editor and now a Gandhi Peace Foundation Fellow, has urged:

'The fantastic potential of the Greater Ganga Basin cannot be allowed to remain grossly under-utilised for another long period of years by [ which time ] costs will have risen greatly and population pressures will have multiplied...'

(1)

In the opinion of Verghese, the 1977 Treaty 'unlocks the door' which has hitherto barred access to the potential of the basin.

This section of the thesis is devoted to a discussion of the issues involved in the choice of technology facing the two governments and the way in which those issues have been presented. The 'fantastic potential' of the Ganges and Brahmaputra cannot be tapped easily. Considerable technical and political obstacles must be surmounted before a choice can be made.

The nature of these technical and political obstacles can be identified from an analysis of the two documents exchanged by India and Bangladesh in March 1978. These two papers setting out the considered intentions of each government are entitled as follows:

Government of India, Ministry of Agriculture and Irrigation,  
Department of Irrigation,  
Proposal for augmenting the dry season flow of Ganga,  
New Delhi, March 1978;

Government of the Peoples Republic of Bangladesh, Ministry  
of Power, Water Resources and Flood Control,  
Proposal for the augmentation of the dry season flow  
of the Ganges, Dacca, March 1978.

The two documents are henceforth referred to as the Indian Proposal and the Bangladesh Proposal, respectively.

Maintenance of national sovereignty and competition for control of a resource appear to be two of the more important political obstacles

to the utilisation of the waters of the Ganges and Brahmaputra. It will be argued in the following chapters that these are the underlying objectives of the two governments in their conduct of the negotiations. It will be shown, however, that these political objectives are almost inextricably linked with the technical perceptions and technical choices made by the authors of the two Proposals. The technique of one side appears to the other to have political motives and mistaken assumptions. The two Proposals present the cases for and against the two governments' schemes largely in terms of technical rationality. In some cases this technical rationality masks a political choice. From a comparison of the two documents, for example, it is possible to identify a few instances where technical uncertainties, particularly in the estimation of quantities of water supply and demand, are interpreted to suit the case for or against a politically chosen option.

Ambiguities in the text of the Ganges Waters Treaty are also exploited by the two governments in pursuit of their underlying political objectives. In Chapter 9, certain limitations of the Treaty were identified. The Treaty recognises a 'long-term problem of augmenting the flows of the Ganga during the dry season' (Article VIII) and commits the two governments to solve it, but it does not state what 'the problem' is: it does not define the purpose of augmentation nor even the geographical limits within which it should take place. It will be seen in the following chapters that this lack of definition allows the two governments to choose schemes with widely differing objectives. The differences can be understood by referring back to the contrasting political ends of the two governments.

The implicit political ends of the two governments seem to be, as I have said, maintenance of national sovereignty and competition for control of a resource. The sovereignty under threat is Bangladesh's rights and freedoms over the Brahmaputra, and the resource for which the two governments are competing is the water flowing in that river.

Having experienced a dispute over the waters of the Ganges and, as a result, having ceded a measure of control over that river to India,

the Bangladesh Government wishes to avoid a similar situation arising with the country's other major river. The Bangladesh Government does not relish the prospect of India gaining physical control over the Brahmaputra nor the suggestion that India should make use of a substantial share of the Brahmaputra's waters. The former possibility is viewed as a threat to the sovereignty of Bangladesh and the latter as a danger to the country's economy and ecology. To avoid these possibilities, Bangladesh suggests that water shortages in the Ganges Basin can be augmented by schemes within the Basin. Bangladesh believes that enough flood water can be stored in reservoirs within the Ganges Basin to meet all the needs of the Basin. Such a scheme would present less of a threat to Bangladesh's sovereignty. It also evades India's claim to the Brahmaputra's waters.

The Indian Government's objective is, for perfectly laudable motives, to increase the sum of water available for the development of India. The Government of India perceives water shortages both within the Ganges Basin and elsewhere in India. The waters of the Brahmaputra can only be used to a limited extent in Assam, the Indian State through which the river flows. If, however, some of the 'excess' water could be diverted into the Ganges Basin, then water flowing in the Ganges could be released either for use higher up in the basin or transferred out of the basin for use in areas of perennial drought.

Bangladesh believes that water is best transferred over time; India that it is best transferred over space. It is in each country's national interest so to believe.

Even in their introductory summations of the 'problem', the perceptions of the two governments can be seen to diverge. It is national interest - the political ends of maintenance of national sovereignty and resource competition - which explains this divergence.

In its Proposal, the Indian Government refers to 'one big river system, namely, the Ganga-Brahmaputra-Meghna' (2); whereas Bangladesh is concerned only with the Ganges River and the Ganges Basin. India provides statistics which describe the combined flow

of the Meghna Estuary where it enters the sea; Bangladesh lists statistics which refer only to the Ganges (3). The two governments are perceiving 'the problem' in the way which best suits their national interests.

We shall see, in the following two chapters, that these political objectives gain expression throughout in the assumptions, perceptions and choices of a political battle waged in technical disguise (4). This dispute, over alternative techniques for increasing the flow of the Ganges, is the last of the many such disputes characteristic of the development of the Ganges which will be discussed in this thesis.

The following two chapters are structured to provide first a description of the Indian or Bangladesh scheme, followed by a summary of the arguments for and against the scheme. At the end of each chapter a conclusion reviews the political objectives of each proposal and the ways in which ambiguities in the 1977 Treaty and technical uncertainties have been harnessed to those ends.

## Chapter Fourteen

### A BIG CANAL?

The Indian scheme for augmenting the dry season flow of the Ganges consists of a barrage across the River Brahmaputra and a canal to take water from that river to the Ganges at Farakka (see Figure 14.1). At a later stage the Indian Government intends to construct three storage reservoirs in the Eastern foothills of the Himalayas to supplement the dry season flow of the Brahmaputra. Each of these five structures - the barrage, the canal and the three dams - is large. The canal, for example, will be 200 miles (320 km) long and 900 ft (270 m) wide, and the Brahmaputra barrage will supplant that at Farakka as the world's largest. Altogether, the five structures could cost in excess of US \$6,000 million. (The cost estimates contained in the Indian Proposal are reproduced here as Table 14.1).

The Indian Government's justification for this scheme rests on a number of inter-related points. First of all, the Government argues that there is a shortage of water in the Ganges Basin which cannot be overcome by schemes within that Basin. According to India, all feasible reservoir sites within the Basin could not store enough water for the needs of the two countries (three, if Nepal is taken into account). Secondly, Indian planners assert that the needs of Indian drought areas outside the Ganges Basin must be considered, and the Ganges is the nearest source of water. Finally, the third Indian point is that there is water available and unused in the Rivers Brahmaputra and Meghna at times of year when the shortages in the Ganges Basin are most acute.

It is clear from its Proposal that the Indian Government's perception of the 'problem of augmenting the flows of the Ganga' is not bounded by the watershed of the Ganges Basin. Both needs for water outside the Basin and sources of water outside the Basin are considered. We shall see in Chapter 15 that the Bangladesh Government contends that 'the problem' and its resolution should be limited to the Ganges Basin.

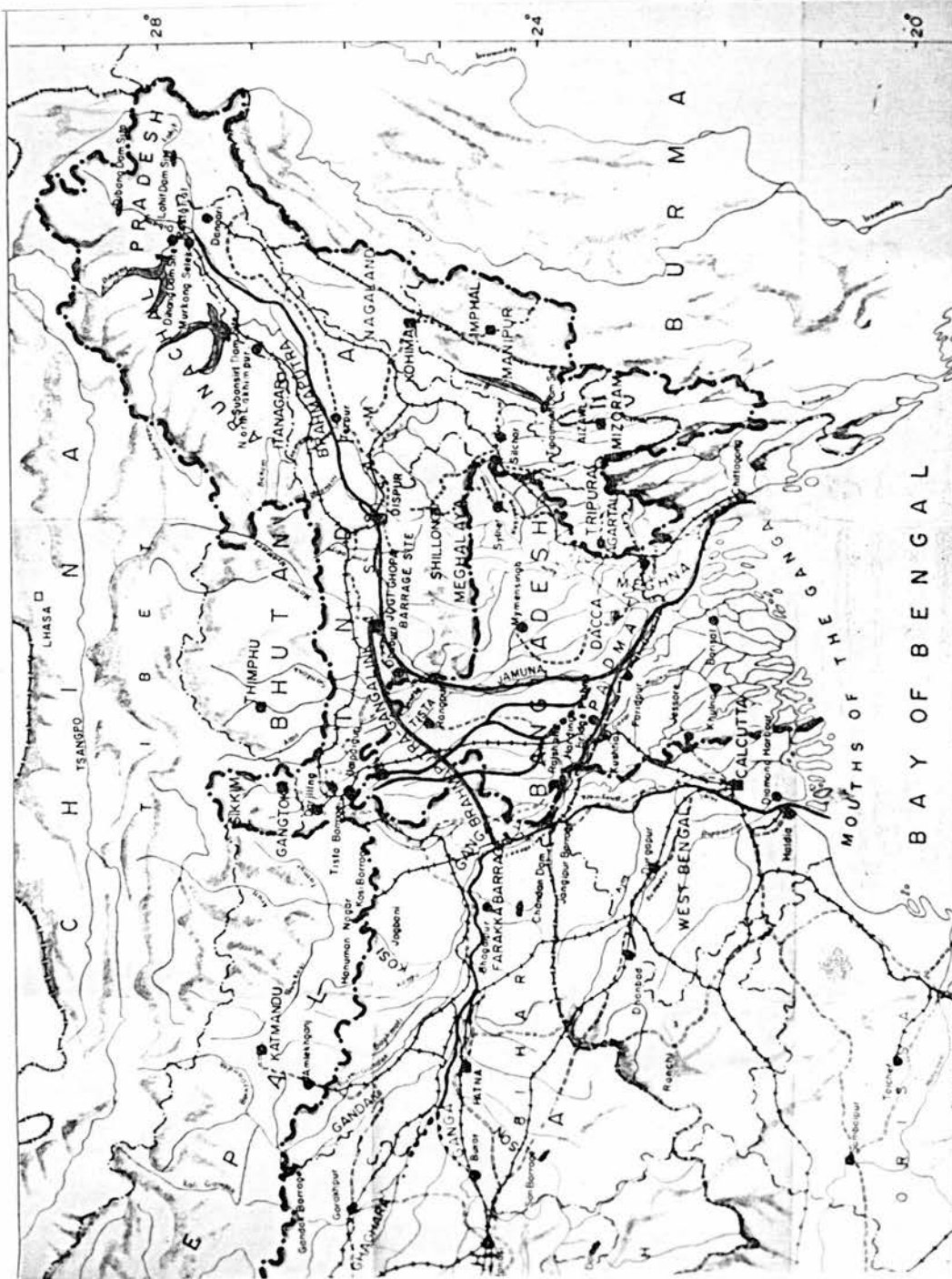


Figure 14.1: Map of India's proposed Brahmaputra-Ganges Canal.

Source: India, Proposal for augmenting dry season flow of Ganga, Delhi, 1976

Table 14.1: Approximate cost of the Indian Proposal at 1978 prices

COMPONENT	COST	
	Rupees x 10 <sup>9</sup>	US Dollars x 10 <sup>9</sup>
Barrage across the Brahmaputra at Jogighopa and 150 MW power plant	4.5	0.5
Ganges-Brahmaputra link canal including ancillary works	17.5	2
Dam across River Dihang, including 7,500 MW power plant	22.0	2.5
Dam across River Subansiri, including 1,800 MW power plant	10.7	1.2
Dam across River Barak with 660 MW power plant	6.3	0.7
	<u>61.0</u>	<u>6.0</u>

Source: Indian Proposal, p 83.

The Indian Government's Proposal stakes a claim to the waters of the River Brahmaputra. That claim is made, however, not through an outspoken assertion of rights and the power to implement those rights, but with the painstaking construction of a case, based on technical rationality, for a particular scheme of engineering works.

This chapter explores the Indian Government's case, the way in which it is made, and some of the arguments which have been raised against it. We shall see that technical uncertainties, and ambiguities in the terms of reference for the discussion, provide the authors of this Proposal (and also the authors of the Bangladesh Proposal) with a useful political resource, providing a technical expression of political aims.

The chapter is divided into four sections: (i) a description of the engineering structures which India proposes should be built; (ii) the arguments put by India in favour of this scheme; (iii) the objections to the scheme, and (iv) a conclusion identifying the ways in which technical perceptions, assumptions and choices coincide with political objectives.

The first two sections of the chapter are based on information contained in India's Proposal. Section (iii) includes quotations from interviews I had with Bangladesh officials, and from one Bangladesh official's personal commentary upon the Indian Proposal. This personal commentary I have dubbed the Insider's critique.

#### DESCRIPTION OF THE INDIAN PROPOSAL

##### The barrage

India proposes to build a barrage across the River Brahmaputra at Jogighopa, in Assam, 70 miles downstream of the State's capital, Gauhati. At one and a half miles long, the barrage will be slightly longer than the Farakka Barrage, but in most respects it will be a similar structure. Its purpose is the same as that of the Farakka Barrage: to raise the river level so that water will flow by gravity



into a canal.

Indian engineers chose the Jogighopa site partly because the river is narrow and its bank stable at that point, but also in order to maximise the benefits of the project to both countries (1). However, they did not consider potential sites in Bangladesh.

#### The canal

The Brahmaputra Barrage is intended to feed water into a 200 mile long canal which will transport the water to the Ganges at a point just upstream of the Farakka Barrage. The Indian Proposal suggests that this Brahmaputra-Ganges Canal should have a capacity of 100,000 cusecs, and a depth of 30 ft (2). In this case the width of the waterway would be approximately 900 ft (3).

According to Indian estimates, the canal would occupy 20,000 acres of Bangladesh land and a further 44,950 acres in India (see Table 14.2). As these estimates suggest, slightly more than two thirds of the length of the canal would be through Indian territory.

#### The Dihang, Subansiri and Tipaimukh Dams

The River Brahmaputra rises in Tibet and for more than half the river's length it flows East through that region of China. As the river turns South and crosses into India the river falls through about 7,500 ft in a distance of 200 miles. The hydroelectric potential of this reach of the river is considerable (4). As the river crosses into India, it takes the name Dihang. The Indian Government proposes that a rock-fill dam should be built on this river at a site 25 miles North of the Assam plain.

The dam would be 800 ft high and half a mile long, resting on hard jointed Basalt foundations. Indian engineers estimate that the reservoir behind the dam would have a gross storage capacity of 26.5 million acre-feet (MAF), making it four times larger than the largest reservoir in India, and about the same size as the largest in the USA. The live storage (that is, after allowing for eventual

Table 14.2: Indian Government estimates of land areas required for the Indian Proposal

COUNTRY	AREA REQUIRED (acres)	
	Brahmaputra-Ganges Canal	Brahmaputra Barrage
Bangladesh	20,000	0
India	<u>44,950</u>	20,000
	64,950	

Source: Indian Proposal, p 69).

siltation and the minimum head for power generation) of the reservoir would be 17.2 MAF, and a hydroelectric power generation station built at the dam could provide 7,500 MW (at 60% load factor). India estimates that this reservoir alone could store enough water to augment the dry season flow of the Brahmaputra from 60,000 cusecs to 120,000 cusecs. However, the reservoir would flood 137 square miles, in the midst of which is the town of Along.

India proposes a second dam on the River Subansiri, the first major tributary to join the Brahmaputra in the plains of Assam. This tributary also flows from the Tibetan Himalayas. India suggests a 700 ft high rock-fill dam, at a gorge 40 miles North of the Assam town of North Lakhimpur. The reservoir behind the dam could store 7.5 MAF and augment the dry season flow of the Brahmaputra by 25,000 cusecs. 1,800 MW of electricity could be generated at the dam. Fortyone square miles and a large village called Daporijo would be flooded.

An added benefit of these two reservoir projects is that they could mitigate the flooding potential of the Brahmaputra. Indian calculations suggest that a flood peak of 1.5 million cusecs at the Dihang Dam site could be reduced to 1 million cusecs, and an additional reduction could be made by reducing the flood peak of the Subansiri River.

A third dam proposed by India, the Tipaimukh Dam on the River Barak, is much smaller than the first two. This dam could provide live storage of 6 MAF and 600 MW of hydroelectric power. India also states that it could 'control flooding in the districts of Sylhet and Dacca in Bangladesh and Cachar in India' (5). The Indian Proposal also mentions a number of other potential reservoir sites, but detailed descriptions are not provided.

#### Level crossings

The Brahmaputra-Ganges Canal crosses a series of rivers in North West Bangladesh and could disrupt the North-South flow of natural drainage. In particular the canal crosses the Tista River at right angles, at a

point North West of Rangpur. The Indian Proposal states:

'For major rivers it would be more convenient to have level crossings which would permit navigation also along the rivers being negotiated.' (6)

A four-way, river-canal junction, similar to a road junction is envisaged for the Tista crossing and possibly also elsewhere. This would be a major engineering project and, possibly, the largest such 'level crossing' in the world. Indian engineers believe that such a crossing could be operated with one barrage across the river and one regulator at the outfall of the canal (7).

#### THE CASE FOR THE INDIAN PROPOSAL

The Indian Proposal is a carefully written, well-reasoned document, longer and more detailed than its Bangladesh counterpart. It sets out the Indian case in three parts. First it outlines the context in which India wishes the augmenting of the Ganges to be considered: the needs of different parts of India for water and the problem of flooding. Then, the Proposal explains India's reasons for rejecting surface water storage in the Himalayan tributaries of the Ganges as a satisfactory way of meeting the demands for water which India perceives. Finally, the Proposal provides the central arguments justifying the Indian scheme.

#### The context

The Indian Government's interpretation of why and where the water is needed is given in the 'Problems, needs and opportunities' chapter, which constitutes almost a third of their Proposal.

Surprisingly, perhaps, this chapter opens with a description of the problem of floods in India and Bangladesh, leading to a summary of the Indian experience with flood control measures. Deepening and resectioning rivers has been found to be ineffective and prohibitively costly, and doubts have been raised about the efficacy of embankments. However, embankments used in conjunction with multi-purpose reservoirs

have proved more effective. That presumably is the moral to be drawn: reservoirs are good for flood control, and the Indian Government consider that flooding is one of the problems which should be tackled in the course of augmenting the flow in the Ganges.

The chapter goes on to describe a 'flood-drought-flood syndrome', a perennial problem of Bangladesh and India:

'Floods and drought alternately bring havoc and tragedy to a large number of people. Therefore, control of floods and removal of drought are high priority problems facing both countries.' (8)

The Bangladesh Government would not disagree. However, it would and does disagree with India's enlargement of the geographical context. The Indian Government thinks that discussion of the 'problem' of augmenting the low flow of the Ganges should include consideration of the needs of Indian drought areas outside the Ganges Basin:

'A major policy of the Government of India is to remove to the maximum extent feasible, the regional disparities with regard to irrigation development and water availabilities. A national plan for the optimum exploitation of the water resources of the country, within a national policy framework of the accepted social goal to remove the regional disparities, is under formulation. Since the Ganga is the major source of water within economic reach of the water-short areas in the country, any perspective plan in the context of the needs of the country as a whole cannot overlook the possibilities of use of the Ganga waters for the drought areas which lie outside this basin. All the indications point to the need for a sizeable diversion of Ganga waters, when they get augmented, for meeting the growing needs of water-short areas in India, after taking due consideration of the in-basin needs.' (9)

No estimate is provided by the Indian Proposal of the quantity of water needed by the drought areas, when it is needed, nor even where it is needed. However, some indication of what Indian engineers have in mind can be obtained from investigation of the proposed National Water Grid.

The concept of having a system of canals across the length and breadth of India, to provide navigation routes and equalise the supply of water, has been studied by several agencies and seriously considered by several Governments of India. The most detailed available study is that carried out by a United Nations Development Programme team in 1972 (10). This study concluded that the project was technically feasible and that a flow of at least 40,000 cusecs could be transferred from the Ganges to the South of India (11). However, the UNDP team assumed that water transfers would only take place during the monsoon season, the four to five month period starting in July when even Bangladesh would agree that there is surplus Ganges water.

India's inclusion of the needs of drought areas in the discussion of increasing the dry season flow of the Ganges suggests that transfer of Ganges waters to drought areas during the dry season is contemplated. This is not, however, explicitly stated.

Having introduced the question of transferring Ganges water to drought areas, the Indian Proposal then proceeds to calculate each country's demand for water without estimating the needs of Indian drought areas.

The Proposal estimates that 150 million acres of the 213 million acres of the Ganges Basin within India is cultivable. The area irrigated in 1978 is estimated as 49 million acres. 'Projects in hand' will irrigate a further 17 million acres from surface water and the government is committed to irrigating a further 10 million acres from that source. The Proposal estimates that 25 million acres is currently irrigated from groundwater and that it may be possible to use groundwater for the irrigation of a total of 52 million acres, but only if 85-100 million acres of surface water irrigation is established (providing sufficient groundwater recharge).

At this point, the Indian Government's argument takes a leap from an estimate that 49 million acres is irrigated to an estimate that 135-150 million acres 'can easily be irrigated annually' (12). This estimate implies the claim that the whole of the cultivable area of the Ganges Basin in India can, and should, be irrigated. Then, without any

indication of the steps in their calculations, the authors of the Indian Proposal take a second leap. The estimate of potential future irrigation is transformed into an estimate of India's demand for Ganges water. India needs, according to the Proposal, 320,000 cusecs in the Rabi season and 200,000 cusecs in summer (13).

The Indian Proposal mentions, but does not estimate Nepal's need for irrigation water. However, it does estimate Bangladesh's demand. The Proposal assesses Bangladesh's priorities as follows: (i) flood prevention and drainage; (ii) prevention of saline intrusion; and, (iii) diversion for irrigation, counteracting saline intrusion, and for navigation, fisheries and forestry. Bangladesh's own estimates (given at a Joint Rivers Commission meeting) of irrigation demand, and of water needed for the River Gorai, are cited by the Indian Proposal. It is not specific in allotting water for other needs. Table 14.3 sets out the Indian estimate of demand for water.

#### Rejection of alternatives

The next step in the Indian Government's argument is the dismissal of alternative options - namely, storage of water in India or Nepal.

As far as storage in the Ganges Basin in India is concerned, the Proposal states that reservoirs storing 20 MAF are in operation and potential storage of a further 20 MAF is under construction or investigation. These reservoirs will provide for the extension of irrigation to new areas but:

'Considering the large and growing needs for improving the water availability in the existing systems, and to extend, where possible irrigation facilities the storages in the Ganga basin in India are utterly inadequate for meeting even the minimum local needs.' (14)

The Proposal authors are also pessimistic about the possibilities of storing water in Nepal. They mention four potential reservoir sites, but estimate that the water from these reservoirs could only increase the Ganges flow by 25,000 cusecs:

Table 14.3 India's estimate of dry season water demand

COUNTRY	USE	DEMAND cusecs
Nepal		not estimated
India	Irrigation ( <u>Rabi</u> season) <sup>(a)</sup>	320,000
	Calcutta Port	40,000
Bangladesh	Irrigation For the River Gorai	50,000 5,000
		<hr/> 415,000 <hr/>

Note: (a) This figure does not include any estimate of diversion out of the Ganges Basin. The Rabi season is from November to March/April.

Sources: Indian Proposal, pp 47-9.



'The four storages mentioned in Nepal can hardly meet a small fraction of (India's) requirements. Besides, the needs for Ganga waters are so urgent and so large that any additional storages that may be created in Nepal will not be able to effectively meet the requirements in time as well as in quantum.' (15)

Other potential reservoir sites in Nepal are rejected with this rather unconvincing argument:

'While all feasible sites in Nepal could advantageously be exploited for multi-purpose benefits to Nepal and the areas lower down, this would not provide a solution to the augmentation of the flows of the Ganga in its lower reaches at Farakka and down below as these are located from 500 km to 1,300 km (300 to 800 miles) away from storage sites and where the shortages have already developed and are growing. No realistic scheme can overlook the requirements of the areas lying between the points at which the waters are being augmented and the points where they are needed for use.' (16)

If this argument, disqualifying distant reservoirs, has any validity it can also be applied to disqualify India's proposed reservoirs on the Brahmaputra, which are similarly distant from Indian drought areas.

That argument aside, the essence of India's rejection of reservoir storage on the Himalayan tributaries of the Ganges rests on a technical assessment of the quantity of water which can be stored. India argues that these reservoirs cannot store enough water to meet the demands of the three countries. We shall see in the following chapter (Table 15.6) that Bangladesh's estimates of the volume of water which can be stored are much higher.

#### The central arguments justifying India's preference

Having dismissed the possibility of storing water in the Ganges Basin, the Indian Government then put the strong arguments in favour of their preferred alternative: water transfer from the Brahmaputra Basin.

Firstly, the Indian Proposal demonstrates, with the table reproduced here as Table 14.4, that both the Brahmaputra and the Meghna Rivers have more water per unit of cultivable area and per head, than the Ganges. This calculation is made on the basis of the average annual flow, as estimated by India, reaching a given point.

The Indian Proposal argues not only that there is greater flow compared to population or area in the Brahmaputra and Meghna rivers but also that the flow is more useable in present circumstances because, even without storage, in those rivers the flow is better regulated, that is, the highest and lowest flows are less extreme. This is attributed to the presence of large natural lakes in the upper reaches of the Brahmaputra in Tibet.

The third and final point of substance in the Indian case is that suitable sites are available where water from the Brahmaputra and Meghna may be stored in huge volumes. Quite why suitable sites should be available in the Eastern foothills of the Himalayas and not in the Central and Western foothills is not made clear in the Proposal.

The case continues with a demonstration that the minimum flows in the three rivers do not coincide, as shown in Figure 14.2. The conclusion, presumably to be drawn from this being, again, that even without reservoir storage the Brahmaputra and Meghna can offer water to the Ganges basin. This is the second substantial argument, and justifies the tentative schedule set out by the Indian government which states that the Brahmaputra-Ganges canal should be built first, without any reservoirs.

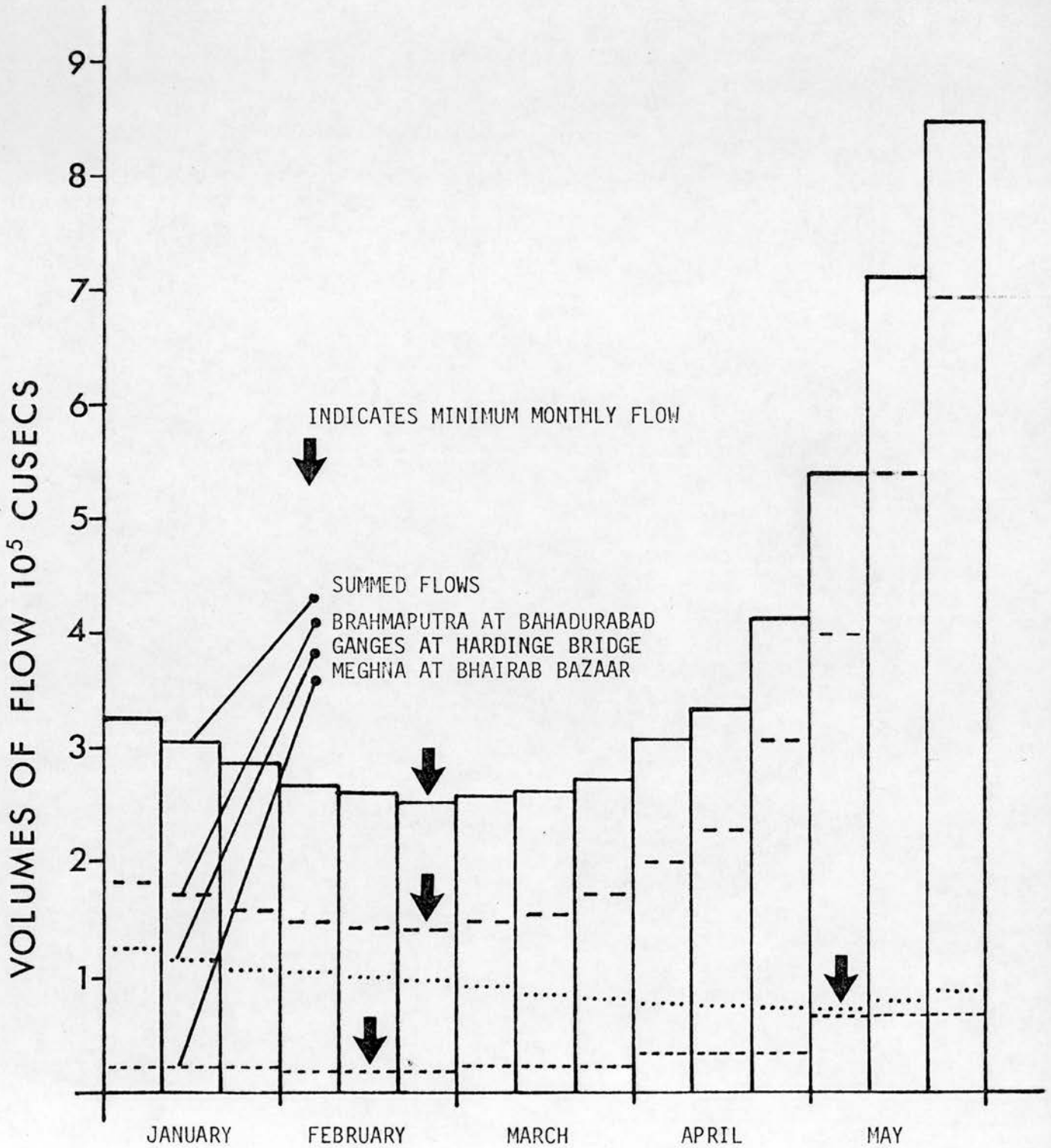
The Indian case is buttressed by several quotations from a World Bank study (17) attesting to the technical feasibility of the Indian proposals, and asserting that 100,000 cusecs may be diverted from the Brahmaputra without causing 'excessive' salinity intrusion (18). Then, the case is concluded with a list of the benefits potentially accruing from the Indian scheme. This list can be summarised as follows:

Table 14.4: India's estimate of the water resources of the Ganges, Brahmaputra and Meghna Basins

BASIN	MEAN ANNUAL FLOW MAF	POPULATION (1977) million	PER CAPITA FLOW $10^3$ ft <sup>3</sup> /yr	CULTIVABLE AREA $10^6$ acres	FLOW PER UNIT AREA ft
Ganges	308	291	46	160	1.9
Brahmaputra	490	51	420	20	24
Meghna	90	27	145	10	10

Source: Indian Proposal, p 26.

FIGURE 14.2 Combined Average Monthly Flows of the Ganges Brahmaputra and Meghna



1. Provision of irrigation water to an additional 20 million acres in India and Bangladesh, and provision of the full quantity of water required by Calcutta Port.
  2. Nearly 10 GW of hydroelectric power at 60% load factor can be provided.
  3. The Indian scheme will give 'reasonable' flood protection of 5 million acres, and 'substantial' relief to an equal area suffering deep flooding.
  4. Perennial navigation will be possible from Assam to Calcutta.
  5. Salinity in coastal areas of Bangladesh and India can be mitigated.
- (19)

#### THE CASE AGAINST THE INDIAN PROPOSAL

Four categories of criticism can be made against the Indian scheme. First it can be argued that India has inflated 'the problem' to its maximum extent, exploiting the broad definition of the 1977 Treaty. Then, secondly, the Bangladesh Government perceive that the political and social implications of the Proposal present a serious obstacle. Thirdly, there are 'technical objections' to the Indian scheme, and, finally, it is possible to identify conflicting estimates of annual river flows. These four categories are described in turn.

#### The limits of the problem

In the opinion of one Bangladesh official:

'they are trying to develop the whole of India with water from the Ganges.'

(20)

The inclusion in the Indian Proposal of the suggestion that drought areas may be supplied from the Ganges Basin raises fears in the minds of some Bangladesh officials. They are satisfied that the needs of the population within the Basin can be met from the resources of the Basin, but they anticipate that inter-basin transfers on the scale implied by Indian discussions will pose a threat to Bangladesh's development. The possibility of transfers out of the Ganges Basin,

and the inclusion of the Brahmaputra and Meghna Basins in the discussion on increasing the Ganges low flow should, in their view, be ruled out. One Bangladesh official wrote in his Insider's critique:

'The proposal of mass transfer of water from the natural command of the Brahmaputra without considering the need of its basin is against the principles of river basin development. The report [India's Proposal] has even considered the whole of the drought areas of India within the scope of irrigation possibilities by the common water resources of the Ganges basin and accentuated the Indian demand over the other co-basin countries' needs.' (21)

Another Bangladesh official, in a more restrained mood, had this to say:

'Our main point is that we must first see how much water is needed within the basin. If there is surplus after that, then ok, water transfers could be considered... But surplus transfers must not be at the cost of the basin... We do not deny their need for water, but I am sure we can prove to them that the Ganges basin requirements can be met from the basin itself.' (22)

The estimate of the needs which have to be met also sets limits to the problem. The Indian Government's Proposal assumes that the whole of the cultivable area of the Ganges basin is irrigable and should be irrigated. As the Insider's Critique comments:

'The report apparently envisaged pump lifts in the reverse direction for irrigation of areas that are not actually commanded by gravity canal. It has assumed bringing the whole drought area in Rajasthan and [the] Northern peninsular slope including all the high grounds that are difficult to command by gravity flow in order to show a (possible) future demand on the Ganges flow. It has included the whole of the Bardwan Divisions of West Bengal in the list of the Ganges command and conveniently ignored the requirement of Bangladesh. No sensible authority would even entertain the concept of bringing the whole of the stated 60 million hectares of land in the Indian territory - 40 million from surface water and 20 million from ground water, to be brought under intensive irrigation at the expense of other co-basin countries.' (23)

## Political and social implications

The political implications of the Indian Government's proposal may be divided into those relating to its domestic impact and those concerning Bangladesh's external relations. Taking the external questions first, there appear to be two, of which the first is considered, by many in Bangladesh, to be of overwhelming importance. The Indian proposal represents a threat to the sovereignty of Bangladesh (24). Seen from this point of view, the Farakka barrage gives India nearly complete control over the dry season flow of one of Bangladesh's two major rivers; the proposed Brahmaputra barrage could give India control over the other. The Insider's Critique has this to say:

'No doubt, the provisions in the Agreement on the sharing of the Ganges waters and augmenting its flows oblige Bangladesh to put an equal priority on both the Bangladesh and the Indian proposals for the explicit objectives stated in the Agreement. However, such acquiescence does not oblige her to undertake investigations for examining the feasibility of a proposal that prima facie affect[s] her territorial security...

This is perhaps an exaggerated view. Even though the barrage itself would be well outside Bangladesh's territory, much of the canal, and any control structures associated with the Teesta river crossing would lie within Bangladesh. Consequently total control would not devolve on India. However, control of the barrage in circumstances when relations between the two countries had broken down and at certain times of the year, could give India the ability to jeopardize some irrigated crops.

The second political implication of the Indian scheme is the involvement of China. On the one hand, the proposed Dihang and Subansiri dams are located within an area of territory in dispute between India and China (see Figure 14.3), and, on the other, Chinese development of the Brahmaputra (Tsangpo) could conflict with the Indian proposal. Whilst, at the time of writing, neither of these factors appear to constitute serious obstacles to the Indian scheme,





their existence suggests China should play a greater role than has so far been allowed.

Then there is a social implication of the Indian scheme - or, to put it another way, a political question with domestic impact. A considerable number of people will be uprooted by the Indian scheme. Their resettlement would be problematic in such a densely populated region. Estimates of the number involved vary widely. If the Indian estimate of land required for the scheme is correct (Table 14.2), 30-40,000 people might be uprooted in Bangladesh and a further 100,000 in India (25). The Insider's Critique, however, estimates that 300,000 would be evicted from 160,000 acres of land in Bangladesh alone. This estimate implies that a swathe 3.75 miles wide would be required for the Brahmaputra-Ganges canal, reflecting the Bangladesh fear that the canal will cause serious waterlogging of adjacent land.

#### 'Technical objections'

Bangladesh officials argue that the proposed Dihang and Subansiri dams are dangerously high at 7-800 ft for a seismically active zone. At least ten earthquakes are thought to have occurred in the region since 1869. After a major earthquake in 1950, disturbed sediment caused a 10 ft rise in the bed of the Brahmaputra (26). The Insider's Critique comments:

'[An] Indian Geological survey report of 1972 on the feasibility of building reservoirs across the Dihang and Subansiri has cast strong doubt over it. It established the age of the rocks at different alternate locations of the dams across these two streams and declared their unsuitability for foundation of high dams...In the JRC deliberations the Indian counterparts spoke against any possibilities of building any reservoirs of substantial capacity at these sites...the Indian geological survey highlighted the possibilities of large scale landslides in the reservoir consequent upon the rise of water levels and saturation of soil on hill slopes that are composed of weak materials. Coupled with high incidence of tremors arising out of intensive seismic activities in the region and closeness of the epicentres of earthquakes from the surface, the incidence of landslides may multiply and thereby reduce the life of the reservoirs within a few years of their completion.'

Doubts have also been expressed about the feasibility of the 'level crossing' proposed for the Tista River. The large sediment load of the Tista could cause siltation problems. Generally, cross drainage may present difficulties, particularly with a highly seasonal river, like the Tista.

The environmental impact of the Indian scheme could be injurious to Bangladesh. If the 35,000 cusec diversions at Farakka caused serious damage, how much more would be caused by a 100,000 cusec diversion from the Brahmaputra? The Insider's Critique has only generalities to offer on this point: the Indian scheme will 'upset the delicate ecological balance' and 'affect deleteriously the productivity of these eco-systems'. This reflects the difficulty of predicting the consequences of upstream diversions.

#### Conflicting estimates

Table 14.5 lists some estimates which have been made of the annual mean flow in the three rivers with which the Indian Proposal is concerned. There is a range of estimates for the annual flow of the Ganges. From this range the Indian Government have chosen the lowest figure. The Bangladesh Government's chosen estimate is 20% higher. Clearly it is advantageous, for the Indian Government's case, for a low estimate to be given of the quantity of water in the Ganges. This strengthens the argument that there is too little water in the Ganges Basin. We shall see in Chapter 15, that a comparison of Indian and Bangladesh estimates of water supply and demand in the Ganges Basin (Table 15.6) shows that Indian estimates of supply tend to be lower than Bangladesh estimates, whereas, Indian estimates of demand are higher than Bangladesh estimates.

#### CONCLUSIONS

This chapter has explored the Indian Government's scheme for increasing the dry season flow of the Ganges. Firstly, the details of the engineering works have been investigated. Then, the Indian argument for this particular technical scheme has been outlined. Finally, the

Table 14.5: Comparison of annual mean flow statistics

RIVER	ANNUAL MEAN FLOW (million acre-feet)		
	(a) Indian <u>Proposal</u>	(b) Bangladesh <u>Proposal</u>	Other estimates
Ganges at Farakka	308	372	(c) 446
Brahmaputra at Bahadurabad	492	-	(d) 497
Meghna at Bhairab Bazaar	90	-	(d) 90

Note: Some statistics have been converted from the metric equivalent

- Sources:
- a) Indian Proposal, p 26
  - b) Bangladesh Proposal, p 9, Table IV, citing Dr K L Rao's India's water wealth, Orient Longman, Delhi, 1975, p 69
  - c) India, Report of the Irrigation Commission 1972, New Delhi, 1972, 1, p 46
  - d) UN ECAFE, Compendium of major rivers in the ECAFE Region, Water Resource Series No 29, 1966

chapter has described some of the arguments which have been made against the Indian proposal. This concluding section summarises the body of the chapter and then identifies some of the ways in which political aims have found expression in a technical guise.

The Indian case consists of three propositions: that enough water cannot be stored within the Ganges Basin; that the needs of the Indian drought areas outside the Ganges Basin must be considered; and, that there is surplus water in the Basins of the Rivers Brahmaputra and Meghna. The first and last of these propositions are 'practical' ones, dependent for their validity upon scientific and technical estimates of water supply and demand. The second, or middle proposition concerns a question of principle, or scope, left undefined in the 1977 Ganges Waters Treaty.

This chapter has described the detailed Indian calculations which form the basis of these three propositions. The Indian Government estimates that, in the dry season, the two countries, India and Bangladesh, need a flow of water in excess of 415,000 cusecs. This, India argues, cannot be met from the potential reservoir storage capacity of the Ganges Basin. The Indian Government's Proposal does not provide estimates of reservoir storage (supply) in a form which can easily be compared with demand for water. It is noted that 25,000 cusecs might be available from 4 reservoirs in Nepal, but the potential augmentation from Indian reservoirs is not estimated, only a storage volume of 40 MAF. Other Indian sources (27) suggest that storage reservoirs in the Ganges Basin as a whole could provide 80,000 cusecs of dry season flow. It is the disparity between a need for 415,000 cusecs and an additional potential supply of 80,000 cusecs which forms the foundation for the first Indian proposition: that enough water cannot be stored in the Ganges Basin.

In addition to the 415,000 cusecs needed within the Ganges Basin, the Indian Government argues that drought areas outside the Basin should also be supplied from the Ganges. The magnitude of this additional demand is defined only as 'sizeable' in the Indian Proposal; another document, cited in this chapter, suggests a transfer out of

the Ganges Basin of the order of 40,000 cusecs, but during the monsoon season when there is surplus water. The Ganges Waters Treaty does not exclude, nor specifically include, consideration of areas outside the Ganges Basin.

The last of the propositions forming the Indian case is that there is excess water in the Brahmaputra and Meghna. This proposition is established only to the extent that there is more water per head of population and more water compared to cultivable area in the Brahmaputra and Meghna than there is in the Ganges Basin. On the basis of the figures provided in the Indian Proposal, there is nearly ten times as much annual flow per capita in the Brahmaputra as there is in the Ganges, and nearly thirteen times as much flow in terms of cultivable area.

The objections to the Indian scheme which have been considered in the this chapter have been grouped into three categories: the limits of the problem; political implications; and technical objections.

It has been repeatedly shown that the Indian Government's Proposal does not recognise the watershed of the Ganges as a geographical limit for the augmentation of the Ganges. The Bangladesh Government argues that the needs of the people living within the basin can, and should be met from the resources of the basin.

Bangladesh's political objections to the scheme range from a fear that it represents a threat to the 'territorial security' of the country, through doubts about China's view of development in an area of disputed ownership, to fears that people displaced by the construction of the Brahmaputra-Ganges Canal will have a strong sense of grievance against the government which sanctioned that canal.

Finally, in this list of objections, there are technical doubts about the Indian scheme. Bangladesh officials question whether large dams can be constructed safely in an area of seismic activity. They also fear the environmental impact of large diversions from the Brahmaputra.

What can the case for the Indian proposal and the objections to it tell us about the discussion which is taking place? It is very clear that it is a political discussion being carried on in technical language. The Indian Proposal does not refer to questions of equity or rights; it is concerned with practice and technical feasibility. The Bangladesh scheme is dismissed by reference to technical opinion: enough water cannot be stored within the Ganges Basin for the needs of the three countries. The Indian scheme is justified not as the most equitable way of sharing and developing the resources of the region, but as the only feasible method by which all the needs (as estimated by India) can be met. The scheme is legitimated not by essentially political value judgements, but by reference to technical expertise. Science or expertise is, in this way, being used to authenticate one view of 'reality'. The Indian proposal is the only feasible or 'realistic' option: the experts say so.

The Bangladesh Proposal, as we shall see in the following chapter, is similarly reticent about 'political' questions, those where negotiation is required. It is only in the informal comments of Bangladesh officials (on which the case against the Indian proposal has been based) that fundamental political feelings are expressed. Those comments have to remain anonymous, possibly because such political matters are more sensitive than technical questions.

The political questions, questions of equity and rights, do not disappear just because the discussion is carried on in technical language. They reappear in the assumptions and choices of each government's scheme.

What are the assumptions and choices inherent in the Indian scheme which express political questions? There are two areas where they can be identified: in the debate over the scope of the discussion and in the choice of uncertain observational data.

What is the scope of the discussion? What is 'the problem', and are there any limits to its solution? India has assumed that the terms of reference of the discussion are drawn very widely to include areas

of water supply outside the Ganges Basin. This choice is justified in terms of practice and rationality. It is argued, by the Government of India, that the Ganges Basin is no more than a sub-basin of the 'real' basin, that of the 'Ganga-Brahmaputra-Barak'. It is argued that a solution is not possible within the Ganges Basin, suitable reservoir sites are not available. India might have argued that it would be more just to share the resources of the subcontinent equally between the people living in the subcontinent. India might also have argued that as the larger and militarily more powerful state, and as the upper riparian state, she had the right to a larger share of the rivers' waters and the means to enforce that right. The Indian Proposal puts neither of ~~these~~ arguments. Instead, it uses the resource of technical feasibility, arguing that the Indian scheme is, according to the experts, more realistic.

The choice of an estimate for water supply appears to be another instance where political choices are inherent in a technical statement. The Indian case for transfer of water from the Brahmaputra is aided by a low estimate of the annual mean flow in the Ganges. We find that the Indian Proposal provides an estimate significantly lower than that provided by Bangladesh. I suggest that the Indian Proposal is a technical expression of an Indian political objective: the utilisation of the 'surplus' waters of the Brahmaputra for the general development of India.

## Chapter Fifteen

### A FEW DAMS?

The Bangladesh Government believes that the transfer of water from the Brahmaputra is not the best way of increasing the dry season flow of the Ganges. The Bangladesh Proposal (1) suggests, instead, that the monsoon season flow of the tributaries of the Ganges should be stored for use later in the year when it is most needed. Bangladesh argues that enough water can be stored in reservoirs for the needs of India, Nepal and Bangladesh.

The Bangladesh Proposal identifies a total of 83 reservoir sites, 52 of them in India and 31 in Nepal (see Figure 15.1). It does not provide details of the design, operation or cost of these reservoirs, but it presents an estimate of the additional dry season flow which could be generated if all these reservoirs were built. The Proposal concentrates on 12 major reservoirs in Nepal on the three main trans-Himalayan river systems: the Karnali, Gandaki and Kosi systems. For these 12 reservoirs the Proposal provides outline estimates of the volume of storage available. The Proposal also briefly mentions a scheme to link the Rivers Gandak and Kosi to rivers in West Bengal and Bangladesh with a navigable canal.

The Bangladesh Government argues that there is surplus water in the Ganges Basin; enough of that water can be stored to meet the needs of the three countries. It is not, therefore, necessary to consider using water resources outside the Ganges Basin.

The Bangladesh Proposal implies that the water stored in reservoirs to be built in Nepal should be allocated for the needs of Bangladesh and of Calcutta Port. Until now, the development of Nepalese reservoirs has been the subject of bilateral discussion between India and Nepal. India has offered to provide finance for the construction of some large dams, and to buy the hydroelectricity generated. In its Proposal Bangladesh is stating its interest in Nepalese reservoirs.



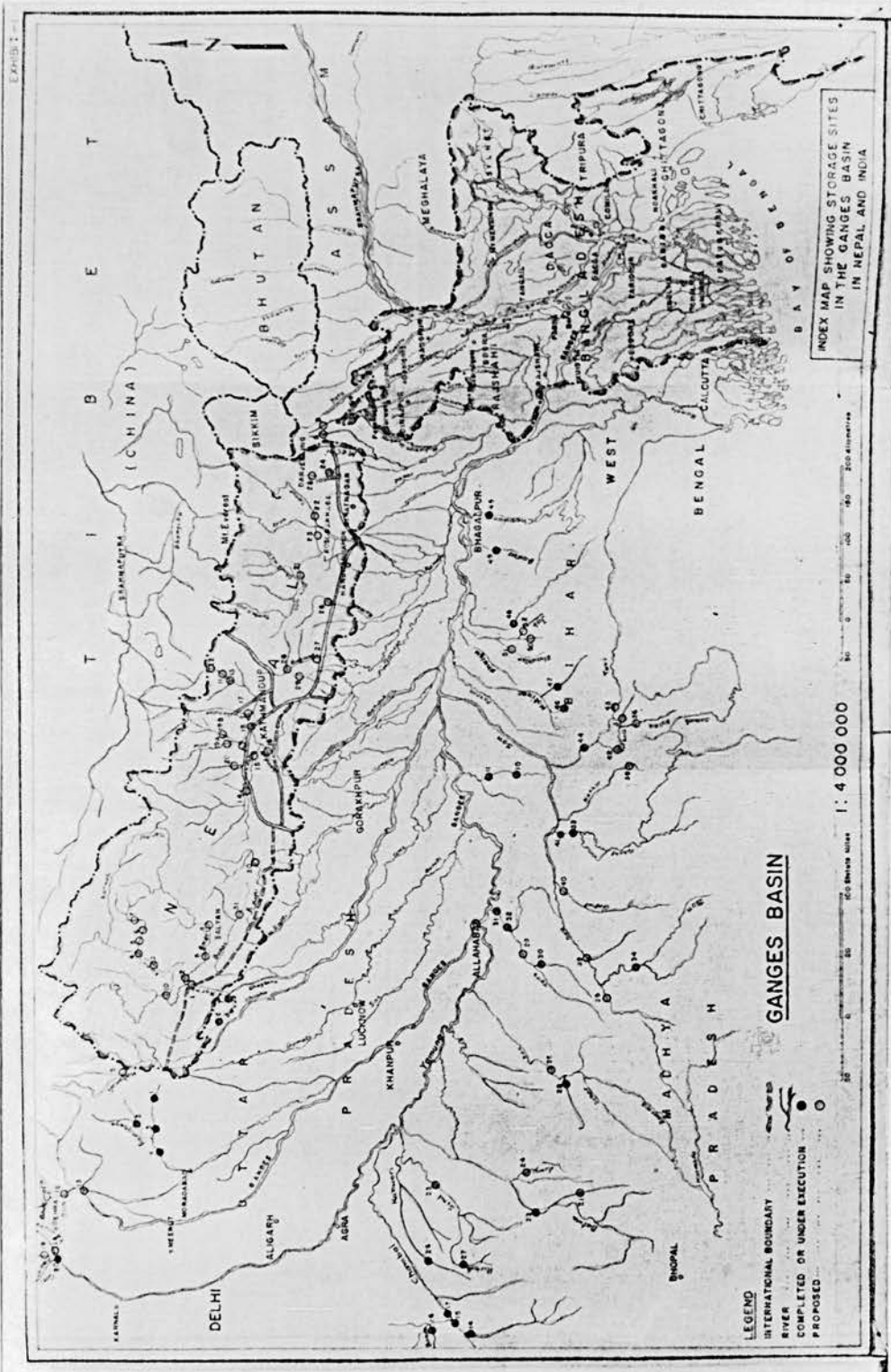


Figure 15.1: Map of Bangladesh's proposed reservoir sites in the Ganges Basin in India and Nepal

Source: Bangladesh Proposal, Exhibit 1.

Table 15.1: List of Bangladesh's proposed reservoir sites

NEPAL

Karnali River Basin

- 1 Chisapani High Dam
- 2 Lakarpata
- 3 Bhankot
- 4 Poliparni (Tila)
- 5 Samla (Tila)
- 6 Ramni (Tila)
- 7 Junitan (Tila)
- 8 Surkhet (Bheri)
- 9 Thapna (Bheri)
- 10 Seti

Gandak River Basin

- 11 Syabrubensi - 1
- 12 Syabrubensi - 2
- 13 Betrwati
- 14 Kali Gandaki - 1
- 15 Kali Gandaki - 2
- 16 Dev-ghat
- 17 Buri Gandaki
- 18 Buri Gandaki (Bhomichok)
- 19 Marsyangoi
- 20 Seti

Kosi River Basin

- 21 Sun Kosi High Dam
- 22 Tamur (Mulghat)
- 23 Arun (Tribeni)

Other Rivers

- 24 Kanki
- 25 Mai Khola Loop (Kanki)
- 26 Kamla
- 27 Bagmati High Dam
- 28 Kulekhani - II
- 29 Kulekhani - III
- 30 Rapti (West)
- 31 Sharda

Cont/d...

INDIACOMPLETED/UNDER EXECUTIONRamaganga sub-basin

- 1 Nanak Sagar
- 2 Bahgul
- 3 Haripura
- 4 Ramganga

Main Ganga

- 10 Nagwa
- 11 Naugarh

Yamuna sub-basin

- 20 Yamuna Hydroelectric
- 22 Matatila
- 26 Pagara
- 27 Harai and Kaketo
- 28 Rangawan

Son sub-basin

- 33 Rihand Dam
- 34 Son Barrage
- 41 Obra Scheme

Gomati, Ghogara Basin

- 6 Sarda Sagar - I
- 7 Sarda Sagar - II

Chambal sub-basin

- 14 Gandhi Sagar
- 15 Rana Pratap Sagar
- 16 Godha
- 17 Jawahar Sagar

Tons, Karamnasa, etc.

- 30 Ghaghara
- 31 Sirsi Dam
- 32 Meja

Right bank tributaries, East of Son

- 44 Jirgo
- 45 Chandan
- 46 Lilajan
- 47 Mohane
- 48 Sakri
- 49 Badua

PROPOSEDGomati, Ghoghara

- 5 Pancheswar

Main Ganga

- 12 Tehri
- 13 Kotli Bhel

Tons, Son, etc.

- 29 Purwa
- 35 Bansagar
- 36 Kutku
- 37 Auranga
- 38 Kanhar
- 39 Demba
- 40 Gopat
- 42 Tahle
- 43 Amanat
- 50 Dhadhar
- 52 Jab

Gandak, Kosi etc.

- 8 Mahananda
- 9 Balsan

Yamuna sub-basin

- 18 Lakhwar Dam
- 19 Kishau Dam
- 21 Rajghat
- 23 Sindh
- 24 Jamni
- 25 Ken

Source: Bangladesh Proposal, exhibit 1

This chapter investigates the Bangladesh case, the manner in which it has been argued, and some of the objections which can be made against it. Bangladesh estimates of water supply and demand are compared with Indian estimates, and at the end of the chapter the similar ways in which both countries use technical information are identified.

#### THE BANGLADESH PROPOSAL

The Bangladesh Proposal identifies 83 potential reservoir sites in the Ganges Basin. From Bangladesh's map of the basin (Figure 15.1). It can be seen that slightly more than half of the dams in India are either completed or under execution. Construction has not been started for any of the Nepalese dams. The Bangladesh Proposal provides only the location of these reservoir sites; the dams are not described, nor the areas they will flood.

The Bangladesh Proposal concentrates primarily on the calculation of the flow which could be generated by the reservoirs. For the 12 major reservoirs in Nepal (as listed in Table 15.2), Bangladesh engineers have made two estimates. Each of these dam sites has already been investigated and a design proposed by a firm of Japanese consulting engineers acting for the Nepalese Government (2). Bangladesh engineers have used these designs, which were made with a primary objective of hydroelectric power generation, for a first estimate of the volume of dry season flow which could be generated. A second estimate has been made, assuming that the height of the dam could be increased. These two estimates are shown in Tables 15.2 and 15.3. Details of these calculations, and the assumptions made about dam-site geology and the topography of the reservoir, are not presented in the Proposal.

A similar calculation has been made, by Bangladesh, for the potential and existing reservoir sites in the Ganges Basin in India. The potential increase in the Ganges dry season flow from these reservoirs is shown in Table 15.4.

Table 15.2: Bangladesh's estimate of flow available from identified reservoirs in Nepal

Basins	Dam site	Effective storage in $10^6 \text{ m}^3$	Average monsoon runoff (June-October) $10^6 \text{ m}^3$	Augmentation at identified storages only (Jan. to May)	
				$\text{m}^3/\text{sec}$	Cusecs
A Karnali	(1) Chisapani	7,300			
	(2) Lakarpata	1,860			
	(3) Surket	2,700			
	(4) Thapna	<u>2,010</u>			
		13,870	33,562	1,070	37,787
B Sapt Gandaki Basin	(5) Devghat	160			
	(6) Kali Gandaki - I	4,480			
	(7) Kali Gandaki - II	360			
	(8) Burhi Gandaki	770			
	(9) Marsyandi	1,800			
	(10) Seti	<u>1,760</u>			
		9,330	39,994	720	25,423
C Sapt Kosi	(11) Kothar	8,000			
	(12) Sun Kosi High Dam	<u>1,060</u>			
		9,060	40,202	699	24,687
Grand total:		32,260	113,758	2,489	87,899
		(26.2 MAF)	(92.2 MAF)		

Note: Arun should have large storage potential, but not identified.

Source: Bangladesh Proposal, p 23.

Table 15.3 Bangladesh's estimate of flow available from the same reservoirs with higher dams

Basins	Dam site	Effective storage in $10^6 m^3$	Average monsoon runoff (June-October) $10^6 m^3$	Augmentation from estimated potential	
				$m^3/sec$	Cusecs
A Karnali	(1) Chisapani	18,000			
	(2) Lakarpata	2,500			
	(3) Surkhet	9,000			
	(4) Thapna	<u>8,000</u>			
		37,500*	33,562	1,720	61,000
B Sapt Gandaki	(5) Devghat	600			
	(6) Kali Gandaki - I	6,000			
	(7) Kali Gandaki - II	2,000			
	(8) Burhi Gandaki	1,000			
	(9) Marsyandi	2,000			
	(10) Seti	<u>2,500</u>			
		14,400	39,994	1,111	39,238
C Sapt Kosi	(11) Kothar	8,000			
	(12) Sun Kosi	<u>2,500</u>			
		10,400	40,202	810	28,611
	Grand total:	62,400	113,758	3,641	128,849
		(50 MAF)	(92.2 MAF)		

Note: Arun and other rivers are known to have large storage potential but no information is available at present.

\* - Effective storage required for this case is about 32,000 M cu m.

Source: Bangladesh Proposal, p 24.

Table 15.4: Bangladesh's estimate of flow available from potential reservoirs in India

Sub-basin	Water available in MAF	Storage capacity in MAF	Increase of dry season flow in cusecs
<u>North of the Ganges Basin</u>			
1. Ramganga	15.10	2.100	7,000
2. Gomati, Ghaghara and other rivers	99.55	3.846	12,800
3. Gandak and other left bank tributaries	141.60	0.387	1,300
4. Main Ganga	34.50	6.492	21,600
<u>South of the Ganges Basin</u>			
5. Chambal	19.71	7.571	25,200
6. Yamuna	53.20	7.709	25,200
7. Tons, Karamnasa etc	11.45	2.100	7,000
8. Son	34.30	23.193	77,300
9. Right bank tributaries	36.60	1.050	3,500
	446.01	54.448	181,400

Source: Bangladesh Proposal Table VIII.

The total of the two estimates - for Nepalese and Indian reservoirs - suggests that 310,000 cusecs of additional flow could be made available during the dry season. This estimate constitutes the essence of the Bangladesh proposal.

In the closing paragraphs of the Bangladesh Proposal there is a three-sentence description of a Nepal-Bangladesh link canal to provide a connection between the Gandak and Kosi Rivers in Nepal, Mohananda in West Bengal and the Karatoya in Bangladesh. This canal would have the purpose of increasing the dry season flows in the latter two rivers and providing Nepal with a navigable link to the sea. This canal has been described in greater detail elsewhere (3), but it does not seem to be an integral part of the Bangladesh scheme.

#### THE CASE FOR THE BANGLADESH PROPOSAL

The context of the Bangladesh scheme is set in the opening paragraph of the Proposal:

'The dry season flows in the Ganges Basin have been diminishing in the lower reach as diversions for irrigation are taking place in the upper reaches. The low flows must not be allowed to decrease any further and at the same time measures must be taken to increase the dry season flow of the river to meet the present and future needs of the riparian countries.'

(4)

The Bangladesh Government is here concerned not with the threat of the Farakka diversions, but by the threat posed by future irrigation development in India. This introduction continues with a summary of the Bangladesh argument:

'The minimum recorded discharge at Farakka was 40,000 cusecs. It is much below the needs of India and Bangladesh; in Bangladesh alone, there is about 9 million acres of land dependent on the Ganges waters to feed about 30 million people. However, looking at the Basin as a whole, the average runoff at Farakka is about 372 MAF (1) (excluding the irrigation diversions upstream already taking place). The utilisation of water in India is planned up to the year 2,000 AD is 150 MAF including existing diversions (2). It is, therefore, evident that there is a considerable amount of water in



the Ganges Basin which can be utilised to augment the dry season flow of the river by storing its monsoon runoff. Many potential large storage sites are known to be available in the tributaries of the Ganges in its upper reaches. This proposal has been prepared for undertaking studies of such potential in resolving the critical dry season shortage of water in the Ganges Basin.'

(5)

The Bangladesh Government asserts that the Ganges has an annual flow of 372 MAF, compared with which India will require only 150 MAF. The Indian Government would disagree about the exact quantities involved, but would probably agree that the surplus indicated by those figures exists. There is a surplus, but can it be stored? We saw in the last chapter that India argues that not enough of the surplus can be stored to meet the needs of the three countries. If the Bangladesh Proposal shows that the demand for water can be met with water stored in the Ganges Basin, then the Bangladesh case is established. To do this, Bangladesh engineers have presented an outline water 'budget' for the Ganges Basin.

A water budget consists of a calculation of water supply and demand. On the demand side, the Bangladesh Proposal calculates the land resources and groundwater availability of the three countries. These estimates of cultivable area, present irrigated area and groundwater availability are presented here in columns 2-4 of Table 15.5. From these estimates, the three countries' demands for water are calculated, as shown in column 5. The Bangladesh Proposal does not detail the steps by which estimates of cultivable area, irrigated area and groundwater availability are transformed into estimates of demand for water in the year 2,000. If the demand estimates are indeed calculated from the preceding consideration of land and groundwater resources, the reader is not told how.

In Chapter 15 of this thesis, we saw that the Indian Proposal does not detail the calculations which relate an estimate of cultivable or irrigable area to an estimate of demand for water. In the Bangladesh Proposal there is a very similar 'leap' in the calculations. Estimates of demand are produced as from a conjuror's hat. It should be noted that whilst the Indian demand estimate is made in units of instantaneous flow (cusecs), the Bangladesh estimate is in

Table 15.5: Bangladesh's estimates of the land and water resources of the Ganges Basin

COUNTRY	CULTIVABLE AREA million ares	PRESENT <sup>(a)</sup> IRRIGATED AREA million acres	GROUNDWATER AVAILABILITY Various units	WATER REQUIRED <sup>(f)</sup> million acre-feet per year (MAF)
India	148 <sup>(b)</sup>	44	88 MAF <sup>(c)</sup>	150 <sup>(d)</sup>
Nepal	4.5	1.5	large but not known exactly	24
Bangladesh	9	7.4	'not too <sup>(e)</sup> bright'	33

- Notes:
- (a) Present is taken to include projects 'under investigation'. This formulation explains the unexpectedly large figure for Bangladesh.
  - (b) This figure is comparable with the estimate in the Indian Proposal of  $160 \times 10^6$  acres
  - (c) This is an estimate from the Government of India's Irrigation Commission report of 1972
  - (d) This figure is also attributed to the Irrigation Commission report
  - (e) No estimate is made of the groundwater potentially available from South West Bangladesh but, as with the Special Studies report, every possible doubt is cast upon the usefulness of this source of water
  - (f) By the year 2000

Source: Bangladesh Proposal, pp 3-19

units of annual flow (MAF). The importance of this choice of units will become clear in the conclusion of this chapter.

The figures in column 5 of Table 15.5 constitute the demand side of the Bangladesh water budget. The supply side is provided by the Bangladesh Proposal's estimate of the additional water which can be generated from the 12 proposed reservoirs. This has been given in Tables 15.2 to 15.4. In total, Bangladesh estimates that 180,000 cusecs can be generated by reservoir storage in India, and a further 130,000 cusecs from reservoirs in Nepal. This is the storage in terms of instantaneous flow. It cannot readily be compared with the total annual demand of 207 MAF calculated by Bangladesh (column 5 Table 15.5). Tables 15.3 and 15.4 show that Bangladesh calculates that 10<sup>4</sup> MAF can be stored, for use during the dry season. It is also difficult to compare this estimate of additional supply during the dry season, with an estimate of annual total demand. In other words, the Bangladesh Proposal does not attempt to balance the water budget. The Bangladesh Government considers that its case is made by the demonstration that 310,000 cusecs of additional flow, or 10<sup>4</sup> MAF of additional storage can be made available by the Bangladesh scheme.

The Proposal concludes its discussion of the Bangladesh scheme with a paragraph allocating the potential water availability to different uses:

'The present dry season flow of the three major rivers from Nepal has an average of 53,000 cusec from November to May, or 22.3 MAF, which should be sufficient to irrigate the available land in the Terai area in Nepal and in India under command of these rivers. In addition to this, the existing flow of the rivers from the Mahabharat range would continue to serve the areas. Therefore most of the increased dry season flow from storages in Nepal as shown above would be available at Farakka and downstream in Bangladesh.'

(6)

In this paragraph Bangladesh is claiming the water generated by reservoirs in Nepal for its own use.

## THE CASE AGAINST THE BANGLADESH PROPOSAL

Verghese has summarised the Indian critique of the Bangladesh scheme as follows:

'India is not favourably disposed towards this proposal on the ground that there is no reason to involve Nepal, a third country, in what should be a bilateral settlement. It has, however, no objection to a joint examination of the Bangladesh storage proposals in Nepal if the Nepalese Government agrees. Nor is it averse to a navigation route for Nepal to the sea. But the principal objection is that India needs all the limited storage available on the Ganga to satisfy its large unfulfilled irrigation requirements within the populous Indian-Ganga basin and that these needs cannot be satisfied from any other source.

'There is only a limited Himalayan storage potential because of the seasonality of the preponderant monsoon discharge, a relative shortage of storage sites and the meagre storage available even behind high dams on account of the steep gradient. Consequently, only a small fraction of the monsoon runoff can be harnessed.'

(7)

Verghese has raised three objections: a third country should not be involved; India needs all the water that can be stored in the Ganges Basin; only a small volume of water can be stored in the Ganges Basin. Several other objections will be detailed in the following paragraphs. The Indian Government believes the practicality of Bangladesh's reservoirs is in doubt; it questions whether Nepal will agree to such a large number of reservoirs, and it argues that the Nepal-Bangladesh canal is outside the scope of the discussions. These various objections will be dealt with under the same headings as were used in the discussion of objections to the Indian scheme.

### The limits of the problem

The Indian Government has not asserted that Nepalese projects are outside the terms of reference for the discussions. It has, however, opposed multilateral negotiations, arguing that the Nepalese Government can be consulted but should not be given the right to participate in the discussions. Since the Bangladesh Government has insisted

that the projects in Nepal can only be investigated with the full involvement of Nepal, discussion of the Bangladesh proposal cannot proceed.

The Indian attitude to Bangladesh's request for Nepalese participation can be seen in this quotation from a report by the government-owned Press Trust of India:

'This stand of Bangladesh [requiring the participation of Nepal] is seen here as an attempt to preempt the very outcome of the study and politicise the issue right from the beginning.' (8)

A second conflict over the scope of the discussion can be identified in the Indian Government's doubts about the Nepal-Bangladesh canal. The Press Trust of India report, quoted above, goes on to say that this canal 'has nothing to do with the augmentation of the flow of the Ganga...' (9). A Ministry of External Affairs official made a similar point to me: he didn't think the canal came within the terms of reference of the discussion (10).

#### Political implications

A second aspect of India's reluctance to accept Nepalese involvement is the fear that Nepal and Bangladesh may unite as an alliance against India. Verghese notes these fears as follows:

'[India apprehends] that multilateralism will slow down progress. Bangladesh and Nepal will gang up against India and will be encouraged to raise their demands at India's cost by international forces.' (11)

A Ministry of External Affairs official commented to me that Nepalese participation in the negotiations would complicate the existing Indo-Nepalese discussions on four or five major reservoir projects, most of which are included in the Bangladesh list. The official argues:

'Those projects are important for India's development. Bangladesh is not involved, except to create a locus

standi...both states are not confident in dealing with us alone, but we wonder if this is not another way of doing nothing, of making the whole thing very complicated.' (12)

This same official doubted that the Nepalese would agree to the construction of 31 reservoirs in Nepal; India had been negotiating for 20-25 years for hydroelectric projects in Nepal and one project, but only one, was close to agreement. Certainly, Bangladesh's scheme would flood a significant proportion of Nepal's scarce valley-bottom land. The Bangladesh Proposal does not include an estimate of the population which would be displaced, nor of the towns and areas of agricultural land which would be submerged.

#### 'Technical objections' and conflicting estimates

There is a serious disagreement between the Indian and Bangladesh Governments about the quantities of water needed and the quantities of water which can be stored in Nepalese and Indian reservoirs. The Government of India argues that all the feasible reservoir capacity of the Ganges Basin is going to be required for the needs of India and Nepal. A Ministry of External Affairs official emphasises this point in the following manner:

'The greatest problem with India about the Bangladesh proposal is that all the known storage in India and Nepal are not likely to give even a fraction of our requirements [in the future].' (13)

This argument was put, as we saw in the last chapter, in the Indian Proposal. In that document it was used as a reason for rejecting schemes for storage in the Ganges Basin. Table 15.6 presents a comparison of the estimates for water demand and supply contained in the two governments' Proposals. From this comparison it is possible to identify the wide difference between the two governments' estimates of the storage potential within the Ganges Basin. Bangladesh estimates that 10<sup>4</sup> MAF can be stored, and that this volume can be used to generate an additional flow of 310,000 cusecs. Indian estimates of storage are incomplete but it is suggested that only 55-80,000 cusecs could be generated. Neither Proposal explains the calculations

Table 15.6: Comparison of some Bangladesh and Indian estimates of water supply and demand in the Ganges Basin

	BANGLADESH ESTIMATE		INDIAN ESTIMATE	
	MAF	cusecs	MAF	Cusecs
<u>FORESEEABLE DEMAND</u>				
Bangladesh	33	55,000+ <sup>(a)</sup>	-	55,000
India	150	-	-	360,000 <sup>(b)</sup>
Nepal	24	-	-	-
	<u>207</u>			<u>415,000+</u>
<u>FORESEEABLE SUPPLY</u> <sup>(c)</sup>				
Storage in Nepal	50	130,000	-	25,000 <sup>(d)</sup>
Storage in India	54	180,000	20	(20,000) <sup>(e)</sup>
	<u>104</u>	<u>310,000</u>	<u>-</u>	<u>45,000</u>

- Notes:
- (a) This is Bangladesh's estimate of current demand
  - (b) This is India's estimate of irrigation demand in the Rabi season, plus the demand for Calcutta Port. It does not include any allowance for diversion out of the Ganges Basin
  - (c) These estimates are of additional flows; that is, excluding the existing dry season flow
  - (d) This is the estimate contained in the Indian Proposal, p 56. However, a Press Trust of India report of 18/7/78 quoted an estimate of 50,000 cusecs, a figure also suggested in my interview with a Ministry of External Affairs official
  - (e) This estimate is from my interview cited in (d)

Sources: Bangladesh and Indian Proposals, except where indicated otherwise

from which these estimates arise. It is not, therefore, possible to identify the causes of this discrepancy between estimates of the water potentially available from reservoir storage in the Ganges Basin.

Nevertheless, it is clear that the Indian Government is more conservative than Bangladesh in assessing the feasibility of proposed reservoirs in Nepal. One Indian engineer has commented that only six of Bangladesh's proposed reservoirs have been 'investigated'; the remaining 25 have only been 'reconnoitred' (14). The Bangladesh Government does not deny this; it says that storage of water within the Ganges Basin is a proposal put forward for investigation.

The Bangladesh Proposal leaves many questions unanswered. How much will it cost? How high will the dams be (15)? Will there be a conflict between the objectives of generating electrical power and augmenting the dry season flow (16)? How much land will be flooded? In leaving these questions unanswered, the Bangladesh Government seems content to emphasise that their scheme is a proposal; its case will be established, or proved, when investigations are undertaken.

## CONCLUSIONS

This chapter has examined the Bangladesh scheme for augmenting the dry season flow of the Ganges. We have seen what the scheme consists of; this concluding section is an attempt to draw attention to the similarities between the two Proposals and to identify some of the assumptions and choices inherent in the Bangladesh document.

The Bangladesh Proposal, like its Indian counterpart, eschews questions of equity and rights. The Bangladesh case is founded only upon 'reality', as attested by technical experts. The 'reality' perceived by Bangladesh's experts is markedly different from that described in the Indian Proposal. According to Bangladesh's calculations there is plenty of water in the Ganges Basin and enough can be stored to meet all parties' needs. Whilst the reality is different, the mode of argument is identical: it is based on technical calculations and avoids



all politics.

A second similarity occurs in the explanation of calculations. The Bangladesh Proposal's authors say they estimated the demand for water from consideration of the cultivable area and potential irrigated area, but they do not explain how that calculation was made. As was noted in the previous chapter, India's experts are similarly reticent about how they arrived at their water demand estimate. Why are both parties discreet about this matter? If so much depends on these calculations, proof that they are based on sound estimates and assumptions would significantly strengthen either side's case. Perhaps the experts are discreet because the assumptions are inadequate. More probably, both sides are reserving their negotiating positions, their ability to manipulate the calculations in search of the most partisan, believable answer.

A significant difference between the two Proposals is in their choice of units. It can be seen, in Table 15.6, that the Bangladesh Proposal measures demand for water in MAF per year, whereas the Indian document uses cusecs.

A measurement of annual demand for water (such as MAF per year) provides an estimate of the total demand for water. Bangladesh has chosen to measure this total rather than the peak requirement for water. India's choice of instantaneous demand (cusecs), on the other hand, directs attention to the peak requirement. It can be seen that each country's choice of unit corresponds to its political interest in the negotiations. Bangladesh's interest lies in a conservative estimate of demand, whereas it is in India's interest to estimate demand generously. The case for the Indian proposal rests on the assertion that 'enough' water cannot be stored within the Ganges Basin; the Bangladesh case is founded on the belief that it can. The notion of what is 'enough' thus becomes a focus of dispute, with Bangladesh tending to reduce the estimate, and India tending to increase it. The Bangladesh Government's choice of total annual demand coincides with this tendency toward underestimation by ignoring seasonal variation; India's choice of instantaneous demand similarly

reflects a wish to draw attention to a generous estimate.

Politics appears to dictate not only the selection of units of measurement, but also the measurements themselves. Where the discretion of the two parties does not prevent comparison, it is possible to identify a dramatic difference: India variously estimates the foreseeable supply from reservoirs in the Ganges Basin at 55-80,000 cusecs, whilst Bangladesh assesses the same quantity as 310,000 cusecs, a figure nearly four times larger than the highest Indian estimate. Again the variation in these 'technical' calculations is in the direction which political considerations would suggest. Bangladesh needs to prove the feasibility of storage within the Ganges Basin; India's need is to cast doubt upon it.

The Bangladesh Proposal is, in the same manner as its Indian counterpart, a technical document, the assumptions and calculations of which are informed by political goals; it is also, from another point of view, a political document argued in the language of technical discourse.

The politics informing the Bangladesh Proposal is the national interest as perceived by the authors of the document. That interest appears to be defined primarily in terms of a single goal of maximising the availability of dry season water. No doubt compromise will, in the long term, be conceivable, but the Bangladesh interest is initially identified with a claim to water which may be stored in the Ganges Basin, and with opposition to the regulation of the Brahmaputra. The Indian Proposal argues that it is in Bangladesh's interest to regulate the Brahmaputra and thus reduce the flooding caused by that river. In other political circumstances, and with a scheme different to that described in the Indian Proposal, the Bangladesh Government might well concur. If, as the Indian Proposal implies, regulation of the Brahmaputra is associated with transfer of water out of the Brahmaputra Basin and a reduced dry season flow, and if there is no basis of 'trust' between the two countries, then Bangladesh is willing to forgo the regulation of flooding: the sovereignty of Bangladesh and dry season flow in the Brahmaputra are more important.

V

REVIEW

## Chapter Sixteen

### REVIEW AND COMPARISON

This thesis opened with five main questions about the conflict over the River Ganges:

- a) Why was the Farakka Barrage built?
- b) What influenced the responses of Pakistan and Bangladesh?
- c) Why do India and Bangladesh have different approaches to augmenting the Ganges?
- d) How does the conduct of this dispute compare with that of others elsewhere?
- e) What does the study tell us about the interaction between politics and expertise in a conflict of this sort?

This chapter attempts to draw loose ends together by providing answers to these questions. As has been made apparent in the body of the thesis, some of these answers must remain sketchy and provisional in character, until further evidence becomes available and further research is undertaken.

The first three questions are answered only summarily because the concluding sections of Parts I and II and of the chapters in Part III have already elaborated answers. The fourth and fifth questions are discussed at greater length; the fourth because it contains comparative material not previously explored, and the fifth because it is a summarising discussion of the various aspects of the interaction between politics and expertise contained in this case study. Before embarking upon these concluding discussions, it is necessary to consider briefly the areas in which the conclusions of this thesis might be said to rest upon incomplete data.

#### Secrecy and speculation

The study of current affairs, or contemporary history, and particularly

of issues which governments define as sensitive, is problematic. Information is a resource which governments husband carefully. It was inevitable, therefore, that this investigation would prove an arduous exercise in information gathering and predictable that this thesis should be open to the criticism that its conclusions are founded on incomplete knowledge and inadequate documentation. Criticism of this kind was voiced in the course of my interviewing in South Asia. It is a criticism to which response should be made.

Setting aside those areas where I have specifically indicated that my conclusions are speculative, and further research is required, I believe that there are two places in this thesis where discussion appears to rest on seriously incomplete information. I shall deal with them in turn.

Firstly, the circumstances in which the decision to build the Farakka Barrage was taken remain ill-documented. In particular, my discussion of the contradiction between the conclusions of the Indian and Pakistani consultants (see Chapter 3), and of the inadequacy of the technical rationale of the project, is carried on in the absence of Hensen's report, of the official technical literature and of the subsequent studies of the Calcutta Port Hydraulic Study Department. Any future investigation might start by attempting to obtain that documentation; mine was hampered by the Indian Government's refusal to grant research permission. Nevertheless, whilst my discussion is based on slight documentation, that documentation is reliable, emanating as it does from the relevant government. There can be little doubt about the existence of technical ambiguity (1), although the details of its origin require further exploration. But, did Indian engineers realise that there was this ambiguity before the decision to build the Farakka Barrage? This we do not know for certain. If they did not know before the decision, they certainly learnt soon afterwards from the protests of Pakistan.

The second area where the validity of my data may be questioned concerns the technical 'talks' held between India and Pakistan between 1960 and 1970. The only direct evidence we have of these

exchanges is the summary list of documents exchanged contained in Appendix B. Otherwise, this account has relied on the secondhand or polemical accounts provided by the governments involved and on contemporary newspaper reporting. Can these talks be fairly categorised as Indian attempts to stave off negotiation? Would a less partisan account describe them as at least consultation, if not substantive negotiation? When the minutes of these meetings are released we shall be able to find definitive answers to those questions. In the meantime, I consider that my categorisation of these talks as part of a 'strategy of procrastination' is a reasonable inference from incomplete evidence. The inference is, in addition, confirmed by my interview with India's former Foreign Secretary, Rajeshwar Dayal. I think the record suggests that Pakistan was remarkably cooperative on this issue, in the face of indications that India was unwilling to compromise.

Having dealt with those two areas of inadequate documentation, I turn now to the first of the questions to which this chapter provides summary answers.

#### Who initiated the Farakka Barrage Project, and with what motives?

The decision to build the Farakka Barrage seems to have been determined primarily by anxiety: fears about the physical decline of the Hooghly, about the decline of Calcutta's export and import trade, and about the economic decline of West Bengal. In 1833, and intermittently since then, the Bengal chambers of commerce have expressed their anxiety about the deterioration of the Hooghly. In 1960, representatives of foreign shipping companies were sufficiently concerned to issue an alarmist statement suggesting the port might die within two years.

Anxiety prompted governmental action. A series of governmental investigations were instigated, approximately one per decade for the first sixty years of this century. The investigators were generally unable to find conclusive evidence that the Hooghly was deteriorating. Nevertheless, they favoured controlling the headwaters of the Hooghly as a prophylactic measure. Thus, out of anxiety arose the idea for a

Ganges barrage. The British rulers of India, however, do not appear to have taken the idea seriously; certainly there is no evidence to suggest such a project had been sanctioned prior to Partition. After Partition the Man Singh Committee found evidence sufficient to satisfy itself that the Hooghly was deteriorating. But action did not immediately follow the development of this degree of expert consensus.

The fears of the business community and the opinions of the expert investigators were articulated in the Indian parliament by West Bengal MPs for several years before ministerial backing for the project could be obtained. Only gradually were the MPs able to transform the central government's perception of the project from that of a state preoccupation to being a national priority.

The exact circumstances and timing of the Indian cabinet's decision to build the Farakka Barrage remain shrouded in secrecy: a subject for further research when the political sensitivity of the issue has subsided. We have seen that there appears to have been some caucus-building by MPs from North Eastern states attempting to persuade the central government to back the projects they favoured. We have also speculated that the Farakka Barrage may have appeared as a useful 'panacea' for the political leaders of West Bengal: the state had been declining economically since independence, but diagnoses which located the cause of decline in the structure of the economy threatened the broad, nationalist base of the Congress party, whereas blaming the Hooghly and demanding central government help threatened only Pakistan. This is speculation, but speculation is needed to explain why the Farakka Barrage was built. As we have seen the technical rationale for the project was the subject of serious doubt and, with the benefit of hindsight, the project does have many of the attributes of a 'white elephant'. In addition to those two failings, a third, that the project would create vigorous conflict with Pakistan must always have been evident to the Indian leaders. In the light of these three inadequacies, speculation is required to explain why the project was built.

### What alternatives were available?

Chapter Three describes five contemporary alternatives to the Farakka Barrage Project: a ship canal; a barrage and ship canal; an alternative port; dredging and the restoration of the 'flushing' action of the Rivers Rupnarayan and Damodar. Without access to Calcutta Port Commission archives, we cannot be certain of the degree to which each of these alternatives was investigated. However, a brief account by Framji, the director of the investigations, has been published. From this account it would appear that only the first of the alternatives, the Diamond Harbour ship canal, was assessed with any zeal. Not one of the five alternatives can be proffered as a certain solution to the problems faced by Calcutta Port; indeed, it is probable that a sea port connected to the sea only by 125 miles of winding, unpredictable river channel cannot economically be rejuvenated to meet the requirements of twentieth century shipping. These doubts do not absolve the Indian Government from its responsibility to investigate the alternatives thoroughly. The belief that the Farakka Barrage was not a sensible solution to the decline of the Hooghly and that the alternatives had not been seriously investigated is a belief which has lent acrimony to the arguments of Pakistan and Bangladesh in the conflict over the Ganges.

### What influenced the responses of the Pakistan and Bangladesh Governments?

The most tangible factor motivating the opposition of the Pakistan and Bangladesh Governments to the Farakka Barrage Project was and is the fear of the project's downstream consequences. The full force of these consequences was experienced by Bangladesh during the dry season of 1976 and to a lesser extent 1977. Part III of this thesis provides an assessment of the extent and depth of the effects.

The effect of India's Farakka diversions on the Ganges' flow in Bangladesh is proved beyond reasonable doubt. During the dry season months of March and April in 1976 and 1977, the flow in the river was, on average, only half of what would have been expected. The



flows in the two main distributaries of the Ganges, the Gorai-Madhumati and Arial Khan, seem also to have been affected by the Indian diversions. In the years in question, the flows in these two rivers were unusually low, but these low flows cannot be irrefutably blamed on the Farakka withdrawals. Since, in the case of the Gorai, low flows had previously occurred naturally, some doubt remains as to the cause of the low flows in 1976 and 1977. In the case of the Arial Khan, there is an element of doubt because the river obtains its water from the combined flow of the Brahmaputra and Ganges; it is surprising that a change in the Ganges should have significantly altered this somewhat larger flow. Nevertheless, the most likely explanation for the low flows observed in both these rivers during the dry seasons of 1976 and 1977 remains the Farakka diversions. In areas within a few miles of these three rivers, the Ganges, Arial Khan and Gorai, groundwater levels may also have been adversely influenced by the Farakka diversions.

In the years of maximum Indian diversion, there was unprecedented saline intrusion up the rivers of South West Bangladesh. However, only in the central 'compartments' of the Nabaganga-Pussur and Gorai-Madhumati estuaries is this plausibly attributable to the reduced flows in the Ganges and Gorai Rivers. In particular, the immediate area of Khulna, which by chance is also the main industrial centre of Bangladesh, suffered an exceptional salinity change. A quirk of river channel formation seems to have left the area prone to large salinity changes as a consequence of relatively small changes in river flow. In 1976 and 1977, therefore, the industries in and around Khulna were forced to cope with either increased salinity in their process water or the increased costs of shipping fresh water many miles. The damage or increased costs caused by the salinity changes can be reasonably attributed to Indian withdrawals.

As a consequence of reduced river flows and increased river salinity, agricultural production in South West Bangladesh was reduced. Undoubtedly, both the Bangladesh Government and the 'independent' experts who wrote Special Studies have exaggerated the extent of the

reduction. The effect on agricultural production is connected to the Indian withdrawals of Ganges water only by a long and complex chain of causation. The existence of the chain cannot reasonably be doubted, but there is inadequate evidence to quantify the effect on agriculture.

There is also a degree of uncertainty about the effect of the Farakka diversions on the Sundarban mangrove forests of South West Bangladesh. Potential natural causes for decline have not been irrefutably eliminated by Special Studies, but the decline may be attributable to the Farakka diversions.

There can be no doubt that the Farakka withdrawals made navigation difficult or impossible on the Ganges and Gorai during the dry months of March and April in 1976 and 1977. This was the consequence predicted by Cotton in 1856 (see Chapter Two). The Indian Government's claim that navigation 'practically ceases' during the dry months is not supported by the evidence of traffic surveys. The Ganges and Gorai are not Bangladesh's most important waterways but there was significant disruption of inland navigation.

It is difficult to attribute a general or widespread ecological deterioration in South West Bangladesh to the Indian withdrawals. There has been, however, a significant decline in catches of Hilsa fish from the Ganges. The exact causes of this decline remain to be identified but the Farakka Barrage, as a substantial intervention in the ecology of the Ganges, must be a strong potential culprit.

In sum, therefore, the assessment of Part III casts doubt on both governments' propaganda claims but, in the final analysis, it concludes that there was an objective basis to the Bangladesh Government's sense of grievance. The economy of Bangladesh did suffer significant damage as a direct result of India's withdrawal of Ganges water during the dry seasons of 1976 and 1977.

Economic damage and the fear of such damage were the most tangible factors influencing the responses of the governments of Pakistan and

Bangladesh to the Farakka Barrage Project. As we have seen in Parts I and II of this thesis, however, they were not the only factors.

As we saw in Chapter Three, doubts about the efficacy of the Farakka Barrage gave rise to a 'myth' about the sinister intentions of the project, a myth which may have lent acrimony, distrust and intransigence to the Pakistan and Bangladesh responses. On two occasions after the independence of Bangladesh, the Ganges conflict appears to have been given a symbolic national status such that it could be promoted for political ends unconnected with the sharing of the river. Thus, in Chapter Seven, it was speculated that the failure to resolve the conflict during the period 1972 to 1975 may be explained by the 'use' of the conflict in a struggle for the leadership of Bangladesh. Similarly, in Chapter Eight, we saw that one factor behind the Bangladesh Government's promotion of the dispute was, apparently, its desire to build an internal, national consensus and to improve the country's international image. In both these cases, the conflict was seen as a symbol of Bangladesh's national identity.

There is, of course, one final and very significant factor conditioning the response of the Pakistan Government, and to a lesser extent that of Bangladesh. This is a factor which has only been touched upon in passing: Indo-Pakistan hostility. The complex and contradictory explanations for this hostility have been discussed elsewhere (2). The focus of this thesis is upon other factors, but the general 'state of relations' between India and Pakistan and India and Bangladesh has been used, herein, to identify potential 'windows' when resolution of the conflict might have been achievable.

#### Were opportunities for a settlement overlooked?

We have seen in Part II that there were 'windows' in the conflict in 1960 and again in the period 1972 to 1975. These two potential opportunities to resolve the dispute were overlooked. Why?

For a few months in 1960, as we saw in Chapter Five, convivial relations held sway. In the euphoria following the successful negotiation of the India-West Pakistan border demarcation and of the sharing of the Indus River, a resolution of the embryonic Farakka conflict might have been possible. The Indian High Commissioner to Pakistan at that time has admitted, 'then, perhaps we could have reached agreement'. Towards the end of the window, and some months after India's announcement that the Farakka Barrage would be built, the leaders of India and Pakistan met and made arrangements for discussions to be held. This meeting, between Ayub Khan and Nehru in March 1961, cannot, however, be interpreted as an attempt to grasp the opportunity offered by the window in relations. It was apparently little more than a casual encounter (Ayub Khan does not bother to mention it in his memoirs); it took place after Indian intentions had been made apparent, and relations had already begun to deteriorate. The achievement of the meeting was a vague, verbal understanding which confirmed the necessity for the technical exchanges which had already commenced and held out the prospect of ministerial negotiations at some future date.

Some time before the Nehru-Ayub meeting, Pakistan had apparently offered to extend the principles of the Indus Waters Treaty to the sharing of the Ganges. In 1961, the Pakistan Government also offered to consider a joint barrage across the Ganges (see Chapter Six). These are not the actions of an intransigently hostile state. India was at this stage offered the option of opening substantive negotiations with Pakistan; it did not do so. Instead a protracted, intermittent and apparently trivial series of technical talks were begun. We do not have documentary evidence of India's reasons for ignoring the 1960 window. We do have, nevertheless, strong circumstantial indications that a policy of procrastination was started at about this time. These indications include, firstly, the admission by a former foreign secretary of India that the opening of negotiations would have led to an 'injunction' from Pakistan; secondly, the several statements in the Indian parliament implying or stating that the Farakka Project was a unilateral project. In the absence of evidence to the contrary, these are good reasons for

believing that this window in relations was consciously ignored by the Indian Government. The needs of Calcutta's export-import trade took precedence over relations with Pakistan and the possibility of a cooperative development of the Ganges.

For more than two years, between January 1972 and May 1974, relations between India and Bangladesh were excellent or at least positive. The record of what happened during these years is confused. But there is no doubt in the minds of participants on the Bangladesh side that this was a period when negotiations were possible; nor is there any doubt that progress was not made. At the end of the period, when Sheik Mujibur Rahman met Indira Gandhi they found that the negotiations were only just beginning. In Chapter Seven, we have explored three possible explanations for this state of affairs: the Bangladesh Government was too busy with other matters; the officials responsible for the technical negotiations chose to follow a 'hard line'; the Bangladesh water minister prolonged the dispute as part of a struggle for the leadership of the country. There is not enough evidence to decide between these three explanations (or indeed one of the many alternatives which could be imagined) but the third is slightly the more plausible. Further research should concentrate on the deliberations of the members of the Joint Rivers Commission, how their negotiations developed, and on the circumstances in which their discussions ceased. Specifically, our interpretation of the events would be aided by a knowledge of when, how and with whose agreement the JRC negotiations were curtailed.

A third window in the relations between the parties to the conflict occurred in the months after the victory of the Janata Party in the Indian General Elections in 1977. The window led first to the understanding of April 1977, then to the Ganges Waters Treaty of November 1977. As has been suggested in Chapter Nine, this opportunity was grasped because, in the words of an Indian civil servant, 'the new government wanted to project an image of having achieved success in foreign policy...'

Why are India and Bangladesh proposing different means for increasing dry season flow of the Ganges?

In Part IV of this thesis, the Indian and Bangladesh Proposals for augmenting the Ganges have been examined, and in Chapter Nine the deadlock in the negotiation of augmentation has been described. What we have seen is that a curious, stultified discussion is being carried on. The implicit ground rules of this discussion debar questions which might be deemed political. Rules or no rules, politics not only finds its way into the discussion; we discover that the two parties schemes are principally moulded by their political objectives. A political discussion is hidden under the technical language.

The central questions of this discussion are: Who shall control the two rivers? How shall the water be shared? How will national sovereignty be maintained? From the Bangladesh Government's point of view, the Indian scheme expresses several threats to Bangladesh and to Bangladesh's interests. The Indian Government is not proposing the Brahmaputra-Ganges link canal in order to threaten the sovereignty and resources of Bangladesh. That is nevertheless, how the scheme is perceived. India's interests are similar to those of Bangladesh: both countries want to maximise their command over dry season water. This inevitably leads to a conflict of interest, a conflict which is expressed in the divergence between the two Proposals. The Bangladesh Proposal concentrates on the possibilities for developing the Ganges; that way the whole dry season flow of the Brahmaputra is left for Bangladesh and that way Bangladesh expresses its demand for a share in the increased dry season flow of the Ganges. There can be little doubt that, whatever may happen in the Indo-Bangladesh negotiations, the dry season flow in the Ganges will be enhanced even if only through the bilateral efforts of India and Nepal. By neglecting that increase, the Indian Government's Proposal serves to deny Bangladesh's rights in the augmented flow of the Ganges. The Indian scheme focusses on the Brahmaputra because India wishes to stake a claim (not an unreasonable one, it must be noted) in the waters of that river.

The experts of both countries doubtless have good reason to believe that the arguments they have put forward are based in a thorough and objective analysis of the alternative possibilities. The basis for the choice which each government has made is, nevertheless, political. The two Proposals are grounded in the 'national interest' and shaped by the history of conflict and distrust.

#### How does this dispute compare with other water sharing disputes?

This thesis is primarily a case study. In order to fit the conduct of this conflict into its historical context, however, it is necessary to briefly compare this case study with the experience of other water sharing disputes. I have chosen to make a comparison with two other traditions: firstly, with India's inter-state water disputes and, secondly, with the experience of other international water disputes as embodied in the precedents and judgements of contemporary international law.

#### India's inter-state river disputes

Most of India's major rivers cross state (or provincial) boundaries and there is a long history of inter-state disagreements over water. As a consequence, a body of legislation has been created, notably provision in the Government of India Act (1935), the Inter-State Water Disputes Act (1956), and the River Boards Act (1956), and a number of settlements or partial settlements have been made. Superficially, it would seem that such a body of law and practice could provide a useful comparison for the practice of international river disputes. During the fifties and sixties, however, Indian publicists and lawyers denied that the comparison was valid (3). For example, Bains wrote, 'As international law is the product of sovereign States, and..."restrictions of the independence of States cannot be presumed", the rules of law dealing with the provinces or federal units cannot be accepted as rules of international law' (4). Be that as it may, there is a suggestion that at this time Indian publicists were trying to maintain an outdated view of riparian rights, one which contradicted both international practice and

internal Indian practice. The analogy or comparison between national and international decisions seems to be gaining the support of lawyers (5) as well as having the advantage of being a common sense view.

If the comparison is valid, what can be learnt from it? The main difference between Indian inter-state practice and the conduct of the Ganges water dispute relates to the principle of equitable apportionment. In inter-state disputes this principle was accepted many years before the Indian Government was willing to recognise its relevance to the Ganges dispute.

Hassan, writing in the Harvard International Law Journal, has pointed out that the principle of equitable distribution was proclaimed as early as 1862 by irrigation officers in the Punjab. The Irrigation Commission of 1901 and the Rau Commission of 1942 are also based on this principle (6). Whilst the Inter-State River Disputes Act (1956) does not specifically propose such a principle, it is clear that the tribunals which it provides for would be unnecessary if a simpler view of riparian rights prevailed. The Administrative Reforms Commission\* commented that whilst 'there is no codified law prescribing rights...the notion of 'equity' has come to prevail restraining the upper states from drawing such quantities of water as would injure the lower states' (7).

As we saw in Chapter Six, the Indian Government did not adopt the principle of equitable distribution of waters in the Ganges dispute until 1971 and the Bangladesh Government feared that they were going to restate the principle of territorial sovereignty as late as 1976. There was, therefore, an uncomfortable contradiction in the fifties and sixties, between Indian national and international practice. It is this, presumably, which led to the denials, by Indian publicists, of the analogy between national and international practice. In most other respects the practice and law of Indian inter-state river disputes corresponds quite closely to international law and to the conduct of the Ganges dispute.



The two laws passed in 1956, the Inter-State Water Disputes Act and the River Boards Act, have been used most sparingly. The first provides for an informal tribunal to arbitrate in intractable disputes. The second allows for a supra-State administration to develop a river or a river basin (8). The two laws have been described as a curative and a preventive measure, respectively, in the settlement of inter-State river disputes (9). The central government has shown itself loathe to refer any river dispute to a tribunal. Where this has been done, tribunals have in all cases but one, been unsuccessful in settling disputes (10). The preventive measures have been no more successful. No river boards have been established, apparently because the idea is widely opposed by State governments (even though the boards would have only advisory powers) (11). The unwillingness of the Indian central government to intervene in these matters stems from a fundamental, and reasonable, belief in the efficacy of negotiated agreements. In the words of the Irrigation Commission (1972):

'Mutual accommodation and agreement go much further in the direction of ensuring equity, of redressing imbalances, and obtaining willing implementation, than judicial decisions, which more often than not, in spite of the probity and impartiality of the judge or arbitrator, have the effects of prolonging the agony of the riparian States. That the scope of mutual agreements often extends beyond what can be enforced by judicial decisions, is borne out by the history of successful negotiations in India, where compromise, mutual accommodation and even a willing sacrifice of interests to help solution, have led to many settlements.' (12)

The parallel between this reliance on negotiation in inter-State disputes, is the bilateralism repeatedly espoused by India for the settlement of the Ganges dispute. This is, however, only one strand in the justification for bilateral negotiation. Another is that bilateral negotiations best suit the interests of an upper riparian state. That state has the physical power to change river flows. The lower riparian must rely upon the force of international law and international opinion (and, rarely, also on the good faith of the upper riparian) in order to obtain a reasonable share of the water. For this reason, the involvement of third parties, in

mediatory and conciliatory roles, is in the interest of the lower riparian.

The conclusion of several writers and of the Indian Irrigation Commission is that if, as seems to be the case, neither negotiation nor arbitration are effective in a large number of inter-State river disputes, then there must be river basin commissions and, perhaps, a national water policy (13). This recommendation can be seen as a parallel to the establishment by India and Bangladesh in 1972 of the Joint Rivers Commission, though that Commission is rather more limited in its scope than is recommended, for example by the Irrigation Commission.

#### The experience of other international water sharing disputes

Five legal principles applicable to the sharing of international rivers were outlined in the introduction to this thesis under the following headings:

- (i) Absolute territorial sovereignty;
- (ii) Absolute territorial integrity;
- (iii) Positivistic theory;
- (iv) Jusnaturalistic theory; and
- (v) Equitable utilisation theory (14).

Principles of territorial sovereignty have in the past been espoused by upper riparian states, whereas theories of territorial integrity have better suited the interests of lower riparians, and have, therefore, been adopted by them. In recent years, however, the principle of equitable utilisation has gained general acceptance.

It has been shown in Chapters Five and Six that the Indian Government adopted a strategy, during the first two decades of the conflict, which expressed the principle of territorial sovereignty. In the blunt words attributed to Nehru: 'What India did with India's rivers was India's business'. The question we have to answer is: Was India out of step with the practice elsewhere in the world?

One of the few authoritative, and now notorious, statements of territorial sovereignty is the Harmon doctrine. In 1895, United States Attorney General Harmon gave his opinion that the American Government could appropriate the Rio Grande without considering Mexico's needs. In 1961, a lengthy legal opinion supporting this principle was reprinted in The Hindu, J S Bains wrote that:

'The Harmon doctrine has become a part of international jurisprudence [and] has served as a sheet anchor of the arguments of later writers and statesmen...even in treaties the sanctity of territorial supremacy has been reiterated...' (15)

In fact, the Harmon doctrine had by that time fallen into disrepute. Thus, Hassan comments:

'The legal positivists who rely on state practice in support of this principle overlook the fundamental fact that unilateral actions by upper riparians affecting the flow of waters into lower riparians have mostly, if not always, been protested by the latter and as such are weak evidence of what they now consider to be international water law.' (16)

Similarly, Glos writing in a Yale University doctoral thesis published in 1961 could comment:

'It may be seen that the notion pursuant to which a state because it exercised jurisdiction and physical power over the waters within its territorial limits, was therefore permitted by international law to do whatever it pleased with the waters, has long been abandoned. This was mainly because it has been realised that the application of this notion was detrimental to the interests of all riparians and that states could gain much more by mutual co-operation.' (17)

Hassan also noted that the Harmon doctrine had been abandoned by the United States:

'The limited force, if any, of such a partly accepted rule, which has been abandoned by the very country which gave birth to it, is obvious and needs no comment.' (18)

A list of the dates of statements, adjudications and treaties which eschewed territorial sovereignty in favour of the principle of equitable utilisation clearly indicates that the latter principle had been generally accepted by the middle of this century. These are examples quoted by Lipper:

Chile/Bolivia, 1962  
Israel/Arab states (Jordan River), 1954  
River Oder case, 1929  
Lake Lanoux, 1957  
Equador/Peru, 1945  
Afghanistan/Iran (Helmand River), 1872  
Trail smelter Arbitration, 1941  
Kansas/Colorado, 1902  
New Jersey/New York, 1931  
Geneva Convention, 1945  
Niger Agreement, 1963  
Montevideo Declaration, 1933 (19)

In 1966, after lengthy discussions, the International Law Association unanimously adopted a statement of international law which has become known as the Helsinki Rules (20). The Indian delegate was amongst those who voted in favour of the notion that:

'each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an international drainage basin.' (21)

If any further precedent is required, we may turn to the Indus Waters Treaty which India signed in 1960. Baxter notes that this 'effected an equitable apportionment of the waters of the Indus system' (22). A clause was inserted, perhaps with the Ganges dispute in mind, in this treaty stating that it does not constitute a precedent, but the force of such a clause is doubtful (23).

Thus, it can be seen that the Indian conduct of the Ganges dispute involved the adoption of principles of law abandoned by other states and also abandoned by India herself when dealing with inter-state rivers and with the Indus.

The subject and extent of the negotiations between India and Pakistan in 1969 and 1970 suggests that India had begun to shift

from reliance on territorial sovereignty as a guide to practice. But, in 1976 the legal advisors of the Bangladesh Government feared that India would again make recourse to the doctrine. The Bangladesh Government's White paper in the Ganges water dispute (24) contained a page rebutting the Harmon doctrine. In the event, the Indian case did not look for support to that principle; adequate support could be provided within an interpretation of the complicated practice of equitable sharing (25).

If India had accepted the theory of equitable sharing at an earlier stage, would there have been a great difference in their conduct of the dispute? The application of equity lacks the simplicity of earlier principles, so there is considerable room for alternative interpretations. The limits of this room for manoeuvre can, however, be reasonably established. It is clear that a lower riparian is given some rights in the determination of the development of an international river, but those rights do not go so far as a veto. Stone writes that 'equality of rights implies that a nation will have an equal right to claim a reasonable allotment of water... consistent with the corresponding rights of others' (26). The joint Indo-Bangladesh statements of 1972 and 1973 clearly lay the basis for an equitable sharing, providing as they do for a Joint Rivers Commission, cooperation and for a mutually acceptable solution before operation of the Farakka Barrage (see Chapter Seven). But the conduct of the dispute up to that point is more questionable.

A United Nations publication lays down what appear to be the absolute minimum requirements of cooperation:

'General international law places minimum requirements on a State...to give notice, to provide the requisite information and to provide affected States the opportunity to be heard.'

(27)

A less conservative interpretation of what is expected of an upper riparian was agreed by participants to a seminar held at the University of British Columbia in 1963. They said that, 'the essence of this doctrine [of equitable apportionment] is sharing, based on

a notion of good faith and respect for rights' (28).

By either of these interpretations, the Indian conduct of the dispute during the sixties was inadequate. Notice of the intention to build the barrage was given to Pakistan only after a final decision had been made on the project and after the first moves toward construction had been made. It is difficult to interpret the Indo-Pakistan talks as giving Pakistan the opportunity to be heard, let alone as negotiation in good faith.

Having compared the experience of the Ganges conflict with the practice of Indian inter-state water disputes and with the conduct of international water disputes as indicated by international law, I turn now to the final question asked at the outset of the thesis: What can this case study tell us about the role played by technical experts, and the use made of expertise, in international political disputes about technological innovation and resource sharing?

#### Politics and expertise

As previous chapters have amply shown the conflict over the sharing and development of the Ganges is rich in debates which straddle the indistinct border between politics and science. Four principal technical debates have been identified:

- (i) Was the Hooghly progressively deteriorating?
- (ii) Would diversion of water from the Ganges, that is increased headwater supply, overcome the deterioration of the Hooghly?
- (iii) Did the diversion of a proportion of the Ganges' dry season flow cause serious damage to downstream areas?
- (iv) By what means can the low flow of the Ganges best be augmented?

The use of experts and expertise has not, however, been confined to these debates focussed primarily on technical questions. 'Science' is a resource which has also been mobilised throughout the more

political aspects of the Ganges conflict. Experts and expertise have influenced and been influenced by politics and politicians in many and diverse ways. But it is clear that the 'rationality' or 'neutrality' of science, to which attention was drawn in the introduction of this thesis, is a crucial attribute of expertise providing much of its power within political debate. In this summary discussion of the use of expertise within the Ganges conflict, I want to focus first upon this depoliticising and legitimating attribute of science.

Chapters 14 and 15 have shown that the negotiations about augmenting the Ganges (debate (iv) above) are political discussions using technical language as a mode of discourse and of argument. This is a straightforward example of the use of expertise or science to depoliticise a discussion. We have seen that some of the technical choices implicit in the two government's Proposals are in fact expressions of political decisions. Similarly, questions of equity, rights, power and goals - political questions, that is, at the heart of the negotiation - have been eschewed by the unspoken agreement of the two parties. Articles IX and X of the Ganges Waters Treaty do not specifically indicate that the negotiation shall be confined to technical questions, but Article IX contains the following terms of reference:

'The Indo-Bangladesh Joint Rivers Commission...shall carry out investigation and study of schemes relating to the augmentation of the dry season flows of the Ganga...with a view to finding a solution which is economical and feasible.'

(29)

Political arguments are not specifically excluded, but equity is not stated as a goal, nor are political or legal rights indicated. However, the implicit agreement to depoliticise the negotiation has proved in practice a hindrance to progress. The discussions have become deadlocked as a result of the failure to resolve political questions (see Chapter Nine).

A less straightforward and obvious use of expertise to depoliticise debate seems to have occurred during the period 1961-1971. Part of

India's strategy of procrastination was a recourse to technical discussions and data exchanges. The Nehru-Ayub understanding of March 1961 (see Chapter Five) established a dichotomy between 'facts' and 'political' questions. Nehru told the Lok Sabha:

'I hope that after the next [technical] meeting...both parties would be in possession of these facts. Then the time will come...for ministers on both sides to meet and discuss.'

(30)

This formula provided India with a useful delaying tactic. Whenever Pakistan called for political negotiations (a meeting at ministerial level, that is) India was able to parry the demand merely by saying that insufficient data had been exchanged. This tactic enabled India to ward off Pakistan's protests for a decade.

A similar but distinct use of science in the Ganges conflict is its use to authenticate and substantiate choices, decisions and opinions. Scattered throughout this thesis are occasions when an 'independent group of experts' have been wielded to validate or verify. The frequency with which this device is used leads one to muse whether there might not be a steady state theory of experts: for each independent expert an equal and opposite independent expert exists!

As we have seen in Chapter One, Two, Three and elsewhere, the employment of expertise for legitimation sometimes involves a simplification or misinterpretation of the expertise which amounts to misuse. Thus, the venerable name of Sir Arthur Cotton is deployed to support the contention that a barrage to divert water into the Hooghly will reverse the deterioration of the lower Hooghly (debate (ii)). In fact we find that Cotton's writings provide no such support; Cotton wanted to build a barrage for other reasons (see Chapter Two). The decision of a rather different sort of expert, the partition line drawn by Sir Cyril Radcliffe, was, as we saw in Chapter Five, also misinterpreted. Radcliffe did not provide a detailed explanation of why he chose his line, but the explanation he gave cannot be interpreted, as the Indian Government have suggested, as uncomplicated support for a Farakka Barrage.



Examples of this tendency to misinterpret expertise in one's own favour can be identified on both sides of many of the debates associated with the Ganges conflict.

These, then, are two ways in which the inherent 'objectivity' of science is used in a political debate: as a resource capable of depoliticising or legitimating choices or beliefs. A third aspect of the rationality of science can be identified in the fear or belief, expressed at several occasions in this conflict, that technical advisers may take a 'harder' line in negotiations. It may be that the apparent objectivity of the procedures used by experts imbues them with an 'overconfidence' not shared by more 'relativist' politicians.

For example, in Chapter Seven a close adviser of Mrs Gandhi is quoted as suggesting that one explanation for the lack of progress in the discussions during the early years of Bangladesh might be that the technical expert, B M Abbas, 'continued to treat it as a technical question rather than political...' Kamal Hossein, the former Bangladesh Foreign Minister, agrees that experts sometimes take a harder line 'partly because technical people do attach importance to things they think are technically important'. In Chapter Nine, we saw that the fear of hardline advisers was bluntly articulated to the US Embassy:

'Khan and Jagjivan met several times separately from advisers...but were unable to reach [the] political agreement which several Bangladeshis have hoped would emerge from discussions not burdened by technical personnel. The latter have been accused of splitting cusecs so minutely as to be a hindrance to a solution.' (31)

It is not possible to estimate to what extent this aspect of the apparent objectivity of science may have impeded the negotiations but it is a factor of which participants are conscious.

Having explored, briefly, these three ways in which the 'capacity of science to authorise and certify facts' (32) has been utilised in the Ganges conflict, I want now to turn to the notion of technical

ambiguity and uncertainty.

In each of the four main technical debates of the Ganges conflict there were uncertainties about the understanding of natural processes or about the consequences of particular human interventions in nature. In debate (ii), there was also a rather more profound uncertainty, which I have referred to as a technical ambiguity: there were two alternative theoretical models explaining a natural process, and the data available apparently did not enable a conclusive choice to be made between them.

These uncertainties and ambiguities both delayed the resolution of the dispute and provided resources which the two sides could deploy in argument. The resolution of the conflict was postponed because uncertainties distorted the perceptions of both parties. In so far as the dispute could be resolved by a negotiated and equitable compromise, that compromise had to be founded in a clear mutual perception of 'both parties' interests; technical uncertainties and ambiguity fogged that perception. At the same time the uncertainties provided a resource which could be employed in the negotiations and in public denunciations of the other party.

I wish to speculate that the utility of this resource, combined with governmental power to control information flows, may have allowed uncertainties to be prolonged beyond their 'natural' lives. The examples which best illustrate this process of uncertainty prolongation arise from the technical debates (ii) and (iii) as defined above. Taking the more straightforward example first, debate (iii) was over the seriousness of the downstream consequences of the Farakka diversions. As we have seen in Part III of this thesis, this debate was argued at length in the pamphlets both parties produced before the 1976 UN presentations. India argued that the consequences of the Ganges withdrawals were slight and insignificant. Bangladesh, on the other hand presented evidence of serious damage. In order to assess these conflicting claims recourse has been made, in this thesis, to the World Bank-funded investigation of the consequences known as Special Studies. Even this extensive and

detailed investigation did not succeed in dispelling uncertainty entirely; it did, however, clarify several areas of dispute. But Special Studies has not been widely distributed; quite the opposite. In 1977 and 1978 and, as far as I know since, the Bangladesh Government has striven to suppress the report. To my knowledge, the Indian Government had not been shown the report by late 1978. There may be several reasons for restricting the circulation of this evidence, but two seem particularly likely: firstly, Special Studies does not wholly substantiate Bangladesh's claims; it confirms some damage but generally over a smaller area. Therefore, it casts doubt upon aspects of the case Bangladesh presented to the UN. Bangladesh may wish to suppress it for that reason: because it shows their case in a critical light. Alternatively, the Bangladesh Government may be delaying its circulation until a good opportunity arises for its use. Perhaps it will be widely distributed if public 'internationalised' conflict recurs over the sharing of the water, or if India attempts to renegotiate the 1977 Treaty. In either case, Bangladesh is prolonging a technical uncertainty. Information is available which could resolve some of the uncertainties in debate (iii) but it is not in Bangladesh's interest to release that information: it is within the government's power to suppress it.

The second example of uncertainty prolongation is rather more speculative. It concerns technical debate (ii) and the technical ambiguity present in that debate. We saw, in Chapter Three, that there was in 1961 an ambiguity concerning the sedimentation processes of the Hooghly. Pakistan's experts explained the sedimentation as a salinity-related phenomenon, whilst experts employed by India dismissed salinity as an insignificant variable. We also saw in Chapter Three, that the Hydraulic Study Department of Calcutta Port began investigation of related questions in 1962 or thereabouts. Presumably these investigations would have begun to clarify or resolve the ambiguity over the next decade. Fourteen years later, however, in 1976, the Bangladesh Government was still able to deploy 'experts of repute' to question the 'very practicality of the diversions' (33). As far as Bangladesh was concerned, the ambiguity remained. In this case it was in India's power, and

apparently in India's interest to dispel that ambiguity, but that has not been done. When India's Foreign Secretary replied to Bangladesh's case in the Special Political Committee of the UN, he did not refer to the investigations of the Hydraulic Study Department but to the well-worn panoply of expert unanimity shored up with pre-partition expertise from Sir Arthur Cotton onward (34). The reports of the Hydraulic Study Department are, if anything, less widely circulated than Bangladesh's Special Studies. Why India should choose not to dispel the ambiguity concerning sedimentation must remain something of a mystery. There is a general cloak of confidentiality covering most technical investigations of the Hooghly and the Ganges. Does the data required to resolve the ambiguity remain under this cloak by choice or by chance? If the latter, we must presume that the Indian Government has some larger purpose for the information. It is impossible to establish this larger purpose without access to India's strategies. It can, however, be plausibly speculated that data relevant to the sedimentation process of the Hooghly may also be relevant to possible future negotiations about the sharing of the Ganges. India may therefore choose to retain control over that information to use it in future negotiations, rather than use it to clarify the ambiguity.

This discussion is, as I have emphasised, speculative. It is possible that India has submitted convincing data to Pakistan or Bangladesh and that in 1976 Bangladesh chose to ignore it. These speculations have, nevertheless, served to provide a second example of uncertainty prolongation within an international context. There are, I suggest, needs and interests in the dispute which hamper the free flow of data required to clarify uncertainty and ambiguity. There is a contradiction between the secrecy frequently considered by diplomats to be desirable in the conduct of foreign policy, and the openness, or free access to information, characteristic of most scientific discussion. In any technical dispute, parties are likely to suppress information harmful to their case. In a technical dispute between governments the parties not only have the wish but also unrivalled means to suppress information. In the Ganges conflict these means have apparently been employed in the perpetuation of

uncertainty.

Here, therefore, we have a characteristic which distinguishes technical debates within the context of intergovernmental conflict from technical debates between less weighty contenders. The means to control information flows are available more in the former case than in the later. This may allow a lengthening of the life of technical uncertainty.

Another aspect of technical uncertainty and ambiguity should be briefly mentioned. This is the tendency for 'scientifically-certified' disagreement to give rise to myth. The best example of this is the belief of Pakistan and Bangladesh participants that the Farakka Barrage is the outcome of sinister Indian policy. This 'myth' arose because technical experts, Ippen and Wicker, had said that the barrage would not assist navigation on the Hooghly (see Chapter Three). The corollary of this weighty judgement was that some other purpose for the barrage had to be identified. Hostility and a malign policy came to hand. This myth could be dismissed with 'common sense' but it persisted because it had the backing of technical expertise.

Another example of this myth-generation process can be identified in India's belief that the Farakka diversions could do little damage to Bangladesh. Common sense might suggest that the diversion of half the minimum flow of a river would significantly after the ecology downstream of the diversion. This common sense view was displaced by a 'myth' backed by technical expertise (Framji's report) that there would be no injury.

Finally in this discussion of the interaction between politics and expertise in the Ganges conflict, it may be helpful to return to the six propositions about such interactions developed by Nelkin and re-stated in the introduction to this thesis. How far does this case study provide confirmation for these propositions?

Nelkin suggests that developers seek expertise to legitimize their

plans and use their command of technical knowledge to justify their autonomy. Many examples of the use of 'independent experts' have been identified in this case, but it is less clear that national governments have need to justify their autonomy. In a second proposition Nelkin argues that whilst experts may clarify technical constraints, they may also increase conflict. This surmise is illustrated by the effect of the technical ambiguity defined by Ippen and Wicker. This ambiguity served to reinforce the belief of some Pakistani and Bangladeshi participants in the malign intent of the Indian Government.

Ippen and Wicker, and Hensen come to mind when looking at Nelkin's third proposition: the acceptance of technical advice depends less on its validity and the competence of the expert, than on its correspondence to existing positions. A fruitful line for future enquiry might be the process by which India and Pakistan selected their respective consultants. Did Pakistan consult Ippen and Wicker on the basis of their earlier work on salinity in estuaries? Was Hensen employed by India because the Indian Government expected him to confirm their choice of flood tide-caused sedimentation?

A clearer example of this third proposition is to be found in the 1905 debate, carried on in the Proceedings of the Institution of Civil Engineers of London, between Vernon Harcourt and the two officials of the Calcutta Port Commissioners. This debate is described in Chapter One. We find that Petley and Palmer, the two port officials, cast doubt both on Vernon Harcourt's methods and his motives. Palmer said that Vernon Harcourt's paper was 'calculated to give shipowners a feeling of uneasiness', whilst Petley said 'the mere study of annual charts...could be of little real value'. Vernon Harcourt had, however, previously been employed by the Commissioners as a consultant, and his method of comparing patterns of sedimentation from year to year is used to this day. Therefore, neither his competence nor the validity of his method can be in doubt. Petley and Palmer were reacting to his conclusions, to which the Commissioners were opposed. At that time, the Commissioners did not want any suggestion of the Hooghly's

deterioration to gain currency. They were therefore vociferous and intemperate in criticising Vernon-Harcourt. This brief confrontation is an excellent example of the acceptance of advice depending on the extent it reinforces existing opinion. Further illustration of this proposition can be seen in Bangladesh's decision to suppress the report of Chinese water experts (see Appendix D) and in Bangladesh's failure to circulate Special Studies.

The fourth of Nelkin's propositions does not seem to apply in this case. Nelkin suggested that those opposing a case need not muster equal evidence. If the implication is that technical doubt may be sufficient to have a development halted, then the evidence of the Ganges conflict suggests otherwise. Nelkin writes:

'It is sufficient to raise questions which will undermine the expertise of a developer whose power and legitimacy rests on his monopoly of knowledge or claims of special competence.'

(35)

In the Ganges conflict, Pakistan's experts successfully undermined the competence of India's, but the power and legitimacy of a national government rests on more than just information control and competence. Here we find another peculiarity of technical debate in the context of intergovernmental dispute: there is no agreed final arbiter to whom opponents of a development can appeal. There are only the diffuse and weak powers of international 'public opinion' and the severely constrained and generally indecisive 'judgements' of the United Nations. This is one reason why it was helpful, but not 'sufficient', for Pakistan and Bangladesh to undermine the expertise of the developer, India.

The fifth of Nelkin's propositions, that expert conflict reduces the political impact of expertise is neither confirmed nor refuted by this case study. There is, however, an illustration of the sixth, that soft and hard experts play a similar role. We found in Chapter Five that Sir Cyril Radcliffe's decision as an arbiter of the boundary was deployed (erroneously) to legitimize the Farakka Project. There can be few experts 'softer' than a lawyer.

Two further propositions, suggested in another article by Nelkin (36), are well illustrated by the Ganges conflict. Nelkin writes, 'a generalised mistrust of authority has compounded sensitivity to the social and environmental impacts of technology'. In this case we see that Bangladesh's mistrust of India enhanced its perception of environmental damage (as was shown in Part III).

A more profound comment is contained in Nelkin's interpretation of the politics of technical innovation as a 'dialectic between efficiency and democratic ideology'. She attributes developers' tendency to define decisions as technical to their concern for efficiency. Part IV of this thesis showed the tendency writ large in the negotiations over augmenting the Ganges. As developers, India and Bangladesh promote their projects on pragmatic technical grounds; as opponents both countries perceive the other's scheme as political. Nelkin's comment is particularly opposite:

'As long' as the problem remains one of performing a narrowly defined task there is no need to weigh conflicting interests, but only the relative effectiveness of various technical alternatives. This situation is surely more comfortable and efficient than the negotiation and compromise required in the political arena.'

(37)

This discussion of the interaction between politics and expertise in the Ganges conflict suggests that there is a considerable area of correspondence between technical debates carried on within the context of intergovernmental dispute and the more common, lower level technical debates subject to control by nation states. The peculiarities of intergovernmental technical dispute seem to be confined to the level of control which governments can exert. In this sort of dispute there is no final arbiter, analogous to the public inquiry, to which opponents of a development can appeal in, for example, Britain. Whilst smaller nations may be eclipsed in power by multinational corporations, the nation state is, generally, the most powerful institutional form on earth; few states have significantly relinquished their autonomy or sovereignty to international institutions. Thus, the importance of technical



expertise may in this context be reduced. Doubt may be cast upon a development, but without arbitration that doubt has only a generalised rhetorical force. Governments, therefore, have greater freedom of action than developers acting within the controlling framework of a nation.

Governments can also exert greater control than most developers, over the information at their disposal. This attribute may lead to the perpetuation of technical ambiguities and uncertainties. The exigencies of prosecuting a political dispute may prevail over the requisites of technical debate, leaving technical questions undetermined.

#### ENVOY

There are dangers in trying to generalise from the disparate conclusions of this thesis. Many different fields have been entered and different analytical tools employed; the conclusions drawn are of variable reliability, some based on pretty conclusive evidence, some on reasonable inference and some are speculative. Accepting that there are risks involved, it is perhaps incumbent upon a thesis-writer to draft some policy guidelines however brief, flimsy or tentative. These are mine:

- o Major engineering projects embody profound political assumptions and frequently initiate far-reaching economic, political and ecological change. Many studies before this have drawn that conclusion. But, the mantle of 'science' confers upon technology and expertise an aura of neutrality which is hard to dispel. The conclusion bears repetition. Technology needs to be assessed from a variety of political perspectives.
- o Whilst expertise carries an aura of neutrality, its writ appears to be less strong in the international arena than in the national. The absence of authoritative international institutions, able to impose their judgements on conflict, results in a dilution of the utility of expertise as a means of appealing against technological development. Nonetheless, technology appears to provide an equivocal language for political discourse between nations; used in this dispute sometimes to mislead

and delay, sometimes to defuse and thus advance discussion. Those interested in technological development and international conflict should be sensitive to these different functions for which expertise may be employed.

- o The analysis, in this thesis, of 'missed opportunities' suggests that in the circumstances of the Indian subcontinent 'windows' in intergovernmental relations may be both brief and rare. It is, thus, in the interest of the weaker party in the dispute to recognise the existence of a window and to exploit it fully and rapidly. The occurrence of a window appears, not surprisingly, to be associated with governmental change, that is, changes of ruling party or within the ministerial ranks. No doubt other such 'cues' could be identified by further investigation.
- o In a conversation with me, a Secretary of the Bangladesh Government characterised the Ganges water sharing conflict as 'an instrument for parties to remain in power'. To the extent that the complex history of the dispute can be distilled and oversimplified into a one-dimensional explanation of what has happened, that blunt comment is it. The Governments of India and Bangladesh are aware of the transformation of agricultural and industrial productivity which could be brought about with the aid of river development. Instead of developing what could be, however, they squabble over the sharing of what is. Expedient political choices triumph over far-sighted ones. Only a change in the character of South Asian governments will remedy this.
- o An exploration of the two governments' proposals for augmenting the Ganges indicates that they are the progeny of their historical and political parentage; the marriage of conflict over water sharing with the aspirations of governments fearful of threats to their power and sovereignty, has produced children which reflect those features. Are augmentation proposals what is required? Should national interest be transcended? The interest of the 300 million or more poor people who inhabit the two basins will be best served by coordinated, equitable and comprehensive river development. Debate is required to identify development proposals appropriate to their needs rather than to the needs and perceptions of the people now in power. That debate, however, is unlikely to influence what happens unless it is part of a fundamental political transformation of the subcontinent.

NOTES AND REFERENCES

## NOTES AND REFERENCES

### INTRODUCTION

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#### INTRODUCTION TO PART I

- (1) There is disagreement on this point because it can be used in argument. If the Ganges once flowed through the Bhagirathi channel, diversion back to that channel can be justified by historical precedent.

Geographers and others in Bangladesh have argued that the present channel of the Ganges has always been the main channel. A prominent exponent of this view is M I Choudhury of Jahangirnagar University. For example see his:

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Chapter 1: THE HOOGLY PROBLEM

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- (29) India. Central Water and Power Research Station, Annual Reports (Technical), Poona, 1950, 1951, 1952 and 1953.
- (30) India, The Report of the Expert Committee on the River Hooghly and the improvement of its headwater supply, Volume I: Report, October 1952.
- The model experiments were also reported in D V Joglekar et al, 'Hydraulic investigations of the Hooghly to improve its navigability', Congress of the International Association for Hydraulic Research, 6th, The Hague, 1955.
- (31) Report of the Expert Committee..., op cit (30), p 7.
- (32) Ibid, p 1.
- (33) Ibid, p 14.
- (34) Ibid, p 29.
- (35) Ibid, p 60.
- (36) Ibid, pp 49-50.
- (37) Ibid, p 53. We shall see in Chapter Three that a Bengali engineer, Kapil Bhattacharya subsequently argued that the decline of the Hooghly could be attributed to the changes in river regime caused by the Damodar Valley Corporation dams.
- (38) Ibid, p 60.

- (39) India, Preservation of the Port of Calcutta (Report), New Delhi, Government of India Press, 22/2/61.
- (40) Ibid, p 5.
- (41) Ibid.
- (42) Ibid, p 6.
- (43) Ibid, p 7. The potable limit is defined as 250 parts per million.
- (44) Report on the Hooghly River..., op cit (18), p 6.
- (45) Oag, op cit (22), p 132.
- (46) Webster, op cit (25), pp 8-9.

Chapter 2: AN IDEA AND ITS PROPONENTS

- (1) India. Ministry of Irrigation and Power, Preservation of the Port of Calcutta, New Delhi, 1961, p 9.
- (2) Lady Hope Cotton, General Sir Arthur Cotton, his life and work, Hodder and Stoughton, London, 1900.  
K L Rao, India's water wealth, Orient Longman, Delhi, 1975.
- (3) A Cotton, Public works in India, Wm H Allen and Co, London, 1954.
- (4) Ibid, p 29.
- (5) Ibid, p 102.
- (6) Official report of Colonel Baker...on Colonel A Cotton's Papers on Indian Public Works, Richardson Bros, 1856 (reprinted from the Journal of the Society of Arts), pp 4 and 20.  
In Souvenir: Farakka Barrage Project, Government of India, Delhi, 1975, Framji quotes the then Governor of Bengal as saying:  
  
    'I was perhaps a little afraid of once letting in Sir Arthur Cotton and his schemes, for I did not know when we should get them out again.'
- (7) A Cotton, A letter to the Society of Arts on Indian Public Works; Being a reply to the report on Col A Cotton's Papers on Indian Public Works, made by Col Baker, Consulting Engineer to the Government of India, by order of the late Gov Gen Lord Dalhousie, Richardson Bros, London, 1856.



- (8) This letter, dated 21/4/1858, is included as a preface to Cotton, Col A, A Memorandum on the Water Communication between Calcutta and Rajmahal, Calcutta at the Alipore Jail Press, 1858. (A copy of this memorandum is to be found in the National Library of India, Calcutta).
- (9) This figure can be calculated from Cotton's Memo, op cit, p 21. He writes of 1 million cu yd per hour, and of the canal head being 110 yd x 3 yd, with a current of  $1\frac{1}{2}$  to  $1\frac{3}{4}$  mile per hour. Both these figures suggest a flow of about 7,500 cusecs.
- (10) 'I cannot at present see any object in keeping open the Bhagirutty, and I would therefore cross it by throwing embankments across it, and supply it only with a small stream of water from a sluice in the canal, so as to keep it navigable for very small boats, and to supply the villages on it with fresh water. The other two rivers I would cross by aqueducts.' Memorandum, op cit (8), p 23.
- (11) H Leonard, The River Hooghly, Eyre and Spottiswoode for HMSO, London, 1865, p 16.
- (12) C Stevenson-Moore, Report on the Hooghly and its headwaters, Bengal Secretariat Book Depot, Calcutta, 1919, pp 11-12.
- (13) W Wilcocks, The restoration of the ancient irrigation of Bengal, pp 13-14, quoted in Bengal Boundary Commission, 'Report of the Non-Muslim Members', p 49, in Partition Proceedings, VI, West Bengal Government Press, Alipore, 1950.
- (14) Extract of Chief Engineer's note in reply to Wilcock's proposal is contained in Annex IV, 'Report of the Muslim Members, p 91, in Partition Proc., op cit (13).
- (15) A Webster, Report on the future development of the Port of Calcutta, Calcutta Port Commissioners, 1946.
- (16) Ibid, pp 9-10
- (17) Abstract of the report of the Ports (Technical) Committee, submitted to the Government of India in May 1946, summarised in The Dock and Harbour Authority, July 1947, XXVIII, 321, pp 56-64, and subsequent volumes.
- (18) India, The report of the Expert Committee on the River Hooghly and the improvement of its headwater supply, I, 1952.
- (19) Ibid, pp 56-8.
- (20) S C Mazumdar, 'Ganga Barrage and Bhagirathi-Hooghly River problem', Indian Journal of Power and River Valley Development, Annual Number, 1953, III, 3, pp 5-20.

- (21) India. Lok Sabha Debates, 'Ganga Barrage Project', 21/7/52, S1, 2, col 1932; and 'Ganga Barrage', 13/11/52, S1, 3, col 316.
- (22) India. The Constitution of India, Government of India Press, New Delhi, 1949, pp 237, 239 and 244 (Seventh Schedule: Union and State Lists).
- (23) India. Lok Sabha Secretariat, A selection from questions and answers in the Lok Sabha (1952-57) Ministry of Transport, New Delhi, March 1957, question on 29/11/54, p 9.
- (24) Ibid, question on 17/8/55.
- (25) This is a censure motion introduced into the debate on a ministerial budget to indicate MPs dissatisfaction with aspects of that ministry's conduct.
- (26) India. Lok Sabha Debates, 'Demands for Grants, Ministry of Irrigation and Power', 3/4/56, 1S, 3, col 4185.
- (27) Ibid, 'Demand for Grant - Ministry of Irrigation and Power', 31/7/57, col 6180 etc.
- (28) Ibid.

Confirmation that the project was seen as a State responsibility is contained in the Central Water and Power Commission's Administration Report for April 1953 - March 1955, published by the Ministry of Irrigation and Power. In this the financial responsibility for the investigation into the Ganga barrage is given as follows:

West Bengal Govt.	50%	
Port Commissioners	10% (max Rs 185,000)	
Min. of Transport	15%	
CWPC	remainder	(p 20)

- (29) India. Lok Sabha, Debates, 'Ganga Barrage Project (Discussion)' 19/11/58, 2S, 22, pp 589-644.
- (30) Mukerjee was referring to the report of a Dutch hydraulics engineer, Dr.Hensen. The report is still confidential but its conclusions have been released and they are discussed in Chapter Three.
- (31) Op cit (29). Patil went so far in dismissing the objections of Pakistan that he said (quite erroneously):

'We will positively increase the irrigation of Pakistan also. There is no real conflict of interest between India and Pakistan...How Pakistan looks at it is a different matter, but so far as experts are concerned there is no difference of opinion that this aspect is equally helpful to Pakistan...'

- (32) No doubt some further investigations did take place. However, it seems unlikely that they were the main reason for the delay in implementing the project. In the period 1950-55, the technical papers from the Central Water and Power Research Station at Poona report hydraulic experiments and investigations central to the understanding of the Hooghly and of the operation of a Ganges barrage; but, from 1955 onwards there is mention only of peripheral experiments.  
India. CWPRS, Annual Reports (Technical), 1950-53 and 1955-60.
- (33) Quoted in India. Lok Sabha, Public Accounts Committee, 196th Report, Farakka Barrage Project, Delhi, 1976, p 5.
- (34) India. Ministry of Transport, Report of the Ministry of Transport 1958-59, New Delhi, 1959.
- (35) 'Statement by His Excellency Mr J S Mehta...on Agenda Item 121 relating to Ganga waters, made on November 16, 1976', Press Release, Permanent Mission of India to the UN.

### Chapter 3: ALTERNATIVES, OPPOSITION AND AMBIGUITY

- (1) Bangladesh Mission to the UN, 'Statement...in the Special Political Committee, 31st General Assembly Session on item 121 "Situation arising out of the unilateral withdrawal of Ganges waters at Farakka"', Press Release, Nov 15 1976, p 8.
- (2) India. Ministry of Irrigation and Power, Preservation of the Port of Calcutta, Delhi, 1961, p 10.
- (3) A T Ippen and C F Wicker, The Hooghly River problem, 1962, mimeo submitted to the Government of Pakistan.
- (4) K K Framji, 'The Farakka Barrage Project - the fulfilment of a dream', in Souvenir Farakka Barrage Project, Government of India, 21/5/75.
- (5) Rendel, Palmer and Tritton, Consulting Engineers, for the Commissioners for the Port of Calcutta, Report on the proposed ship canal between Diamond Harbour and Calcutta, 1946.
- (6) The Dock and Harbour Authority, July 1947, XXVIII, No 321, pp 59-64 and subsequent volumes, 'A survey of Indian ports'. This is a summary of the report prepared by the Ports (technical) Committee and submitted to the Government of India in May 1946.
- (7) D & H A, XXXI, No 357, July 1950, pp 71-77, 'The Port of Calcutta' by R M H Garvie, Chief Engineer, Commissioners for the Port.

- (8) Govt of India, Report of the expert committee on the River Hooghly... October 1952, pp. 47-48.
- (9) India, Central Water and Power Research Station, Annual Report (technical), 1952, Technical Report 51, 'Estuary model of the Hooghly - river regime without dredging and training works'.
- (10) M G Hiranandani and S T Ghotankar, Training of Fulda, James and Mary reach of Hooghly, India, CWPRS Tech. Memo. NAV 1, Sept 1961.
- (11) India. Lok Sabha. Public Accounts Committee 196th Report, Farakka Barrage Project, Delhi, January 1976, p 2.

D Mookerjea, 'Farakka Barrage Project for the preservation of the Port of Calcutta', Engineering News of India, Annual No October 1972, pp 328-334.

Commissioners for the Port of Calcutta, Report submitted to the World Bank Mission, November 1957, p 25.

D & H A, XXXV, No 408, Oct 1954, pp 167-8, 'The River Hooghly'.

- (12) Framji, op cit (4).
- (13) L B Roy; 'Alternative to Farakka', Hindustan Times, 2/10/74. A more detailed description of this proposal is provided in a mimeographed pamphlet by Roy, 'Calcutta Port and the Hooghly River', dated 26/3/74, which is distributed by the Bangladesh Government.
- (14) Framji, op cit (4).
- (15) A Webster, Report on the Future development of the Port of Calcutta, Commissioners for the Port, 1946. A recent history suggests that the Hooghly was first dredged in 1820. This account confirms that dredged material is still dumped in the river.

H P Gosh, 'History, development and problems of dredging in the River Hooghly', in K Bagchi (ed), The Bhagirathi-Hooghly Basin, Calcutta, 1972.

- (16) Framji, op cit (4).
- (17) The World Bank (IBRD), Appraisal of the Port of Calcutta River maintenance and port improvement project, Report No TO-280b, Dept of Technical Operations, June 27 1961. Out of this proposal emerged the money to fund the Hydraulic Study Department.

- (18) The results of this and other studies may be reported in a document cited by N Mukerjee in his history of Calcutta Port:

Report on the improvement of the Bhagirathi  
(3 vols, The Bhagirathi Studies, Calcutta 1966).

I have been unable to find a copy of this report. The Commissioners for the Port, who presumably have a copy, were unwilling to provide documentary evidence to assist my research.

- (19) World Bank, op cit (17), p 1.
- (20) Framji, op cit (4).
- (21) India. Lok Sabha, Public Accounts Committee 175th Report: Audit Report on the accounts of Calcutta Port Trust, Delhi, 1975.
- (22) Ippen and Wicker, op cit (3).
- (23) Ibid.
- (24) India. Lok Sabha Debates, 'Calcutta Port', 1st Series, 4, 17/8/55, Col 3741.
- (25) Ibid, 'Geonkhali Port', 19/12/56, for minister's statement see Appendix V, 14th Session, 1956, Annex 43.
- (26) My interview with an expert who wishes to remain anonymous, Washington, DC, 1979.
- (27) Framji, op cit (4).
- (28) World Bank, op cit (17).
- (29) India. Public Accounts Committee, op cit (11), p 20.
- (30) World Bank expert, op cit (26).
- (31) K Bhattacharya, Silting of Calcutta Port, Burdwan Division District Sammilani, Calcutta, 24/8/61.

In an interview in Calcutta in March 1978, Bhattacharya told me that he had lost his job at a Calcutta shipyard as a result of his opposition to the Farakka Barrage. He believes that the then Chief Minister of West Bengal, Dr B C Roy, intervened with his employers to have him sacked.

- (32) Ibid.
- (33) Quoted in India. Public Accounts Committee, op cit (11), p 107.
- (34) Bhattacharya, op cit (31).
- (35) India. Public Accounts Committee, op cit (11), p 110.

- (36) D Mookerjea in Engineering News of India, Ann No Oct 1972, pp 328-334, 'Farakka Barrage Project for the preservation of the Port of Calcutta', the text of a talk given to the Institution of Engineers (Bengal).
- (37) Public Accounts Committee, op cit (11), p 4.
- (38) D Mookerjea, 'Farakka Barrage Project: a challenge to engineers', Proceedings, Institution of Civil Engineers, London, Part I, 1975, 58, Feb, pp 67-84. Also in Eng News of India article cited above and in his contribution to the Souvenir: Farakka Barrage Project.
- (39) India. Ministry of Irrig and Power, Preservation of the Port of Calcutta, New Delhi, 1961, pp 10-11.
- (40) Ippen and Wicker, op cit (3), pp 2-3.
- (41) Ibid, pp 38-40.
- (42) Hensen in op cit (39), pp 10-11.
- (43) Ippen and Wicker, op cit (3), p 23.
- (44) Ibid, p 27.
- (45) Ibid, pp 30-1.
- (46) Ibid, p 29.
- (47) Ibid, P 31.
- (48) Ibid, p 32.
- (49) McDowell and O'Connor, Hydraulic behaviour of estuaries Macmillan, London, 1977, p 273. McDowell helped to establish the Hydraulic Study Department.

See also S K Bhattacharya, 'Deltaic activity of Bhagirathi-Hooghly river system', Journal of Waterways..., Proceedings of the American Society of Civil Engineers, Feb 1975, WWI, pp 69-87.

- (50) F Posthuma, Report on the development of the Port of Calcutta, parts 1 and 2, 1961?, mimeo, place of publication unknown. This report summarises the findings of his visits of 1957, 1958 and 1960.

In a paper presented to a Calcutta symposium in 1972, two Indian academics also expressed doubts about the efficacy of the Farakka diversions. They did not question the exclusion of salinity as a variable, but they thought that more research should be directed into the reasons for the development of acute offtake angles at the points where distributaries diverge from the Ganges. They wrote:

'The current speculation, designed once again to meet the economic contingency of the port of Calcutta, hovers upon the concept of flushing the Bhagirathi...there is no objective reason to believe that a project like Farakka can at all reverse the process of decay...'

S.R. Basu and S C Chakraborty, 'Some considerations on the decay of the Bhagirathi drainage system', in K Bagchi (ed), The Bhagirathi-Hooghly Basin (Proceedings of an interdisciplinary symposium), Sibendranath Kanjilal, Calcutta, 1972, pp 59-77.

Other papers presented to the symposium discuss sedimentation but none treat salinity as an important variable.

- (51) At this time the World Bank was mediating in the Indus Waters dispute. The Bank's President was undoubtedly aware of the 'sister' dispute developing on the other side of India. Then, as now, the Bank, with an eye to its potential role as mediator, remained aloof. Nevertheless, the decision to fund the Hydraulic Study Department can be interpreted as an intervention to help clarify the issues of the dispute.
- (52) Pakistan, India's Farakka Barrage and its adverse effects on East Pakistan, Water Investigation Division, Dacca, 1971, p 14.
- (53) Interview reprinted in Z A Khan, Basic documents on Farakka conspiracy, Khoshroz Kitab Mahal, Dacca, 1976, pp 126-34.
- (54) Bangladesh Mission to the UN, Press release, 'Statement by the Chairman of the Bangladesh delegation...', November 15 1976, p 8.
- (55) Several 'off the record' interviews of various participants in Dacca, 1978.
- (56) India. Lok Sabha Debates, 19/8/61, 'The Farakka Barrage', S2, 56, col 3201.
- (57) Framji, op cit (4).
- (58) Ibid.
- (59) See quotations (52), (53) and (54).

Appendix C looks at such data as is available showing the actual effects of the Farakka diversions.

#### Chapter 4: THE FARAKKA BARRAGE

- (1) Quoted in India. Ministry of External Affairs, A project to save Calcutta, 1961.

- (2) Economic Weekly, 'To save Calcutta', 29/4/61.

Saroj Chakraborty writes:

'The apprehension regarding the future of the Port of Calcutta publicly expressed by the foreign shipper brought the issue to the fore.'

With Dr B C Roy and other Chief Ministers, Calcutta, 1974, p 444.

- (3) Dilip Hiro, Inside India today, Routledge and Kegan Paul, London, 1976, p 107.
- (4) Myron Weiner, The politics of scarcity, University of Chicago Press, 1962, p 106, quoted in Dilip Hiro, op cit (3).
- (5) Nehru-Roy correspondence in Chakraborty, op cit (2), p 444-7.
- (6) Commissioners for the Port, Report submitted to the World Bank Mission, Calcutta, November 1957.

P C Mitra, a former Chairman of the Calcutta Port Trust, has pointed to the changes in trade patterns from general cargo to bulk carriers and the consequent change to bigger draught ships, as an important factor in the decision to build the Farakka Barrage.

Interview with me in Calcutta, 17/10/78.

- (7) K K Framji, 'The Farakka Barrage Project', in Souvenir: Farakka Barrage Project, Government of India, 1975.
- (8) Lok Sabha Debates, 16/8/61, 'International situation', S2, 56, col 2405-2560.
- (9) Ibid, 19/8/61, 'The Farakka Barrage', S2, 56, col 3201.
- (10) This argument is developed in a series of articles by Ranajit Roy, collected in a book, The agony of West Bengal: a study in Union-State relations, New Age, Calcutta, 1971.
- An alternative explanation for West Bengal's economic decline might be provided by the Partition of India which separated the industrial areas of West Bengal from the primary crop production areas of East Bengal.
- (11) The Statesman, 'Congress-opposition battle of statistics', 18/2/59.
- (12) Framji, op cit (7).
- (13) India. Lok Sabha, Public Accounts Committee, 196th Report, Farakka Barrage Project, Delhi, 1976, p 1.



- (14) T M Oag, Report on the River Hooghly and its headwaters, Calcutta, January 1940.
- (15) Kapil Bhattacharya, Silting of Calcutta Port, Calcutta, 1961.
- (16) Chakraborty, op cit (2), p 447.
- (17) India. Lok Sabha Debates, 'Statement regarding delay in the execution of the FB', 30/11/61, S2, 59, col 2397.
- (18) Mookerjea in The Hindu, 22/7/73, 'Farakka test for Indo-Bangla amity'.
- (19) Quoted in Kulz, 'Further water disputes between India and Pakistan', Int'l and comparative law qtly, Vol 18, p 728.
- (20) Dawn, 'Bharat quits Barcelona Convention in March...', 3/1/57.
- (21) The World Bank mission which visited Calcutta in 1957 was presumably sounded out on its views on the Project and the possibility of Bank funding. The leader of the mission, Mr Posthuma, was doubtful about the Barrage ('so little is known about the results of this barrage...'). The Bank did fund a study of a deep water port (Haldia), certain minor improvements to the facilities of the existing port and, significantly, the setting up of the Hydraulic Study Department.
- World Bank, Appraisal in the Port of Calcutta..., Report TO-280b, 1961, p 4.
- (22) The Hindu, 'Pak bid to prevent USSR aid to India for Farakka Project', 6/8/75.
- (23) World Bank, Report TO-280b, op cit (21), pp 2 and 6.
- (24) Chakraborty, op cit (12), p 444.
- P C Mitra told me that further deterioration in the river was noticed in the 1950s. Op cit (6).
- (25) The Statesman, 'MPs concern over port problem', 18/3/59.
- (26) India. Ministry of Agriculture and Irrigation, Proposal for augmenting the dry-season flow of Ganga, New Delhi, March 1978.
- (27) My interviews with a senior civil servant in the Ministry of External Affairs, Delhi, May and August 1978.
- (28) Appendix C examines the data on the efficacy of the Farakka Barrage in flushing the Hooghly.

## INTRODUCTION TO PART II

- (1) Maxwell has indicated that a distinction can be made between 'talks' and negotiations in the Indian conduct of the border dispute with China. N Maxwell, India's China War, Penguin, Middlesex, 1972, pp 142, and 264-7.

## Chapter 5: PARTITION AND AFTER

- (1) India. Ministry of External Affairs, The Farakka Barrage, 1976, p 4.
- (2) Ibid.
- (3) Interview, Delhi, 28/9/78.
- (4) A A Michel, The Indus Rivers: a study of the effects of Partition, Yale UP, 1967, p 4.

H C Beaumont, now Judge Beaumont MBE, then Private Secretary to Sir Cyril Radcliffe who drew the Partition line, told me, 'More time should have been spent in discussing the lines'. In Beaumont's opinion, another two or three weeks would have allowed a sensible, and in the case of the Punjab, a less violent decision to be made. (Interview, London, 30/9/79)

- (5) HMSO, Indian Policy, statement of 3rd June 1947, Cmnd 7136.
- (6) V P Menon, The transfer of power in India, p 382. Menon was Mountbatten's Reforms Secretary and a very close advisor.
- (7) Lord Mountbatten in an interview for the BBC World Service programme Outlook, re-broadcast in 'Pick of the Week', 20/8/77.

H V Hodson, who had access to Mountbatten's personal papers, has discussed this issue in The Great Divide, Hutchinson, London, 1969, pp 318-321. He notes evidence that the British Government were thinking of October 1st as a likely date. The date of August 15th does not appear in Mountbatten's papers as a Partition date until June 12th.

Collins and Lapierre in their Freedom at Midnight, Collins, London, 1975, were the first to draw attention to Mountbatten's role in setting the date.

Penderel Moon's, Divide and Quit, Chatto and Windus, London, 1962, provides additional support for Mountbatten's account on p 67.

- (8) C H Phillips and M D Wainwright, The Partition of India, policies and perspectives, London, Allen and Unwin, 1970, introduction.

Mountbatten claimed, in the interview with Ludovic Kennedy broadcast by BBC TV as his obituary, that haste was essential in order to avoid a complete breakdown of public order. This is the view Mountbatten has always given, and the one generally supported by British historians.

Peter Lyon writes in his introduction to Razvi, The Frontiers of Pakistan, National, Karachi, 1971:

'the essence of one's appreciation of the Mountbatten timetable for independence and the work of the Radcliffe Boundary Commission still depend very much on the view taken of the fact that the processes were carried through at considerable speed.'

- (9) Michel, op cit (4), p 4.
- (10) Report of the Bengal Boundary Commission, New Delhi, 17/8/47.
- (11) Ibid.
- (12) 'Report of the Muslim Members' and 'Report of the Non-Muslim Members' contained in Partition Proceedings, Vol VI, 'Reports of the Members and Award of the Chairman of the Boundary Commissions', West Bengal Government Press, Alipore, 1950. (This rare document was not to be found in the National Library of India, Calcutta, but a microfilm copy is available at the India Office Library (IOL) London).
- (13) 'Report of the Muslim Members', op cit, p 76.
- (14) Ibid, p 77.
- (15) 'Report of the Non-Muslim Members', op cit, p 50.
- (16) Ibid, p 49.
- (17) Report of the Bengal Boundary Commission. It is impossible not to admire the clarity of thought and purpose behind these simple questions.
- (18) At the time of the 1965 Indo-Pak. War, Radcliffe was reported as saying, 'I wouldn't dream of defending some of the decisions in detail I made at the time...I wasn't aware of the Kashmir thing at all...' Sunday Times, 12/9/65, quoted in Razvi, op cit, p 194.

He also wrote to Michel, '...each decision at each point was debatable and formed of necessity under great pressure of time, conditions and with the knowledge that, in any ideal sense, was deficient. I decided therefore that it was in

the best interests of everyone that I should leave the matter as an Award, conditioned by the terms of reference that were set me, instead of trying to argue it or elaborate upon it further...'. Michel, op cit, p 194.

He told Kuldip Nayar, 'I was so rushed that I had no time to go into the details. Even accurate district maps were not there and what material there was was also inadequate. What could I do in one and a half months?'

Nayar, Distant Neighbours, Vikas, Delhi, 1975, p 35.

A number of allegations have been made that Radcliffe's Award in the Punjab was influenced by Mountbatten or his entourage. This is discussed in Hodson, op cit, pp 352-355. No strong evidence has been unearthed to support the allegation.

- (19) Awards of Punjab and Bengal Boundary Commissions, Memorandum by Minister of State for Commonwealth Relations, India Office Library (IOL) record L/P+J/10/117.

It is clear from the drafts in the file that this explanatory note was inserted by Mr Rumbold, Under-Secretary of State, in a draft by E W R Lumby. Rumbold may have done no more than provide his own interpretation of Radcliffe's Award.

- (20) India. External Publicity, The Farakka Barrage, 1976.

This territorial gain by India has been repeatedly used to provide legitimacy for the Farakka Project itself. In one case, an academic who should know better, Jayanta Kumar Ray, Centenary Professor of International Relations at Calcutta University, quotes at length from 'The Report of the Non-Muslim Members' of the Bengal Boundary Commission and attributes the words to Radcliffe. According to Ray, Radcliffe 'suggested measures for diverting the supply of Ganga waters to the Hooghly and Calcutta Port!'. He did not.

J K Ray, 'The Farakka Agreement', International Studies, 17, No 2, April-June 1978, pp 235-246.

- (21) Interview, Delhi, 4/5/78.

- (22) Both of Radcliffe's Awards are reprinted as an appendix in Razvi, op cit (8).

- (23) L Mosley, Last Days of the British Raj, Weidenfield, London, 1962 p 199, quoted in Michel, op cit (4), p 164.

A sidelight on this exchange is provided by a secret letter from Nehru to Mountbatten, dated 9/8/47, containing a paper by A N Khosla who was subsequently Chairman of the Indian Government's Central Water and Inland Navigation Commission. In his paper Khosla says:

'Any acceptance, even in a remote way, of joint control of the irrigation system will kill all

hope of irrigation development in the Punjab.  
Even the construction of the Bhakra Dam may be  
affected.'

Mountbatten told Nehru that he would not be able to pass the  
letter to Radcliffe, as Nehru had suggested, because to do so  
would prejudice the Award (IOL record, L/P+J/10/117).

(24) Michel, op cit (4), p 193.

(25) This account is mostly based on Helmut Kulz's, 'Further water  
disputes between India and Pakistan', International and  
Comparative Law Qrtly, vol 18, July 1969, pp 718-738.

(Kulz has provided a number of precedents of partition treaties  
with clauses specifying joint control of common rivers.)

The story is also told in:

India, The Farakka Barrage Delhi, 1976;  
Bangladesh, White Paper on the Ganges water dispute, Dacca, 1976;  
Pakistan, India's Farakka Barrage and its consequences  
for East Pakistan, 1970;  
Burke, Pakistan's Foreign Policy, OUP, 1973; and in  
Razvi, op cit (8).

(26) Bangladesh, White Paper, p 12.

(27) Lok Sabha Debates, 25/8/59, 'Indo-Pakistan talks on the  
Gangetic Basin' S2, 33, Col 4324.

(28) See Appendix B which contains a summary of the data supplied  
by India.

(29) The Hindu, 6/8/60, 'Talks on Eastern rivers' (Rawalpindi  
dateline).

(30) Lok Sabha Debates, 4/9/59, 'Talks between President of  
Pakistan and the Prime Minister of India', S2, 34, Col 6425.

Kuldip Nayar, Distant Neighbours, Vikas, Delhi, 1975, p 70.

(31) Lok Sabha Debates, 16/8/61, 'International situation', S2, 56,  
Cols 2405-2560.

See also The Hindu, 19/3/61, 'Nehru-Ayub talks on Kashmir'.

Ayub Khan's Friends not masters, OUP, London, 1967, does not  
mention the March 1961 meeting. Khan refers to three meetings  
with Nehru: May 1960, London at the Commonwealth Prime  
Minister's Conference, September 1st 1960 at Delhi Airport,  
and September 19-23 1960 in Karachi for the signing of the  
Indus Treaty. However, they also met in March 1961 at the  
next Commonwealth Prime Minister's Conference in London. It  
was at this meeting that the discussion of Farakka took place.

- (32) My interview with Dayal, 28/9/78.
- (33) Ibid.
- (34) Nayar, op cit (30), p 75. Nayar does not give a date or source for this information.
- (35) Dayal, op cit (32).
- (36) Debates, op cit (31).

Chapter 6: THE INDIAN POSITION AND THE PAKISTAN RESPONSE

- (1) Lok Sabha Debates, 6/4/61, 'Indo-Pak talks on East-West Bengal rivers', S2, 53, Col 9581.  
Spokesman was Sadath Ali Khan, Parliamentary Sec'y, Ministry of External Affairs. This occurred three weeks before the third round of technical talks.
- (2) Lok Sabha Debates, 19/8/61, 'The Farakka Barrage', S2, 56, Col 3201.
- (3) Ibid.
- (4) Lok Sabha Debates, 30/11/61, 'Statement regarding delay in the execution of the Farakka Barrage', S2, 59, Col 394.
- (5) Lok Sabha Debates, 21/8/61, 'Pakistani claim on water from Ganges', S2, 57, Col 3545.
- (6) Lok Sabha Debates, 22/7/68, 'Farakka Barrage', S4, 18, Col 203.
- (7) Lok Sabha Debates, 26/7/68, 'Visit of Pakistani experts to Farakka Barrage site', S4, 18, Col 2080.
- (8) Lok Sabha Debates, 17/12/69, 'Farakka Barrage talks', S4, 35, Col 299.
- (9) Letter dated 6/7/61, quoted in Kulz, 'Further water disputes between India and Pakistan', Intl and Comparative Law Qtly, 18, July 1969, pp 718-38.
- (10) Kulz, op cit;  
Dawn, 3/5/61, 'Ayub's proposal on Eastern rivers';  
Dawn, 23/5/61, 'Ayub replies to Nehru's letter';  
Hindu, 3/6/61, 'Nehru rejects Ayub Khan's suggestion'.
- (11) Dawn, 12/7/61, 'Pakistan proposal cold shouldered', (Dacca dateline). It is not clear when the proposal was made. The article may be referring to the talks held in Dacca in October 1960.
- (12) Lok Sabha Debates, 20/11/68, 'Ministerial level talks on Farakka Barrage', S4, 21, Col 71.

- (13) See, for example, one document presented by Pakistan, 'Format for information requested by the Indian delegation to assess the effects of any projects on river conditions in East Pakistan', Annex III, Water Investigation Division, EPWAPDA, May 1961.

This paper deals with the effects under three headings:

- A. Navigation
- B. Irrigation
- C. Salinity intrusion.

- (14) The Ganges-Kobadak Project is a canal irrigation project drawing water from the Ganges at Bheramara, near Kushtia. The project planning was started under the UN Technical Assistance Programme in 1951, and the Pakistan Government gave their approval in 1954. The project has been dogged both by technical difficulties and by its inappropriateness to the fragmented land-holdings of Bangladesh and irrigation did not start until the late sixties. However, unlike some other projects which seem to have been hurried through in order to establish Pakistan's rights to historic usage of the water, the G-K project was sanctioned prior to the approval of the Farakka Barrage. Its construction was started first, and it started consuming water before the Farakka diversions.
- (15) Interview with Arshad Hossein, Lahore, 14/9/78. Arshad Hossein was Pakistan's High Commissioner to India 1963-68, then Foreign Minister 1968-69.
- 'My first idea was to tell the delegate to bring about a deadlock and break off negotiations, so we would have an excuse to point out to the great powers what had happened, so that they would pressure India or help us to take the matter to the UN. On the very last day - I could not take that decision myself - I rang the President and I was told that next day a new president was taking over.'
- (16) Ibid. See S M Burke, Pakistan's Foreign Policy, OUP, London 1973, p 382, for details of the UN speeches.
- (17) Dawn, 16/7/68, 'India rejects Kosygin's suggestion on Farakka'.
- (18) Only on three occasions has India accepted any course other than bilateral negotiation for the settlement of disputes. The UN mediated in the Kashmir dispute in 1949 but reached an impasse. The World Bank provided conciliation and mediation for the Indus dispute, and some border disputes were settled by an Arbitral Tribunal in 1948.
- (19) Arshad Hossein, interview.
- (20) Lok Sabha Debates, 31/3/69, 'Construction of barrage across River Padma by Pakistan', S4, 26, Col 46.

(21) Dawn, 11, 15 and 21/6/69, 'The truth about Ganges waters'.

(22) Arshad Hossein told me:

'Purely as a tactical measure our experts were considering [building the Ganges Barrage]. If they do cut off the water, we will build a barrage at Hardinge Bridge which will submerge their project. We didn't officially tell them, we threatened it privately and it caused much concern in India. We initiated a technical study because we knew that the information would reach them eventually. And we could tell India, if you are the upper riparian and you can do whatever you like in your territory, then we, as the lower riparian, can do what we like in ours.'

Two other participants interviewed in Lahore and Islamabad confirmed this view of events. The technical studies referred to were carried out by Tibbet, Abbot, McCarthy, Scratton of USA and Assoc Cons Eng of Karachi.

(23) Bangladesh, White Paper, 1976, and other sources.

(24) Interviews with two participants from the Pakistan side suggest that, during informal discussions, there was agreement on quantity of water to be diverted at Farakka. There is also a suggestion that Pakistan may have used or held in reserve a bargaining 'counter': India would be allowed to use the river channels of East Pakistan for the passage of inland water transport linking Assam to West Bengal, in return for a larger share of water going to Pakistan. Inland water transport across East Pakistan had ceased in 1965.

(25) Water Investigation Directorate, EPWAPDA, Dacca. Also see Dawn, 2/6/71, 'East wings water needs for Eastern Rivers established', in which an aide-memoire sent to India is published.

(26) Harvard University, Center for Population Studies, Bangladesh: land, water and power studies, Final Report, Harvard, June 1972, pl.

(27) See E B Skolnikoff, Science, technology and American foreign policy, MIT Press, Cambridge, Mass, 1967, pp 156-7.

(28) Interview with Professor Peter Rogers of Harvard University, Delhi, 1978.

(29) Revelle and Lakshminarayana, 'The Ganges water machine', Science, 9/5/75, pp 611-6.

(30) My interview, Delhi, 1978.

(31) My interview, Delhi 28/9/78.



- (32) India. Ministry of External Affairs, Bangladesh Documents, 'Awami League Manifesto', p 81, undated, New Delhi.
- (33) Kulz details this incident in op cit (9), p 735.
- (34) A more specific, and better-documented, assertion has been made by a former Bangladesh diplomat, S A Karim who has written:

'In the early years [the Ganges conflict] was never handled with the same sense of urgency or import, as was the case with the Indus Waters dispute, presumably because the question concerned an area which did not carry much weight with decision-makers in Pakistan in those days. If one looks at the chronology of the dispute, one cannot but be struck by the fact that the issue was raised fitfully from time to time to suit the political conveniences of Pakistan Government at that time. During periods when the sense of national integration was strong and there was no need to revive the issue as a reminder of Indian danger, the issue remained dormant. To illustrate: in 1963, Pakistan proposed to India the holding of a meeting on Farakka issue. India did not reply and for two years Pakistan did not even send a routine reminder. The reminder was sent in May 1965 and India conveyed its agreement in August 1965 to hold a meeting. However, war between India and Pakistan broke out in September that year and the meeting was eventually held in March 1969.'

Internationalisation of the Ganges Waters issue..., mimeo submitted to the Bangladesh Foreign Office, June 1976, p 28.

Karim makes a sound point that the Pakistan Government pursued the negotiations only fitfully. This dilatory policy cannot, however, be seen as the primary cause of delay. From time to time the Pakistan Government pursued the negotiations with vigour and its overall strategy appears strong, but neither vigour nor strength influenced the Indian Government's determination to complete the Farakka Barrage.

- (35) My interview, Delhi, 26/9/78.
- (36) My interview, Delhi, 28/9/78.
- (37) My interview, Lahore, 14/9/78.
- (38) S A Karim, in his Internationalisation of the Ganges Waters issue..., op cit (34), comments as follows:

'In the Indus River settlement, India did not allow its political differences with Pakistan on Kashmir and on other issues to stand in the way of a

settlement which was financially beneficial to the  
two countries.' (p 30)

- (39) A further factor may have been India's belief that the Farakka diversions would not damage East Pakistan. Framji had mistakenly advised the Indian Government that there would be no ill-effects. The Indian Government may therefore have believed that there was no conflict of interest. Such a belief may partially explain, but cannot justify, a policy of procrastination.

#### Chapter 7: THE SHEIK AND MRS GANDHI

- (1) India. Ministry of External Affairs, Bangladesh Documents, 'Awami League Manifesto', p 81, undated, New Delhi.
- (2) B N Kureel, the Indian Government's Deputy Minister of Irrigation and Power, in a written answer in the Lok Sabha 21/3/78. Lok Sabha Debates, XI, No 8, Col 86.
- (3) The Hindu, 'Joint Indo-Bangla steps for flood control mooted', 23/1/72. Subsequent articles in 24/1/72 and 29/1/72.
- (4) Joint Statement on the talks between the prime ministers on 8/2/72 in Satish Kumar (Ed), Documents on India's Foreign Policy 1972, Macmillan, Delhi, 1975.
- (5) Treaty of Friendship, Co-operation and Peace between the People's Republic of Bangladesh and the Republic of India, 19/3/72, Article 6.
- (6) Kumar, 1975, op cit (4), 'Joint Declaration on the Treaty of Friendship...'
- (7) The full text of the Statute is given in Appendix A.
- (8) A senior Bangladesh civil servant who was present at the signing of the Statute has confirmed, in an interview with myself, that 'the Agreement encompassed, implicitly, the right to deliberate on all rivers, including Farakka.' A Bangladesh diplomat also told me, in an interview in Dacca in 1978, that the dispute was referred to the JRC in 1972.
- (9) The Hindu, 1/5/72, 'Farakka: Bangla doubts cleared'.  
Hindustan Times, 5/5/72, 'Eastern Horizons'.  
Keesings Contemporary Archives, April 9-15 1972, p 25822, 'Indo-Bangladesh Joint Rivers Commission'.
- (10) Press Note of 26/6/72 in Kumar, op cit (4).

- (11) Hindustan Times, 5/6/72, 'A solid basis for hope'. Moulana Bhashani, who died in 1978, was a populist, peasant leader; he founded the National Awami Party, and was a sometime mentor of Sheik Mujibur Rahman and a longtime nationalist. He had been held under house arrest in India during the 1971 struggle.
- (12) Times of India, 2/8/72 and 15/8/72, 'Farakka will not hit Bangla's interests: Dr Rao', and 'Bengal Chief Minister happy'.
- (13) My interview in Oxford on 3/1/79 with Dr Kamal Hossein, former Foreign Minister and Minister of Law in the Bangladesh Government.
- (14) M Maasland, Water development potentials of the Ganges-Brahmaputra-Meghna River Basins, World Bank, Special Projects Department, Washington, August 30 1972 (with revisions February 12 1973), p 1.
- (15) Ibid, p 20.
- (16) The 'Preliminary Draft' is dated July 25 1972, and entitled Overall water resources potential of the lower Ganges Brahmaputra Basin.
- (17) Press release, 13/12/72 in Kumar, 1975, op cit (4).
- (18) Taking the issues in order:
- 'Major river basins' could apply to the Brahmaputra, the Ganges or, stretching the 'major', somewhat, to the Teesta. The scarcity of dry season water is much less on the Brahmaputra. The likelihood is that the press release is referring to the Ganges, primarily.
- 'Development works of mutual interest' in the stretch of the Ganges referred to, could be (i) the Farakka Barrage, (ii) the Ganges-Kobadak project, or (iii) the proposed Ganges Barrage.
- 'Basic data on works executed' might imply an exchange of data on Farakka, the Ganges-Kobadak Project, or others.
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- (19) Times of India, 13/7/73 and 14/7/73.
- (20) Times of India, 19/7/73, 'Farakka decision left to PMs'. Also India News, 28/7/73.
- (21) Hindustan Times, 18/7/73, 'Farakka issue left to PMs'.

- (22) Press release of 18/7/73 in S Kumar (ed), Documents on India's Foreign Policy 1973, Macmillan, Delhi, 1976. See also Lok Sabha Debates, XXXIX, 31/7/73, Col 127.

A cable sent from the US Embassy in Delhi to the American Secretary of State, after this meeting, commented:

'Apparent failure of two sides to reach agreement is being interpreted to mean decision on division of Ganges waters will be worked out only between two countries' prime ministers. Knowledgeable MEA official recently told emboff final decision would have to be made at "highest level". Comment: The GOI wanted to handle Farakka in the context of broader talks on joint Indo-Bangladesh development of water resources which would have permitted some trade-offs. Bangladesh, however, has pushed for the separate negotiation on Farakka. It is a difficult issue to resolve in isolation, given the importance Bangladesh attaches to the question and the unlikelihood Bangladesh will settle for anything less than Pakistan demanded in the past. Officials with whom we have talked are not happy about this confrontation which forces India to compromise either in favour of Calcutta...or Bangladesh.'

Cable, New De 08426, July 1973, released in November 1979 to me as a result of a request made under the US Freedom of Information Act.

- (23) Times of India, 9/1/74, 'Indo-Bangladesh talks begin today'.
- (24) Foreign Affairs Record, January 1974, 'Indo-Bangladesh Joint Press Statement', 12/1/74.
- (25) Foreign Affairs Record, Feb '74, XX, p 34, 'Indo-Bangladesh Joint Communique' of 15/2/74.  
Lok Sabha Debates, 14/3/74, XXXVI, No 17, Col 65.
- (26) Times of India, 21/2/74, 'Indo-Bangladesh Water Studies'.
- (27) The Hindu, 23/3/74, 'Indo-Bangla stand on Farakka' (by K Krishna Moorthy from Dacca). This intriguing article also notes that Swaran Singh had said in Dacca in February that friendship meant 'sharing the shortages equitably', that the Farakka Barrage had been kept 'outside purview' of the JRC and that the influence of hardliners, like B M Abbas, was waning.
- (28) These details emerge in K L Rao's autobiography, Cusecs Candidate: Memoirs of an Engineer, Metropolitan, Delhi, 1978, Chap 8.

- (29) Foreign Affairs Record, May 1974, 'Indo-Bangladesh Joint Declaration' of 16/5/74, p 155, also The Hindu, 17/5/74, 'India, Bangladesh sign, political, economic pacts'.
- (30) Interview with me in Dacca in July 1978.  
The report certainly exists; it is entitled Ganges River Special Studies and was submitted to the Prime Minister in November 1974. It is still highly confidential, partly because it includes, apparently, the results of 'extra-territorial activities'.
- (31) Interview with me in Delhi, 26/9/78.
- (32) India. Lok Sabha Debates, 25/7/74, 'Accord between India and Bangladesh on Farakka and enclaves', XLI, No 4, col 52.
- (33) India. Ministry of External Affairs, Bangladesh Documents, p 81. No 'grave and permanent damage' had been inflicted at this stage - no Ganges diversions could have occurred because the feeder canal connecting the Ganges to the Bhagirathi was incomplete.
- (34) Interview with me 3/1/79. Dr Kamal Hossein was asked why there was so little progress in a period of improved relations. The second part of his answer to the question was that a concrete step was taken but elaborate political and technical negotiations were required, 'we recognised it was an arduous task, but we were on the track to move step by step to a settlement'.
- Kamal Hossein pointed out that Bangladesh started with nothing. It was in the position, unusual even for a new government, of having few of the political and physical attributes of an independent state. On the side of foreign affairs, there were few embassies and, for the first two and a half years, international recognition was denied. It had an unprecedented task of rehabilitating ten million refugees and providing relief for a nation left in the grip of famine and the devastation of war.
- (35) Interview with me in Dacca, 3/7/78. Abdul Malek Ukil also says, 'Farakka was not completed, so the question does not arise. Only apprehension was there, the real problem cropped up in 1974-75.'
- (36) My interview with Bangladesh official, Dacca, 1978.
- (37) Interview with me, Delhi, 2/9/78.
- (38) Interview, op cit (34).
- (39) Interview with me in Dacca, 10/7/78. Enayatullah Khan's evidence is suspect because he was not a participant in the negotiations.

- (40) The Bangladesh Water Development Board is a semi-autonomous agency under the direction of the Ministry of Power, Water Resources and Flood Control.
- (41) Interview op cit (39).
- (42) In a despatch for the BBC on August 18 1972, (telex copy in BBC's New Delhi office) Michael Charlton states that the two prime ministers decided, at their meeting in March 1972, to set aside the Farakka issue for decision at heads of state level. The Joint Declaration issued after that meeting does not mention the sharing of the Ganges. Foreign Affairs Record, March 1972, pp 60-9.

If Charlton is, nevertheless, correct, what exactly was set aside? Was the JRC detailed to establish the areas of technical agreement and political disagreement? The evidence is not clear, but it does suggest that if the JRC was asked to look at the issue it was soon afterwards diverted onto less significant discussions.

- (43) Bangladesh, White Paper on the Ganges Water Dispute, Dacca, September 1976, p 14.
- (44) Interview op cit (34).
- (45) Ibid.

S A Karim who, in 1974, was a senior official in the Bangladesh Foreign Office has written as follows:

'After liberation also, no sense of urgency was displayed in finding a solution to the dispute.'

Internationalisation of the Ganges Waters issue..., mimeo submitted to the Bangladesh Government, June 1976.

- (46) This is what Moshtaque told Professor Talukder Maniruzzaman of Dacca University in early 1976 - interview of Maniruzzaman by myself in 1979; see also forthcoming book by Maniruzzaman.
- (47) Op cit (39).
- (48) The coup d'etat is described and Khondakar Moshtaque Ahmed's prior knowledge established in L Lifschultz, Bangladesh: the unfinished revolution, Zed, London, 1979.

Chapter 8: ARRIVAL AND DEPARTURE

- (1) Lok Sabha Debates, 24/3/75, S5, L, 25, Col 61.
- (2) The Hindu, 24/3/75, 'Farakka Barrage to be commissioned soon'. This report was repudiated in a press note issued the following day.

Holiday, 21/2/75, 'Farakka offers a foretaste', reported that the barrage was being operated with noticeable effects in Bangladesh.

Business Standard, 20/4/75, 'Serious threat to Farakka Barrage', noted that the ponding of the reservoir behind the barrage had been kept at a high level from the first week of April, in readiness for an agreement.

- (3) The Hindu, 17/4/75, 'Short term solution to Ganga waters problem'. Business Standard, 17/4/75, 'Ministerial talks on Farakka'.
- (4) Bangladesh Observer, 19/4/75, 'Bangladesh will get 44,000 cusecs in lean period'. See also The Hindu, 19/4/75, 'Indo-Bangladesh "short term" accord on Ganga waters'.

The Government of India usually publishes the texts of treaties and agreements in the official Foreign Affairs Record; this one was not. The text of the press release issued after the meeting is the only statement of the 'understanding' to have been published. It is reproduced here in Appendix A.

- (5) M Franda, 'Indo-Bangladesh relations', American Universities Fieldstaff Reports, South Asia Series, XIX, 16, September 1975, p 10.

In a pamphlet issued for the opening ceremony the Indian Minister of Shipping and Transport was rather guarded in his enthusiasm:

'We welcome the recent agreement...as a good initial step in the right direction, though until a much larger quantity of water reaches the Hooghly system, the basic problem of Calcutta Port and the legitimate objective of the Farakka Barrage are unlikely to be fulfilled.'

India, Souvenir: Farakka Barrage Project, 21/5/75.

- (6) Bangladesh, White paper on the Ganges water dispute, Dacca, 1976, p 16.
- (7) This discussion is described in detail in the Bangladesh White Paper, op cit (6), pp 14-16.
- (8) My interviews with Indian and Bangladeshi members of the teams.

- (9) Subsequently a spokesman for the Calcutta Port Commissioners said the surveys showed that Bangladesh would not be adversely affected by the Farakka diversions (Statesman, 12/3/76) and alleged that Bangladesh had refused to provide comparative data (Hindustan Standard, 17/8/76).
- (10) Much has been written about this period, and some of the best-informed writing has appeared in the Far Eastern Economic Review. See L Lifschultz, 'Bangladesh: a state of seige', 30/11/74 and 'Sheik Mujib pays the ultimate price', 29/8/75; also, a correspondent's 'The agony of independence', 16/8/74.

In the Asian Survey, T Maniruzzaman has written a number of useful summary articles:

- 'Bangladesh in 1974: economic crisis and political polarisation', XV, 2, February 1975;  
 'Bangladesh in 1975: the fall of the Mujib regime and its aftermath', XVI, 2, February 1976.  
 'Bangladesh in 1976: the struggle for survival as an Independent State', XVII, 2, February 1977.

The story of the coup d'etat and of the Ziaur Rahman government's choice of the Capitalist road is told in L Lifschultz, Bangladesh: the unfinished revolution, Zed, London, 1979.

- (11) In a statement printed in The Hindu, 19/2/76, 'Ganga waters: India refutes Bangla claim', an Indian Ministry of External Affairs spokesman wrote:
- 'It is no secret from anyone that the Farakka Barrage has been operating at near or optimum capacity 40,000 cusecs since June 1975.'
- (12) The statement indicated only that the Indian Government was anxious about Bangladesh's treatment of Hindus in Bangladesh and that Bangladesh had complained of guerrilla attacks from India. Foreign Affairs Record, December 1975, 'Indo-Bangladesh Joint Statement' of December 8 1975, pp 319-33.
- (13) Keesings Contemporary Archives, 15/10/76, 'Bangladesh: the Farakka dispute'. In an interview with myself, a member of the Bangladesh observer team stationed at Farakka has claimed that a protest was sent by that team on June 1st 1975, that is at the end of the forty day understanding. The protest apparently said that India had no right to continue withdrawals after the end of May 1975. It seems that the note was not ratified by the Bangladesh Government.
- (14) Foreign Affairs Record, January 1976, 'Official statement on anti-Indian propaganda in the Bangladesh press', 30/1/76, p 1.
- (15) Chief Martial Law Administrator Ziaur Rahman reportedly told a Swedish newspaper that the Indians 'have sent several thousand men across the border in the North. They are Bangladesh citizens but are equipped and supported by the Indian Army'.



Dawn, 4/4/76, 'Indo-Bangladesh cold war'.

See also Far Eastern Economic Review, 13/2/76, 'Bangladesh; trouble along the border', and M Franda's 'Indo-Bangladesh relations' in op cit (5).

In an interview with me Mrs Gandhi has denied giving support to these guerrillas but a Ministry of External Affairs official has confirmed (also in an interview with myself) that at least sanctuary was provided. The following year Prime Minister Desai reportedly agreed to 'see that no shelter was given to criminal elements from across the border, whatever might have taken place under the previous regime', The Hindu, 11/6/77, 'Zia Happy over talks'.

- (16) A telegram sent from Calcutta Consul Korn to the Embassy in Delhi, and sent on to the Secretary of State, says:

'We have noticed few public comments by Indian press or officials showing awareness that operations of Farakka may be causing problems for Bangladesh... Bangladesh Government apparently wants to publicise the dispute. Bangladesh Deputy High Commission in Calcutta issued press release on February 13 on Abbas "interview" reported in Dacca 782. It has not been reported by any Calcutta paper. No doubt indicating that authorities here do not want Bangladesh Government's concern over Farakka offtake discussed in the papers at this time.'

Telegram from Calcutta 413, dated 17/2/76, repeated in telegram from Delhi 2453 (copy obtained using Freedom of Information Act).

- (17) The Hindu, 19/2/76, 'India deprecates Bangla attitude on Ganga talks', and 'Ganga waters: India rejects Bangla claim'. Bangladesh Observer, 15/3/76, 'Talks meaningless unless India stops withdrawal of water unilaterally'.
- (18) Xinhua News Agency, 16/3/76, 'Indian precondition for talks on Ganges waters rejected'. See also, The Hindu, 26/3/76, 'Delhi gets Bangla's reply to call for talks'.
- (19) G K Reddy, a generally reliable Indian journalist, described this suggestion as follows:

'One of the fantastic suggestions being canvassed by the hardliners in Dacca is for the creation of two international commissions [for the Ganges and Brahmaputra]'.

The Hindu, 19/3/76, 'Bangla raises new extraneous issues for talks on Farakka'.

Admiral M H Khan told a press conference on March 22 that Bangladesh had abandoned its demand for the cessation of Ganges withdrawals as a precondition for talks. Telegram from US Embassy Dacca to Washington, Dacca 1462, March 1976.

- (20) The Hindu, 30/3/76, 'PM stresses Indo-Bangla amity in talks with envoy'. The concession had previously been reported in The Hindu, 28/3/76, 'Gesture to Bangla: India to reduce withdrawal of Ganga water at Farakka'.

The statement is ambiguous: at what point would India decide that there was insufficient water and Bangladesh should get less than the March 15 level? A telegram from the US Embassy in Delhi to Washington noted the Indian 'refusal to publicize the extent to which it has reduced its offtake of Farakka waters...'

Telegram, New Delhi 4759, March 1976.

Figure 8.1, later in this chapter, suggests one interpretation of the statement, one which indicates the concession was not generous.

- (21) Foreign Affairs Record, April 1976, 'Official statement on Indo-BD talks on Ganga waters' of 26/4/76.
- (22) Foreign Affairs Record, April 1976.
- (23) Bangladesh Observer, 12/5/76, 'Indian figures do not tally with actual observations'.
- (24) Dawn, 20/4/76, 'Bhashani plans peaceful march on Farakka.'  
Bangladesh Observer, 19/4/76, 'Bhashani plans silent march to Farakka.'

According to the weekly paper published by Bhashani, the march was first announced at a prayer meeting on April 18th, when Bhashani said, 'If the people of the 63,000 villages of Bangladesh can remain united and fight for the cause, we will be able to win support from the people of the whole world. We can also expect justice from the 60 crore people in India.'

Haq Katha, 24/10/76, 'Basic Documents on Farakka Long March.' This article is part of a 'Special international supplement on Farakka', and contains some of the correspondence between Mrs Gandhi and Moulana Bhashani at this time.

- (25) Dawn, 17/5/76, '5 lakh people start trek to Indian border.'  
New York Times, 17/5. Financial Times, 17/5. Le Monde, 20/5.
- (26) Foreign Affairs Record, May 1976, 'Official statement on anti-Indian Propaganda over Farakka'.

Far Eastern Economic Review, 28/5/76, 'Bhashani's march for survival'.

- At one stage the march was to end at Farakka: Holiday, 16/5/76, 'Momentous people's march'.
- (27) Bangladesh Observer, 19/5/76, 'Help excavate Gorai River'.
- (28) Bangladesh Observer, 19/6/76, 'Stress on year round water allocation'.  
Keesings, 15/10/76, op cit (13).  
The Hindu, 6/9/76, said this was a reciprocal visit for Abdus Sattar's of December '75.
- (29) Foreign Affairs Record, September 1976, 'Official Statements...'  
of September 4 and 10.  
The Hindu, 5/9/76, 'Delhi talks on Farakka fail'.  
Statesman Weekly, 18/9/76, 'Delhi talks on Farakka fail'.  
Bangladesh Observer, 12/9/76, 'Absurd Indian ideas thwart Farakka issue'.  
Holiday, 12/9/76, 'We want solution: Admiral Khan'.
- (30) My interviews with Bangladesh diplomats, New York, May 1979. After Khan's discussions in Delhi, the US Embassies in Dacca and Delhi both sent telegrams to Washington giving their accredited government's version of what transpired. These telegrams apparently contain sensitive information: both were heavily censored before being released to me.
- The meeting between Khan and Gandhi was described a year later in The Hindu, 25/9/77, 'Summit on Farakka possible'.
- (31) Xinhua News Agency, op cit (18).  
Financial Times, 5/3/76, 'Bangladesh seeks help in River Ganges dispute'.  
The Hindu, 28/2/76, 'Farakka: Bangladesh sticks to stand'.
- (32) These nine courses of action are examined in a paper submitted by Syed Anwarul Karim, formerly a senior official of the Bangladesh Foreign Office, now seconded to the United Nations, to his government in June 1976: Internationalisation of the Ganges Waters issue with special reference to the United Nations.
- (33) Ibid, p 39.

Interestingly, a legal memorandum prepared by the US Department of State also recommended the involvement of the World Bank in an Indus-style approach to resolution of the dispute:

'Because both sides have an interest in settling the issue peacefully, and India badly wants to keep it out of the United Nations General Assembly, it would be worthwhile to float the idea of establishing a Ganges River Commission, constituted in a similar fashion to that of the Indus Commission (one technical expert from India, one from Bangladesh, and one from the World Bank). Such an approach could

be sold as essentially "bilateral" in nature (ie, not involving any other states) and India might be willing to participate in such a venture on the condition that Bangladesh agrees to withdraw or not to press the issue in the General Assembly this session. The commission would be charged first with resolving the immediate and short-term problem of the oncoming dry season, and perhaps subsequently with developing a long-term overall agreement between the two countries on the uses of the waters of the entire basin. However, the probability of the parties agreeing to such an idea may be greater if the commission's initial mandate is limited to fact-finding and the development of technical recommendations to allay Bangladesh's fear of shortages during the dry season.

'This suggests that we consider exploring further the possibilities of participation by the World Bank in such a tripartite technical commission with Mr McNamara in the very near future, and if he is receptive, to propose the venture to India and Bangladesh through the offices of an appropriate neutral third party.'

US State Department Memorandum from L/NEA-Bill Rhodes, Legal aspects of India-Bangladesh dispute over Farakka Barrage, Washington, 24/9/76, released to me in response to a Freedom of Information Act request.

- (34) India. Ministry of External Affairs, The Farakka Barrage, several editions, undated, New Delhi (probably first published late September 1976).

Bangladesh, White Paper on the Ganges water dispute, several editions Dacca, September 1976, a summary of this pamphlet was also published as Deadlock on the Ganges, Bangladesh Water Development Board, September 1976, Dacca.

- (35) UN Document (Summary Record), A/BUR/31/SR.1, pp 7-10 and 13-14, records this discussion. See also, The Hindu, 21/10/76, 'UN panel postpones Farakka decision'.

A report, Review and assesment of progress in raising the Farakka question at the UN, written by the Bangladesh Mission to the UN noted:

'The formal inscription of the item and its allocation to a broad-based Political Committee constituted a significant victory for Bangladesh...However, in analysing the implications of this achievement a clear-cut distinction must be made at the outset between what constitutes an essentially procedural outcome and the substantive issue of deliberating the merits of the Farakka dispute...'

Typescript, undated.

- (36) Foreign Affairs Record, November 1976, 'Foreign Secretary's statement on Farakka issue', pp 321-8.

Bangladesh Mission to the UN Press Release, 'Statement by the Chairman of the Bangladesh delegation...' 15/11/76, New York. UN, Report of Special Political Committee, 29/11/76, A/31/359, pp 66-8.

The consensus statement is reproduced in Appendix B.

- (37) My interviews with a Bangladesh diplomat, New York, May 1979.
- (38) This account is based on my interviews with Bangladesh diplomats in New York and with a delegate to the Special Political Committee who was present when the item was raised.
- (39) The delegate to the Special Political Committee who I interviewed concurred with this view. Interview, New York, May 1979.
- (40) See statement reproduced in Appendix B.
- (41) My interview with civil servant, Delhi, August 1978.
- (42) My interview with Hossein, Oxford, 3/1/79.
- (43) Ibid. .
- (44) Rear Admiral Khan was apparently under a similar impression that the agreement constituted a precedent. He suggested to a Japanese economic delegation on 18/3/76 that India had broken a 'gentleman's agreement' which was assumed to exist following the forty day period. This is recorded in a telegram from the US Embassy in Dacca to the US Government, Dacca 1422, March 1976.

S A Karim in his Internationalisation of the Ganges Waters issue... op cit (32) notes: 'Even after the barrage had been completed the agreement that we signed was for a limited period, with no provision made for our needs after the expiry of the period', p 29.

- (45) 'In our view meaningful talks...can take place only after experts of the two sides have been able to study and evaluate all the relevant data.' op cit (21).

'It is acknowledged that existing reasonable use of water by a riparian state should be taken into account when another co-riparian state decides to utilise its own entitled share of the water...But it is not necessary that a particular use should be subject to prior consent by the other co-riparians.' Permanent Mission of India to the UN, India News, 'Statement by...Foreign Secretary, Government of India, in the Special Political Committee...', 16/11/76, p 3.

- (46) 'Many experts of repute have questioned the very practicality of the diversions for the purpose of removing silt. The need for improving the navigability of the Hooghly could be met in other ways...' Bangladesh Mission to the UN, Press Release, 'Statement by the Chairman of the Bangladesh delegation in the Special Political Committee...', 15/11/76.
- (47) My interview with Indian Ministry of External Affairs official, August 1978, Delhi.
- (48) My interview with Khan in Dacca, 10/7/78, when he was Minister for Petrol and Natural Gas.
- (49) My interview in Dacca, October 1978.
- (50) A telegram from the US Embassy in Delhi to the US Government commented:

'There are two possible reasons for the [Indian Government's] refusal to publicise the extent to which it has reduced its offtake of Farakka waters: (1) the amount involved is so small as to be insignificant; or (2) in the event that the reduction is substantial, the [government] may be concerned about the possibility of a strong reaction from West Bengal where Farakka is an important political issue.'

Telegram, New Delhi 4759, March 1976.

#### Chapter 9: THE GANGES WATERS TREATY

- (1) The Hindu, 24/1/77, 'No accord on Ganga: Bangla team leaves'. See also The Hindu, 27/1/77, 'Bangla wants accord on its own terms', in which an account of the Bangladesh negotiating strategy is given. According to this account, the Bangladesh team was unwilling to exceed the 15,000 cusecs to which the Mujib Government had agreed. The issue of regeneration was also re-introduced.
- However other sources (see note (12) below) suggest that Bangladesh was willing to go at least to 17,000 cusecs with hints that 20,000 cusecs might be acceptable.
- (2) Holiday, 30/1/77, 'After the talks what?'
- (3) Far Eastern Economic Review (FEER), 4/3/77, 'Talks meet a watery grave'.
- (4) A similar point is made in Holiday, 23/1/77, 'What prospect for talks?', and a telegram from the US Embassy in Dacca to the US Government noted:

'The Bangladesh Government appears to be trying to minimise its failure to gain solution by exhortations

to greater sacrifice in the interests of "sovereignty" and lack of dependence on others.'

Telegram, Dacca 0396, January 1977, released to me in response to a request under the Freedom of Information Act.

Other accounts of the negotiations are to be found in Financial Times, 24/1/77 and The Hindu, 10/12/76, and 12, 14, 17 and 21/1/77.

- (5) Telegram; Dacca 0272, January 1977.
- (6) Speech by M H Khan reported by Dacca radio, 10/2/77 (BBC Summary of World Broadcasts, Weekly Supplement, FE/W917/A/11, 23/2/77).
- Khan was talking about three projects (i) labour intensive clearance of rivers in South West Bangladesh, (ii) the old Ganges Barrage project, perhaps again as a retaliatory threat and, (iii) a temporary weir across the Ganges, presumably a genuine attempt to divert water down the Gorai-Madhumati River.
- (7) Dawn, 10/1/77, 'China-Bangladesh relations' and 16/3/77, 'BD fully prepared to uphold its sovereignty'.
- (8) Dawn, 12/3/77, 'BD chief explains Farakka issue to Shahanshah of Iran'.
- (9) Far Eastern Economic Review, 4/3/77, op cit and, Dawn, 15/4/77, 'Farakka again'.
- (10) The Janata Party manifesto, Both bread and liberty, says:  
'The Party will strive to resolve such outstanding issues as remain with some of its neighbours and will consciously promote a good neighbour policy.' (p 25)
- (11) Far Eastern Economic Review, 6/5/77, 'As you were at the Ganges talks'.
- (12) The negotiation concentrated on the flow during the period April 21-30, the ten days of lowest flow, and there was agreement that the total flow in this period should be taken as 55,000 cusecs, the 75% availability value.

The details of this period come from:

Financial Times, 27/4/77, 'Ganges water agreement near'.  
The Hindu, 15/4/77, 'Jagjivan to discuss other issues besides Farakka',  
The Hindu, 20/4/77, 'Concessions to Bangla over Ganga waters'.  
The Hindu, 26/4/77, 'Bengal Minister criticises Farakka accord'.

The Hindu, 5/9/77, 'Only a limited accord on Farakka says BD'.  
The Hindu, 24/1/77, op cit (1).  
The Hindu, 27/1/77, op cit (1).  
Far Eastern Economic Review, 6/5/77, op cit (9).  
Keesings, 29/7/77, 'Bangladesh: understanding on Farakka dispute', p 28480.  
Business Standard, 21/4/77, and,  
Business Standard, 7/5/77, 'Farakka pact under friendly pressure', which records that 'shipping circles believed friendly governments had put pressure on India to make the agreement.'

(13) The Hindu, 15/4/77, op cit (10).

(14) This writer's interview with Indian participant in the discussions.

One of Bangladesh's draft texts included the following:

'If necessary, the two governments may by agreement invite outside experts for assisting in the process of investigation and study.

'After this scheme has been agreed upon the two governments may by agreement jointly approach any international institution or other sources of financing for assistance in implementing this scheme.'

- (15) The Hindu, 11/5/77, 'Farakka talks hinge on techno-economic aspects' by G K Reddy.
- (16) Dawn, 12/5/77, 'Indo-BD talks on Ganges waters fail'.
- (17) The Hindu, 12/5/77, 'Bangla stance on Farakka raises doubts'.
- (18) The Hindu, 11/6/77, 'Zia happy over talks'.
- (19) The Hindu, 16/7/77, 'Farakka: India's thinking on a long term solution' by G K Reddy.
- (20) The Hindu, 27/7/77, 'Cong MPs fear Farakka sellout'.
- (21) Blitz (Delhi), 18/6/77, 'Operation betrayal of Bangladesh'.
- (22) Foreign Affairs Record, 6/8/77, 'Talks on Farakka'.
- (23) The Hindu, 9/8/77, 'Farakka talks make little headway' by G K Reddy.
- (24) The Hindu, 30/8/77, 'India may settle for less water with Dacca'.  
Statesman Weekly, 3/9/77, 'Change in China's attitude says Ram'.



- (25) Statesman Weekly, 10/9/77, Editorial: 'Writ in water'. See also The Times (London), 8/9/77, 'Political outcry in West Bengal at prospect of concessions by India in Ganges water dispute'.
- (26) The Hindu, 15/9/77, 'Farakka water: Bengal team's plea to centre'.
- (27) The Hindu, 5/9/77, 'Only a limited accord on Farakka says BD'.
- (28) The Hindu, 16/9/77, 'India, Bangla drifting apart?' See also, The Hindu, 11/9/77, 'Farakka: Bangla rejects India's proposals' which reports that Dacca insisted that the Farakka Barrage should be taken out of service pending a long-term solution.
- (29) The Hindu, 25/9/77, 'Summit on Farakka possible' by G K Reddy. This article also reports the snub a year earlier of Admiral M H Khan by Mrs Gandhi and says, 'the big problem now is how to bring President Zia more directly into these negotiations without further offending MH Khan'.
- (30) On the morning of Wednesday September 28th, a full meeting of Ziaur Rahman's Council of Advisors was discussing the final instructions to be given to B M Abbas before he returned to Delhi. They were interrupted by the news that a hijacked Japan Air Lines plane was asking permission to land in Dacca (Sunday (Delhi), October 1977, 'The coup coup land'). In the subsequent chaos caused by the hijack, two rebellions were attempted one in Dacca and one in Bogra. Neither succeeded and though few people were killed in the attempts, several hundred people were executed later (Amnesty International, Report of a mission to Bangladesh, February, 1978; EPW, 25/3/78 'Murder in Dacca: Ziaur Rahman's second round'). Despite all this, the instructions were given to B M Abbas and he got back to Delhi in time to initial the treaty on the 30th.
- (31) The Hindu, 27/9/77, 'Bangla team awaits word from Dacca'.
- (32) The Hindu, 30/9/77, 'Agreement on Farakka' by Reddy and The Hindu, 28/9/77, 'Farakka: Dacca summons Abbas for fresh briefing'.
- (33) Ibid.
- (34) The Hindu, 6/11/77, 'Farakka pact, best India can get in present circumstances' by Reddy.

See also:

Dawn, 5/10/77, 'The Farakka Agreement'.  
Financial Times, 7 and 8/11/77, 'Taking the Ganges waters on trust' and 'Agreement on the Ganges',  
 and, Economist (London), 8/10/77, 'Troubled waters'.

- (35) G K Reddy wrote in The Hindu, 30/9/77, 'Agreement on Farakka', that the exchange of letters specified that the JRC was to complete feasibility studies of alternative augmentation proposals within three years. The letters may also include agreement on the minimum water India is allowed to divert down the Bhagirathi during floods. Such agreement might be kept confidential to avoid opposition in West Bengal.
- (36) Amrita Bazaar Patrika, 8/10/77, 'Chambers not happy over Farakka accord',  
Amrita Bazaar Patrika, 30/9/77, 'Calcutta Port let down: Basu' and 'Accord wont achieve aims' (by Debes Mookerjee),  
Business Standard, 6/5/77, 'Calcutta Port shutdown feared',  
Business Standard, 17/12/77, 'Exports attack Farakka pact' which reports a symposium organised by the Bengal National Chamber of Commerce, and,  
Guardian, 1/10/77, 'Farakka accord seals Calcutta's fate'.  
 See also, J K Ray (Centenary Professor of International Relations at Calcutta University), 'The Farakka Agreement', International Studies, 17, 2, April-June 1978, pp 235-246. Unfortunately, this article is full of errors and incorrect assertions. Ray allows his nationalism full reign, even to the extent of attributing statements wrongly. (See note (20), Chapter Five).
- (37) Foreign Affairs Record, November 1977, 'Official statements on sharing of Ganga waters at Farakka'.
- (38) Asafoduwlah, the Chairman of the Bangladesh Water Development Board, who had been closely associated with the negotiations since the formation of Bangladesh, was demoted two weeks prior to the signing of the Agreement. He is a member of the elite corps, Civil Service of Pakistan, and therefore managed to retain his employment. He is now director of a small cultural centre in Dacca and, apparently believes that he was demoted because of his insistence that Bangladesh should get the full 'historic' flow.
- (39) Hassan In Harvard, Intl Law J1, 19, 2, 1978, p 717.
- (40) The Hindu, 20/12/77, 'Zia's fruitful talks with PM'.
- (41) The Hindu, 13/5/79, 'India's gesture to Bangla...'.  
 (42) USIA Delhi, 'Toward our common goals: texts of remarks and speeches...', Delhi, 1978, p 18.
- (43) Financial Times, 4, 6, and 7/1/78,  
The Hindu, 7/1/78, 'Callaghan gets warm welcome',  
The Times, 17/1/78, 'PM reports his tour of Indian subcontinent: good prospects for British firms to increase trade', and  
The Times, 5 and 7/1/78.

EPW, 28/1 - 4/2/78, 'Harnessing Ganga and Brahmaputra: implications of Anglo-American move', pp 129-130.

- (44) The Economist, 8/12/79, 'Back to the Indira Raj'.
- (45) The Hindu Intl Edn, 2/2/80, 'Bangla President's cordial talks in Delhi'.
- (46) The Hindu Intl Edn, 8/3/80, 'Delay tactics won't do, Bangla told'.
- (47) The Hindu Intl Edn, 29/3/80, 'Ganga water accord: minister blames Janata Govt'.
- (48) The Hindu Intl Edn, 29/3/80, 'Farakka: India warns Bangladesh'.
- (49) The Hindu Intl Edn, 10/5/80, 'Ganga water talks fail'.
- (50) The Hindu Intl Edn, 19/7/80, 'Ganga water talks yield no result'.
- (51) Interview with me in Delhi, September 1978.
- (52) Interview with Bangladesh diplomat, New York, May 1979.
- (53) Interview, op cit (51).

#### INTRODUCTION TO PART III

- (1) External Publicity Division, Ministry of External Affairs, Government of India, New Delhi, undated, presumed September 1976.
- (2) Government of the People's Republic of Bangladesh, September 1976. A summary, Deadlock on the Ganges, was published in the same month. Figures reproduced here are generally from this latter document because they reproduce more clearly.
- (3) People's Republic of Bangladesh, Bangladesh Water Development Board, International Engineering Co Ltd (San Francisco and Dacca) and Special Studies Directorate of the BWDB, September 1977. A senior official of the Water Development Board has claimed that the world bank first gave an outright grant of \$600,000 for a study of the effects of Farakka, and that this grant was subsequently increased. According to the report itself, the work was done under the terms of an agreement between IECO and Bangladesh Water Development Board signed on January 20 1977, and

'The study costs were financed by the International Development Association, a component of the International Bank for Reconstruction and Development under the provisions of Technical Assistance Credit 622-BD to the People's Republic of Bangladesh.'

Chapter I, p I-1, Special Studies.

- (4) These four questions are not unproblematic: what, for example, is meant by 'well designed' or 'well described'? These concepts imply a notion of good and bad science which is not explored in these pages. Nevertheless, the questions provide useful means of making a subjective judgement slightly more systematic.
- (5) The three are Daryl B Simons, Ray Linsley and Wayne D Criddle. They contribute a signed letter addressed to the Chairman of the Water Development Board as a preface to Special Studies. It contains this paragraph:
- 'In general, we find that the report accurately summarizes the work performed and the data assembled and analysed during the study and that it presents a good starting point and guide for future studies necessary to implement effective water management in the Southwest region of Bangladesh. Since low flows in the Brahmaputra and Meghna Rivers are probably necessary to meet the needs in their own service areas and since costs of diversion from the Brahmaputra appear to be exorbitant, it cannot be overstressed that for the foreseeable future Bangladesh must rely on the Ganges River alone to serve the Study area.'
- (6) Government officials have an interest in providing resources for their government's negotiating policy. IECO have a similar interest because they wish to receive future contracts from the Bangladesh Government.

#### Chapter 10: REDUCED FLOWS

- (1) Bagchi, K, The Ganges Delta, Calcutta UP, 1944.
- (2) Comparison of land areas in Noakhali published in Dacca University Studies, reference mislaid.
- (3) Nafis Ahmad, An Economic Geography of East Pakistan, OUP, London, 1968, p 15.
- (4) Not used.
- (5) There is little reliable data on rates of erosion in Nepal, and almost none on changes in erosion in recent years, but there is general agreement that there has been an increase. The best study available is Peter Laban's Field Measurements on Erosion and Sedimentation in Nepal, September 1978, FAO, Govt of Nepal and UNDP, Integrated Watershed Management Project.

- (6) East Pakistan Water and Power Development Authority, Water Supply Paper - 64, Gauge and discharge observations for the Gorai-Madhumati River at Gorai Railway Bridge, Hydrology Directorate, Dacca, January 1962.
- (7) Table III-8, Special Studies, reproduced here as Tables 10.1 to 10.6.
- (8) An assumption is made that there are no withdrawals in November. This assumption will be reasonable if the diversions at Farakka plus the water allowed through the Jangipur Barrage are equivalent to the total of water which would 'normally' have flowed into the River Bhagirathi in November. It is a difficult assumption to check. Having made that assumption, the team then calculate the parameters by multiple regression analysis.
- (9) The Hindu, 19/2/76, 'Ganga waters: India refutes Bangla claim'. In 1977, Provash Roy, the West Bengal Irrigation Minister told a press conference that Farakka diversions had been in the range 35-38,000 cusecs in 1976. Business Standard, 18/9/77, 'Farakka study team report on Monday'.
- (10) A comparison of Figure III-28B, the monthly rainfall at Khulna in recent years, with Table II-1, the average rainfall at Khulna, and Table II-2, the variation of monthly rainfall at Khulna, (all these from Special Studies) indicates that:

- the rainfall in the period January-April 1976 was about 2.5 inches compared with an average (for the period of record 1934-69) of 4.5 inches.
- in the same months in 1977, the rainfall was about 5.5 inches.
- the monthly rainfall figures appear to fall into the following frequency distribution categories:

<u>Month</u>	<u>1976</u>	<u>1977</u>
Jan	lower quartile to median	lq to median
Feb	lower quartile to median	lq to median
Mar	upper quartile to maximum	uq to max
Apr	minimum to lower quartile	minimum to lq.

- (11) These conditions may be modified if the aquifer is confined.
- (12) White Paper, p 8.
- (13) In the words of Special Studies:

'The flow pattern between surface water and groundwater is extremely complex. The direction of flow is not consistent along the length of many rivers, on opposite sides of the same river, or at different seasons. Flow tends to be from the rivers into the groundwater in the northern part of the area and from the groundwater into the rivers near the Bay of

Bengal. The rivers tend to gain groundwater on the northern or northeastern banks and lose groundwater on the southern or southwestern banks. Flow during the wet season tends to be from the groundwater into the rivers.'

'...The contours indicate that groundwater flows toward the Mohananda River, the Ganges River above Hardinge Bridge, the Baral River, the Gorai River below Kamarkhali, and the Nabaganga River below a point about 20 miles West of Magura.'

Vol B, p V-19. In a subsequent paragraph the report also says 'Direct infiltration of rainwater probably constitutes most of the natural groundwater recharge of the study area!.'

- (14) SS, Vol B, pp V-33 and 34.
- (15) SS, Vol B, p V-34.
- (16) Ibid, pp V-41 and 42.
- (17) Feris, J G (1963), 'Cyclical water level fluctuations as a basis for determining aquifer transmissibility', US Geological Survey, Water Supply Paper 1536-I, pp 305-318.
- (18) For the Brahmaputra see, Coleman, J M, 'Brahmaputra River: Channel Processes and sedimentation', Sedimentary Geology, 3, 1969, pp 129-239; and,  
North West Hydraulic Consultants Ltd, Edmonton, Vancouver, 'An appraisal of flooding and sediment problems within the Ganges-Brahmaputra river basins', a report submitted to the Canadian International Development Agency, Ottawa, June 1976.  
For the Ganges itself, see, Rahman, K S, A Study of the erosion of the River Padma, MSc thesis, Bangladesh University of Engineering and Technology, June 1978. Rahman concludes that the meeting point of the Brahmaputra and Ganges moved upstream 10.5 miles between 1968 and 1976. In the same period, the width at this confluence increased from 1.5 to 7.5 miles.
- (19) As has been noticed by the inhabitants of many villages on the Indian side of the border who have been displaced by erosion apparently induced by Farakka. See Patranabis, T R 'Farakka Project...', Economic and Political Weekly, March 29, 1975.
- (20) See Table A III-9 of EPWAPDA, Master Plan, Supplement A. From this it can be calculated that, for the years 1958-62, 95% of the sediment load passing Hardinge Bridge was transported during the months of July, August, September and October, the months of flood flow.
- (21) SS, Vol B, Chapter IV, para. 4.4.4.
- (22) Ibid.

Chapter 11: SALINITY INTRUSION IN BANGLADESH

- (1) Leedshill-De Leuw Engineers (for East Pakistan Water and Power Development Authority), Coastal Embankment Project Engineering and Economic Evaluation, 1, p 73, Dacca, December 1968.
- (2) Derived from 250 parts per million suggested as the potable limit in Calcutta Metropolitan Planning Organisation, Basic Development Plan, Calcutta, 1966, p 19.
- (3) Bangladesh, White Paper on the Ganges Water Dispute, September 1976, p 7.
- (4) India, The Farakka Barrage, New Delhi 1976.
- (5) Harvard University, Center for Population Studies, Bangladesh Land, Water and Power Study, Final Report (Draft), June 1972, pages VII.19 to VIII.24. The results of this study are briefly discussed in note (17) below.
- (6) World Bank (IBRD/IDA), in nine volumes, Report PS-13, Washington, May 15 1972. The Indian Government is probably referring to Technical Report 20, Vol VIII, pp 43-4.
- (7) IECO/Special Studies Directorate, Special Studies, Bangladesh Water Development Board, September 1977, C, Chapter VI, para 6.1, p 1.
- (8) Ibid, p 20, para 6.5.
- (9) Ibid.
- (10) A rather different interpretation of the same conclusion is given in the overall summary of the four volume report, in Volume A. There, the relevant paragraph reads:

'The salinity patterns in the study area east of the Madhumati river is dependent on the combined flow of the Ganges and Brahmaputra rivers. The rapid penetration and retreat of high salinity in the Shahbazpur-Tentulia estuary at Ilsaghat in 1976 and 1977 occurred in conjunction with the reduced flows in these estuaries.'

(p I-15, para 1.7.4)

Other paragraphs are reproduced from volume C almost without alteration. Even the paragraph quoted in volume C appears to have been subject to last minute changes, the phrase 'was in conjunction' appears to have replaced an earlier, longer formulation.

- (11) Ibid, C, Chapter VI, p 26, para 6.5.3.
- (12) Ibid, p 23, para 6.5.2.

- (13) Ibid.
- (14) Ibid, p 23-24.
- (15) Ibid, p 25
- (16) Ibid, p 25.
- (17) The Harvard report (op cit) draws the following conclusion from their salinity studies:

'The intrusion of the 2,000 micromho[ $\mu$ S] salinity front with no flow through the Gorai river is not significant when compared with the salinity front of March 23 1966. Therefore the model should be investigated further in order to determine the sensitivity of the movement of the 2,000 micromho salinity front. There are practically no hydraulic data and very little salinity data in the prototype along the areas through which the 2,000 micromho salinity lines are passing, as shown in Figure VII.12. The study of the sensitivity of the movement of the salinity front will require detailed hydraulic and salinity data from the critical area.'

pp VIII.22 to VIII.24.

It was this inadequacy of data which proved the undoing of the Harvard predictions. They predicted an advance of the 2,000 micromhos salinity front of only a kilometer or two in the Khulna region, under the influence of zero flow in the Gorai. The observed advance in 1976 appears to be more than 25km (Drwg VI-4, Special Studies).

- (18) Special Studies, C, Chapter VI, p VI-34.
- (19) Bangladesh, White Paper, op cit, p9.
- (20) India, The Farakka Barrage, op cit, p 2.
- (21) Special Studies, op cit, C, Chapter VI, pp 37-8.
- (22) A prudent industrialist might have anticipated salinity changes. Relatively high salinities had been recorded within a few miles of Khulna in earlier years. In the early 1970s, the Canadian Government provided aid enabling the Bangladesh Government to start modifying a power station in the South West to accept cooling water with a higher salinity. (My interview with official of Canadian High Commission, Dacca, 1978.) Whether this work was completed or proved adequate to the 1976 conditions is not known.



Chapter 12: AGRICULTURE AND FORESTRY

- (1) Bangladesh, Planning Commission, The Two Year Plan 1978-80, Dacca, March 1978, p 71.
- (2) B L C Johnson, Bangladesh, Heineman, 1975, p 33.
- (3) Raisuddin Ahmed, Foodgrain production in Bangladesh, Bangladesh Agricultural Research Council, Dacca, December 1977, p 1.
- (4) World Bank, Bangladesh: Country trends and development issues, March 1979, country data p 2.
- (5) Two Year Plan, op cit, p 105.
- (6) Bangladesh, White Paper, Dacca, 1976, p 6.
- (7) Ibid, pp 7 & 8.
- (8) The document is signed by 'Moslehuddin Ahmed, Director of Agril. (E & M) In-charge, Bangladesh', and by 'M A Kasem, Director, Special Studies, BWDB, Bangladesh', and dated 19/2/77.
- (9) Bangladesh, White Paper, op cit note (6), p 9.
- (10) India, The Farakka Barrage, p 10.
- (11) Ibid, p 15.
- (12) Special Studies, C, p VIII-1.
- (13) Bangladesh claimed in 1976 that the G-K project was seriously effected by the Farakka diversions because, firstly, the water level was too low for the water intake of the power station at Bheramara, so power was unavailable for the G-K pumps and, secondly, because the water level was too low for the G-K pumps to operate. Both these claims are probably correct but such conditions probably did not prevail for the whole of the dry season, and they were not wholly unprecedented. In several previous years, the G-K pumps had been rendered partially inoperative by silting of the intake channel.

According to the G-K Project Engineer's figures, 53,361 acres were irrigated in 1975-6 and 54,202 acres in 1976-7. These areas are slightly above the average for the period 1972-3 to 1974-5. Irrigation may have been delayed and crops damaged as a result, but an average area was irrigated.

Superintending Engineer, G-K Project, Phase I, Kushtia,  
Synopsis on Ganges-Kobadak Project Kushtia Unit, Kushtia,  
15/3/77.

World Bank, Proposals for an Action program, Washington, 1970, p 102.

J W Thomas, Development Institutions, Projects and Aid in the water development program of East Pakistan, Development Advisory Service, Harvard University, March 1972, pp 14-17.

- (14) See also, E R Jordens and M Rahman, Relationship between soil moisture characteristics of some Gangetic soils and the growth of wheat under non-irrigated conditions, Department of Soil Survey, Ministry of Agriculture, Dacca, 1978.
- (15) Special Studies (SS), C, Para 7.7.
- (16) Ibid.
- (17) Bangladesh Bureau of Statistics, 1979 statistical yearbook of Bangladesh, Dacca, 1979, p 166.
- (18) SS, p X-1. The Sundarbans species appear to be segregated according to long term salinity patterns.
- (19) Ibid, p X-12 to X-13. The Gewa tree, which competes better under conditions of slightly increased salinity, appears to be replacing the Sundri tree in areas of deterioration.
- (20) Ibid, p X-19.
- (21) Ibid, p X-23 and Curtis S J, 1933, Working Plan for the forest of the Subdarbans Division...1931-57, Bengal Government Press, Calcutta.
- (22) SS, p X-26.
- (23) Ibid, and Blascoe F, The mangroves of India, Inst Francis de Pondichery, Pondichery, 1975; C Adams Williams, History of the rivers of the Gangetic delta, 1919, reprinted NEDECO, Holland, 1966.
- (24) SS, section 10.4.1.

### Chapter 13: NAVIGATION, FISHERIES AND ECOLOGY

- (1) B L C Johnson, Bangladesh, Heinemann, 1975, p 90.
- (2) Bangladesh, The Two Year Plan, Dacca, 1978, p 92.
- (3) Bangladesh, White Paper..., Dacca, 1976, p 9.
- (4) India, The Farakka Barrage, Delhi, 1976.

- (5) Special Studies (SS), p XI-2.

The location of the places referred to is as follows:

Raita - Right bank, Ganges, 10 mile upstream Hardinge Br.  
Talbaria - Right bank, Ganges, at Gorai offtake  
Satbaria - Left bank, Ganges, midway between Gorai offtake  
and Ganges-Brahmaputra confluence.  
Shilaidah - ?  
Daulatdia - at confluence of Ganges and Brahmaputra  
Tepurakandi - Right bank, Ganges, 14 miles downstream of  
confluence.

- (6) The Farakka Barrage, op cit, p 9.
- (7) East Pakistan Inland Water Transport Authority/Netherlands Engineering Consultants (NEDECO), Surveys of Inland Waterways and Ports - 1963-67, July 1967, The Hague, Plate 5.
- SS, op cit note (5), Drwg XI-1.
- (8) Ibid.
- (9) Economist Intelligence Unit (EIU) in association with Scott, Wilson and Kirkpatrick, Bangladesh Transport Survey, November 1974, Table C.2.
- (10) Ibid, Table C.20.  
This table itemises the major commodity flows by mechanised vessel in 1972-73 by origin and destination. The only commodities which appear to have been carried on the Ganges by this means are 'public sector foodgrains' of which 37,000 tons were carried to Rajshahi and 13,000 tons to Pabna in that year.
- (11) SS, p XI-3.
- (12) White Paper, op cit, pp 8 and 9. Hilsa fish, according to the statistics of the Fisheries Directorate, constitute more than 50% of annual inland water fish catches.
- (13) The Farakka Barrage, op cit, pp 14 and 15.
- (14) Bangladesh Bureau of Statistics, Statistical Pocket Book of Bangladesh 1978, Dacca, December 1977, pp 173 and 174.
- (15) SS, op cit, Chapter IX, Section 9.4.
- (16) Ibid.
- (17) SS, Vol A, Sect 1.7.8, p I-19.
- (18) White Paper, op cit, p 10.
- (19) The Farakka Barrage, op cit, p 16.

- (20) SS, p VIII-2.
- (21) Ibid, p VIII-18.
- (22) Ibid, p VIII-46.

#### INTRODUCTION TO PART IV

- (1) B G Verghese, Gift of the Greater Ganga: an approach to the integrated development of the Ganga-Brahmaputra Basin, Coromandel Lecture 8, 12/12/77, New Delhi, p 32.
- (2) Indian Proposal, p 7.
- (3) Bangladesh Proposal, p 1.
- (4) In an unpublished World Bank document Maasland has identified 'three modes of possible irrigation development' in the lower Ganges-Brahmaputra Basin. These three are (i) tributary development, with surface storage for river regulation; (ii) exploitation of the basin's groundwater potential; and (iii) diversion of the Brahmaputra water into the Ganges Basin. These three categories are essentially technical. The two governments' Proposals select from Maasland's categories (i) and (iii).

Maasland, Special Projects Department, Water development potentials of the Ganges-Brahmaputra-Meghna River Basins, World Bank, Washington, August 30 1972 (with revisions February 12 1973).

#### Chapter 14: A BIG CANAL?

- (1) Indian Government, Proposal for augmenting the dry season flow of Ganga, duplicated, New Delhi, March 1978, p 64.
- (2) Ibid, p 68.
- (3) The depth and discharge are given; the slope appears to be similar to that of the Farakka Barrage feeder canal. The cross sectional area and width can therefore be calculated.
- (4) Maasland has calculated that the power potential of the unregulated minimum flow in this region is 30 GW at 60% load factor. Water development potentials of the Ganges-Brahmaputra-Meghna Basins, World Bank, Washington, 1973, p 20.
- (5) Indian Proposal, op cit (1), p 80.
- (6) Ibid, p 67.

- (7) My interview with C C Patel, Secretary for Irrigation, New Delhi, 28/9/78.
- (8) Indian Proposal, p 33.
- (9) Ibid, p 39.
- (10) UNDP, India: the National Water Grid, New York, 1972.
- (11) Ibid, p 43.
- (12) Indian Proposal, p 47.
- (13) Ibid, p 54.
- (15) Ibid, p 56.
- (16) Ibid.
- (17) Ibid, p 63. The references are not cited in the Proposal but they are: World Bank, Bangladesh: Land and water resources sector study, Washington 1972, VII, technical report 22, pp 6 and 15.
- (18) This quotation is probably from the same World Bank study cited in note (17) but I have been unable to trace the exact source.
- (19) Indian Proposal, pp 84-5.
- (20) My interview with a Bangladesh official of the Water Investigation Directorate, Dacca, 1978.
- (21) The Insider's critique is one Bangladesh official's personal commentary upon the Indian Proposal. It was written in March or April 1978.
- (22) My interview, op cit (20).
- (23) Op cit (22).
- (24) 'Sovereign. 1. Adj. (of power) supreme and exempt from external control....' Pocket Oxford Dictionary.
- (25) The population density in this area of Bangladesh is 1,000 to 1,300 persons per square mile, and less in Assam and West Bengal.
- (26) V J Galay, Augmentation of the dry season flow of the Ganges, typescript North West Hydraulic Consultants, Dacca, June 1978.
- (27) A Press Trust of India report of 18/7/78, said that storage in Nepal could provide 50,000 cusecs. My interview with a senior official in the Ministry of External Affairs revealed that storage in India could be expected, by India's estimate to provide 30,000 cusecs.

Chapter 15: A FEW DAMS

- (1) Bangladesh. Ministry of Power, Water Resources and Flood Control, Proposal for the augmentation of the dry season flow of the Ganges, Dacca, March 1978.
- (2) Nippon Koei and Co for Government of Nepal, Master Plan of Hydro-electric Development in Nepal, Kathmandu, 1974.
- (3) The project is described in Far Eastern Economic Review, 7/4/78, 'Letter from Dacca', an article which appears to have been written by someone with access to the Bangladesh Proposal.  
  
See also the Economist, 28/1/78, 'Water, water everywhere'.
- (4) Bangladesh Proposal, op cit (1), p 1.
- (5) Ibid.
- (6) Ibid, p 26
- (7) B G Verghese, 'An integrated approach to the Ganga-Brahmaputra Basin development', in A symposium on Ganga-Brahmaputra Basin's Potential, Delhi, 1979, p 103.
- (8) Press Trust of India, Delhi, 18/7/78.
- (9) Ibid.
- (10) My interview with Indian civil servant, Delhi, September 1978.
- (11) Verghese, op cit (7), p 106.
- (12) Interview, op cit (10).
- (13) Ibid.
- (14) My interview with engineer in Department of Irrigation, September 1978.
- (15) The Chisapani Dam appears to be a high dam even for the first estimate of storage. The Norconsult/Electrowatt Main report, Kathmandu, 1973, for the feasibility study on this dam suggests a 200m dam.  
  
Bangladesh's estimate requires that the Chisapani reservoir store 2.5 times as much water. The dam height will not rise in direct proportion, but it will rise significantly.
- (16) Norconsult/Electrowatt Main report, ibid, estimates the additional monthly flow available after the needs of electricity generation have been met. This suggests that 16,000 cusecs of additional flow would be available in the driest month of April. This corresponds approximately with

the Bangladesh estimate (in Table 15.2) possibly indicating that there will not be a serious conflict.

Chapter 16: REVIEW AND COMPARISON

- (1) The Indian parliament's discussions in 1975 provide further confirmation of the existence of unresolved technical questions. India. Lok Sabha, Public Accounts Committee, 196th Report, The Farakka Barrage, Delhi, 1976, pp 111-2.
- (2) K P Misra (ed), Studies in Indian foreign policy, Vikas, Delhi, 1969;  
S M Burke, Mainsprings of Indian and Pakistani foreign policy, Minnesota U P, Minneapolis, 1974.  
M S Rajan, India's foreign relations in the Nehru era, Asia Publishing House, Bombay, 1976.
- (3) Tariq Hassan, 'Ganges waters treaty', Harvard Intl Law JI, 19, 2, p 721, note (89).
- (4) J S Bains, 'Equitable solution for water disputes', The Hindu, 16/9/61. This is presumably a summary of the article cited by Hassan (Indian JI Intl Law, 38, 1960).
- (5) Hassan, op cit.
- (6) Ibid, pp 719-20.
- (7) Quoted in Sid Guatam, 'Inter-state water disputes: a case study of India', Water Resources Bulletin (Am Wat Res Assn), 12, 5, October 76, pp 1061-9.
- (8) India, Report of the Irrigation Commission, Delhi, 1972, Vol I, Chapter XV.
- (9) Guatam, op cit, p 1064.
- (10) Ibid, p 1065.  
The dispute between five states over the sharing of the River Godaveri was resolved by a tribunal in December 1979. Hindu Intl Edn, 8/12/79.
- (11) Ibid, p 1064.
- (12) Irrigation Commission, op cit, Vol I, p 349.
- (13) Irrigation Commission, op cit, pp 354-357; Guatam, op cit, pp 1067-70;  
K L Rao, India's water wealth, Orient Longman, Delhi, 1975, p 214 and Chapter XIV.  
Siddeshwar Prasad, 'Water resources development: a few aspects of inter-state problems', Ind JI of Power and River Valley Development, Jan 1970, pp 9-13.

- (14) D A Caponera, Report on the Kosi revised agreement..., mimeo, 1966.  
J Lipper, 'Equitable utilisation' in A H Garretson et al, The law of international drainage basins, New York, 1967, pp 15-88.
- (15) Bains, op cit (4).
- (16) Hassan, op cit (3), p 723.
- (17) Glos, International rivers: a policy-oriented perspective, University of Malaya, Singapore, 1961, pp 244-5.
- (18) Hassan, op cit (3), p 722.
- (19) Lipper, op cit (13).
- (20) The Rules are reproduced in UN, Management of international water resources: institutional and legal aspects, New York, 1975.
- (21) Ibid, article IV.
- (22) Baxter, 'The Indus Basin' in Garretson et al, op cit (14).
- (23) Ibid.
- (24) Dacca, 1976, p 18.
- (25) India, The Farakka Barrage, Delhi, 1976.
- (26) P J Stone, A methodology to provide analytical information for coordinated water resource use in international river basin development, PhD thesis, Massachusetts Institute of Technology, May 1977, p 78.
- (27) UN, op cit (20), pp 44-5.
- (28) J D Chapman (ed), The international river basin, University of British Columbia, Vancouver, 1963, pp 22-3. The Indian Government was represented at this seminar by an observer, East Pakistan by a participant.
- (29) See Appendix A.
- (30) Lok Sabha Debates, 16/8/61, 'International situation', S2, 56, cols 2405-560.
- (31) Telegram from US Embassy in Dacca to Washington, dated January 1977, number Dacca 0272.
- (32) Y Ezrahi, 'The political resources of science', in Barnes (ed), The sociology of science, Penguin, Middlesex, 1975.



- (33) Bangladesh Mission to the UN, Press Release, 'Statement...in the Special Political Committee...', November 15 1976.
- (34) India News, issued by Indian Mission to UN, 'Statement by his excellency...', November 16 1976, p 6.
- (35) Nelkin, 'The political impact of technical expertise', Social studies of science, 5, 1975, p 53.
- (36) Nelkin, 'The technological imperative vs public interests', Society, Sep/Oct 1976, p 6.
- (37) Ibid.

APPENDICES

APPENDIX A

Agreements between India and Bangladesh  
on river waters

1. Statute of the Indo-Bangladesh Joint Rivers Commission, 24th November 1972.
2. Published details of the 1975 interim agreement, April 18th 1975.
3. Indo-Bangladesh agreement on sharing of Ganga waters at Farakka, November 5th 1977.

STATUTE OF THE INDO-BANGLADESH JOINT

RIVERS COMMISSION

Chapter I

The Contracting Parties

Pursuant to the relations of friendship and co-operation that exist between India and Bangladesh,

Desirous of working together in harnessing the rivers common to both countries for the benefit of the peoples of the two countries,

Desirous of specifying some questions relating to these matters,

WE HAVE AGREED AS FOLLOWS:

Chapter II

Article 1

There shall be established an Indo-Bangladesh Joint Rivers Commission, hereinafter referred to as the Commission.

Article 2

- (i) The Commission shall be constituted by each participating government appointing a chairman and three members; of these two shall be engineers. The Chairman and three members shall ordinarily hold office for a period of three years.
- (ii) Each participating government may also appoint such experts and advisors as it desires.

Article 3

The Chairmanship of the Commission shall be held annually in turn by Bangladesh and India.

Article 4

- (i) The Commission shall have the following functions in particular:
  - a) to maintain liason between the participating countries in order to ensure the most effective joint efforts in maximising the benefits from common river systems to both countries.
  - b) to formulate flood control works and to recommend implementation of joint projects.

- c) to formulate detailed proposals on advance floor warnings, flood forecasting and cyclone warnings,
- d) to study flood control and irrigation projects so that the water resources of the region can be utilised on an equitable basis for the mutual benefit of the peoples of the two countries, and
- e) to formulate proposals for carrying out co-ordinated research on problems of flood control affecting both the countries.

(ii) The Commission shall also perform such other functions as the two governments may, by mutual agreement, direct it to do.

### Chapter III SUPPORTING STAFF AND SECRETARIAT ASSISTANCE

#### Article 5

Each government will provide appropriate supporting staff and secretariat assistance to its representatives in the Commission to enable them to discharge their functions in an effective manner.

### Chapter IV SESSIONS

#### Article 6

- (i) subject to the provisions of this statute, the Commission shall adopt its own rules of procedure.
- (ii) Meetings may generally take place alternatively in the two countries, subject to the convenience of the two governments.
- (iii) Special meetings of Working Groups or Ad-Hoc Expert Groups duly nominated by the respective governments may be arranged, as required, by mutual consultation of the Members.

### Chapter V RULES OF PROCEDURE

- (iv) The ordinary session of the Commission shall be held as often as necessary, generally four times a year. In addition special meetings may be convened any time at the request of either government.

#### Article 7

All meetings shall be closed meetings unless the Commission desires otherwise.

Chapter VI GENERAL PROVISIONS

Article 8

The Commission shall submit confirmed minutes of all meetings to the two governments. The Commission shall also submit its annual reports by the thirtyfirst of January, next year.

Article 9

Decisions of the Commission shall be unanimous. If any differences arise in the interpretation of this Statute they shall be referred to the two governments to be dealt with on a bilateral basis in a spirit of mutual respect and understanding.

Done in Dacca on the 24th day of November, Nineteen Hundred and Seventy-Two.

On BEHALF OF THE  
GOVERNMENT OF THE  
PEOPLE'S REPUBLIC  
OF BANGLADESH

On BEHALF OF THE  
GOVERNMENT OF  
INDIA

Sd.  
(Shafiqul Huq)  
Secretary, Ministry of  
Flood Control and  
Water Resources.

Sd.  
(Subimal Dutt)  
High Commissioner  
for India in Bangladesh.

1975 FORTY DAY UNDERSTANDING

JOINT INDIA-BANGLADESH PRESS RELEASE

EMBARGO: NOT TO BE PUBLISHED/BROADCAST/TELECAST  
BEFORE 1700 HOURS IST/1730 HOURS BST  
ON 18TH APRIL, 1975.

DACCA/NEW DELHI, APRIL, 18:

The delegation from India led by His Excellency Shri Jagjivan Ram, Minister of Agriculture and Irrigation and the delegation from Bangladesh led by His Excellency Mr Abdur Rab Serneabat, Minister for Flood Control Water Resources and Power met in Dacca from the 16th to 18th April, 1975. The talks were held in a cordial atmosphere and were characterised by mutual understanding that exists between the two friendly countries.

The Indian side pointed out that while discussions regarding allocation of fair weather flows of the Ganga during lean months in terms of the Prime Ministers' declaration of May, 1974 are continuing, it is essential to run the feeder canal of the Farakka Barrage during the current lean period. It is agreed that this operation may be carried out with varying discharges in ten-day periods during the months April and May, 1975 as shown below ensuring the continuance of the remaining flows for Bangladesh.

<u>Month</u>	<u>Ten-day period</u>	<u>Withdrawal</u>
April, 1975	21st to 30th	11,000 cusecs
May, 1975	1st to 10th	12,000 cusecs
	11th to 20th	15,000 cusecs
	21st to 31st	16,000 cusecs

Joint teams consisting of experts of two Governments shall observe at the appropriate places in both the countries the effects of the agreed withdrawals at Farakka, in Bangladesh and on the Hooghly river for the benefit of Calcutta Port. A joint team will also be stationed at Farakka to record the discharges into the feeder canal and the remaining flows for Bangladesh. The teams will submit their reports to both the Governments for consideration.

April 18, 1975.

Indo-Bangladesh Agreement on Sharing of Ganga Waters at Farakka

The following is the text of agreement between the Government of the Republic of India and the Government of the People's Republic of Bangladesh on sharing of the Ganga waters at Farakka and on augmenting its flows signed in Dacca by Shri Surjit Singh Barnala, for the Government of the Republic of India and Rear Admiral Musharraf Hussain Khan, for the Government of the People's Republic of Bangladesh on November 5, 1977:

THE GOVERNMENT OF THE REPUBLIC OF INDIA AND THE GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH,

DETERMINED to promote and strengthen their relations of friendship and good neighbourliness,

INSPIRED by the common desire of promoting the well-being of their peoples,

BEING desirous of sharing by mutual agreement the waters of the international rivers flowing through the territories of the two countries and of making the optimum utilisation of the water resources of their region by joint efforts,

RECOGNISING that the need of making an interim arrangement for sharing of the Ganga waters at Farakka in a spirit of mutual accommodation and the need for a solution of the long-term problem of augmenting the flows of the Ganga are in the mutual interests of the people's of the two countries,

BEING desirous of finding a fair solution of the question before them, without affecting the rights and entitlements of either country other than those covered by this Agreement, or establishing any general principles of law or precedent,

HAVE AGREED AS FOLLOWS:

A. Arrangements for sharing of the waters of the Ganga at Farakka.

ARTICLE I

The quantum of waters agreed to be released by India to Bangladesh will be at Farakka.

ARTICLE II

(i) The sharing between India and Bangladesh of the Ganga waters at Farakka from the 1st January to the 31st May every year will be with reference to the quantum shown in column 2 of the Schedule annexed hereto which is based on 75 per cent availability calculated from the recorded flows of the Ganga at Farakka from 1948 to 1973.



(ii) India shall release to Bangladesh waters by 10-day periods in quantum shown in column 4 of the Schedule:

Provided that if the actual availability at Farakka of the Ganga waters during a 10 day period is higher or lower than the quantum shown in column 2 of the Schedule it shall be shared in the proportion applicable to that period;

Provided further that if during a particular 10-day period, the Ganga flows at Farakka come down to such a level that the share of Bangladesh is lower than 80 per cent of the value shown in column 4, the release of waters to Bangladesh during that 10-day period shall not fall below 80 per cent of the value shown in column 4.

#### ARTICLE III

The waters released to Bangladesh at Farakka under Article 1 shall not be reduced below Farakka except for reasonable uses of waters, not exceeding 200 cusecs, by India between Farakka and the point on the Ganga where both its banks are in Bangladesh.

#### ARTICLE IV

A Committee consisting of the representatives nominated by the two Governments (hereinafter called the Joint Committee) shall be constituted. The Joint Committee shall set up suitable teams at Farakka and Hardinge Bridge to observe and record at Farakka the daily flows below Farakka Barrage and in the Feeder Canal, as well as at Hardinge Bridge.

#### ARTICLE V

The Joint Committee shall decide its own procedure and method of functioning.

#### ARTICLE VI

The Joint Committee shall submit to the two Governments all data collected by it and shall also submit a yearly report to both the Governments.

#### ARTICLE VII

The Joint Committee shall be responsible for implementing the arrangements contained in this part of the Agreement and examining any difficulty arising out of the implementation of the above arrangements and of the operation of Farakka Barrage. Any difference or dispute arising in this regard, if not resolved by the Joint Committee, shall be referred to a panel of an equal number of Indian and Bangladeshi experts nominated by the two Governments. If the difference or dispute still remains unresolved, it shall be referred to the two Governments which shall meet urgently at the appropriate level to resolve it by mutual discussion and failing that by such other arrangements as they may mutually agree upon.

B. Long-Term Arrangements

ARTICLE VIII

The two Governments recognise the need to cooperate with each other in finding a solution to the long-term problem of augmenting the flows of the Ganga during the dry season.

ARTICLE IX

The Indo-Bangladesh Joint Rivers Commission established by the two Governments in 1972 shall carry out investigation and study of schemes relating to the augmentation of the dry season flows of the Ganga, proposed or to be proposed by either Government with a view to finding a solution which is economical and feasible. It shall submit its recommendations to the two Governments within a period of three years.

ARTICLE X

The two Governments shall consider and agree upon a scheme or schemes, taking into account the recommendations of the Joint Rivers Commission, and take necessary measures to implement it or them as speedily as possible.

ARTICLE XI

Any difficulty, difference or dispute arising from or with regard to this part of the Agreement, if not resolved by the Joint Rivers Commission, shall be referred to the two Governments which shall meet urgently at the appropriate level to resolve it by mutual discussion.

C. Review and Duration

ARTICLE XII

The provisions of this Agreement will be implemented by both parties in good faith. During the period for which the Agreement continues to be in force in accordance with Article 15 of the Agreement, the quantum of waters agreed to be released to Bangladesh at Farakka in accordance with this Agreement shall not be reduced.

ARTICLE XIII

The Agreement will be reviewed by the two Governments at the expiry of three years from the date of coming into force of this Agreement. Further reviews shall take place six months before the expiry of this Agreement or as may be agreed upon between the two Governments.

ARTICLE XIV

The review or reviews referred to in Article 13 shall entail consideration of the working, impact, implementation and progress of the arrangements contained in parts A and B of this Agreement.

ARTICLE XV

This Agreement shall enter into force upon signature and shall remain in force for a period of five years from the date of its coming into force. It may be extended further for a specified period by mutual agreement in the light of the reviews referred to in Article 13.

IN WITNESS THEREOF the undersigned, being duly authorised thereto by the respective Governments, have signed this Agreement.

DONE in duplicate at Dacca on November 5, 1977 in the Hindi, Bengali and English languages. In the event of any conflict between the texts, the English text shall prevail.

SCHEDULE

(Vide Article 2(i))

SHARING OF WATERS AT FARAKKA BETWEEN THE 1ST JANUARY AND THE 31ST MAY  
EVERY YEAR

1	2	3	4
Period	Flows reaching Farakka (based on 75% availability from observed data (1948-73) Cusecs	Withdrawal by India at Farakka Cusecs	Release to Bangladesh Cusecs
January	1-10	98,500	58,500
	11-20	89,750	51,250
	21-31	82,500	47,500
February	1-10	79,250	46,250
	11-20	74,000	42,500
	21-28/29	70,000	39,250
March	1-10	65,250	38,500
	11-20	63,500	38,000
	21-31	61,000	36,000
April	1-10	59,000	35,000
	11-20	55,500	34,750
	21-30	55,000	34,500
May	1-10	56,500	35,000
	11-20	59,250	35,250
	21-31	65,500	38,750

## APPENDIX B

### Miscellaneous documents

1. Text of the consensus statement adopted at the United Nations, November 1976.
2. List of data supplied to Pakistan by India.
3. Haq Katha, 27/8/76, 'Why apathetic in accepting the Chinese suggestion for flood control?'

CONSENSUS STATEMENT AT THE UNITED NATIONS, 1976

1. The parties affirmed their adherence to the Declaration on Principles of International Law concerning Friendly Relations and Co-operation among States in accordance with the Charter of the United Nations and stressed, in this regard, their unalterable commitment to strengthen their bilateral relations by applying these principles in the settlement of disputes.
2. The parties recognised the urgency of the situation, particularly with the onset of another dry season.
3. Both parties agreed that the situation called for an urgent solution and, to that end, have decided to meet urgently at Dacca at the ministerial level for negotiations with a view to arriving at a fair and expeditious settlement.
4. The parties asserted that the prime objective of such intensified contact was to promote the well-being of their peoples and agreed to facilitate the establishment of an atmosphere conducive to the successful outcome of the negotiations.
5. The parties undertook to give due consideration to the most appropriate ways of utilizing the capacity of the United Nations system.
6. It is open to either party to report to the General Assembly at its thirty-second session on the progress achieved in the settlement of the problem.

LIST OF DATA SUPPLIED BY INDIA, JUNE 1960 TO JULY 1970

This is a summary of a typed document prepared by the Pakistan Government, and now in the archives of the Bangladesh Government.

Meeting	Documents supplied
1 Jun-Jul 1960 New Delhi	Note on Tista Project, West Bengal.
2 Oct 1960 Dacca	Project report for the Preservation of the Port of Calcutta; Data format for the Preservation of the Port of Calcutta; Ganga gauge discharge data 1958-60; Data format, Tista.
3 April 1961 Calcutta	Four vols gauge data at Rajmahal, 1910-60; Notes on littoral drift and interference by estuarine closure; Supplementary list of errors in EPWAPDA WSP No 2.
4 27/12 to 3/1/62 Dacca	Hensen's report; Pilot experiment of radioactive tracer study; [Large quantity of additional material - list takes up 15 pages].
5 May 1968	Sets of continuing hydrological data, Ganga and Tista; Dredging costs 1961-66; Navigable depths; Dredged quantities; Salinity data; Replies to 'Statement of data outstanding from India'.
Secretary level December 1968	Continuing hydrological data.  [Between this and the next meeting, India sent a number of requests for more data and an exchange took place through the Deputy High Commission, Dacca on 3/3/69. Daily discharge data for 1960s for Farakka, Hardinge, Paksey. Earlier, 24/1/69, India had requested data for the 'gains and loss study'.]

2nd Secretary level meeting

Gaps in data on the Ganges Barrage Project; 'Note on the comparison of interpolated data of Farakka and Hardinge Bridge by the Indian statistical method and by the Pakistan modified Stout method';

'Preliminary Indian comments on the Pakistan delegation's study on gains and losses in the Ganges River between Farakka and Hardinge Bridge';

'Preliminary Indian comments on the Associated Consulting Engineers Ganges Barrage report';

Comments on the condition of soil moisture in pre monsoon and post-monsoon periods in project area of Ganges Barrage.

3rd Secretary level meeting, New Delhi

- 1 Indian comments on the Ganges Barrage Project - July 1969;
- 2 Gains and losses in the Ganga/ Padma between Farakka and Hardinge Bridge (An interim study by the Indian delegation) - July 1969.

4th Secretary level Islamabad, February 1970

- Documents given by Pakistan:
- a) Observations on Indian gains and losses report of last meeting;
  - b) Preliminary observations by Pakistan delegation on reconciliation of flood data at Farakka and Hardinge Bridge as given by the Indian delegation;
  - c) Preliminary observations on interpolated data report of 2nd Sec. level meeting ((b) below);
  - d) Clarification on a previous note on gains and losses.

- Documents furnished by India:
- a) Reconciliation of flow data at Farakka and Hardinge Bridge;
  - b) Interpolated data on 2 methods
  - c) Preliminary observation on b) above.

List of documents July 1970

- 1 Comments on dependability;
- 2 More on reconciliation of flow data;
- 3 Comments by India on Pakistan's note on gains and losses;
- 4 'Consideration of inland navigation and salinity intrusion in East Pakistan and the Farakka Barrage Project.'
- 5 Comments on Amla Agricultural Farm.



Haq Katha, 27/8/76, 'Why apathetic in accepting Chinese suggestion for flood control?'

Although the People's China expressed their profound eagerness to save Bangladesh from the adverse effects of Farakka and also for flood control and the development of water resources. Still the Bangladesh Government is not yet to take any decision regarding this issue, because there have been some dirty tricks by a section of bureaucrats.

According to the report, People's China, unlike capitalist countries, is not willing to come forward with cash 'aids'. They want Bangladesh to be self-reliant in this regard. The Chinese experts are of a very strong opinion that Bangladesh in fact needs no foreign aids at all for the development of her water resources. If she uses her manpower in a well-arranged and very planned way then this problem would be solved within a few days. The Chinese experts have even opined that Bangladesh needs not to be afraid of the Farakka Barrage. The source of the water is plentiful here. The only solution lies in a planned storing and a proper distribution. They think that if Bangladesh can solve this complicated problem without any foreign aids then it will help the nation to regain its self-confidence.

It is known that a particular section of the bureaucrats are anxious to spirit away this Chinese move. Actually, the suggestion does not help their personal interests, as this would not give any facilities of foreign shopping. So, they are trying to prove the Chinese suggestion is hypothetical. Yet everyone knows that the Chinese had proved its reality long ago in their own country.

However, any sign of acceptance of the Chinese suggestion is still out of sight. On the other hand the rainy season is almost over. We must solve this alarming problem before the next dry season.'

(Translated from Bengali by Mamoon Ahmed).

## APPENDIX C

### THE HOOGHLY AFTER FARAKKA

Chapter One described the deterioration of the Hooghly, and Chapters Two and Three recounted how the Farakka Barrage was seen, despite controversy, as the answer to this deterioration. Has it in practice proved effective? Has the navigability of the Hooghly improved? The available data is inconclusive, but it seems probable that it has.

Proof of the efficacy of the Farakka diversions would be provided by a clear indication that river depths are increasing over the major bars in the lower Hooghly. To show that these increases were not caused by other factors, a series of figures covering, say, twenty years, would have to be provided. If the figures showed that changes in depth coincided with Farakka diversions and are roughly proportional to the quantity of diverted water, than it might be agreed that the Farakka diversions were doing what was expected of them. Unfortunately, such evidence is not available. In Table C.1 selected draught figures are provided for 1975 and 1976. A comparison of only two years is, however, quite inadequate. The effects may have been more significant in subsequent years.

Two alternative criteria for judging the efficacy of the diversions have been suggested by P C Mitra, who was Chairman of the Port Trust from 1973 to 1978, having been employed at the port since 1949. He told me that the success of the diversions could be measured from the influence on ebb and flood tide durations and on channel stability (1).

These two indicators correspond to Indian engineers' understanding of the processes of river deterioration. The 'flood orientation' of the lower Hooghly has long been identified as a cause of siltation. The incoming flood tide is faster, and therefore capable of carrying more sediment, than the outgoing ebb tide. The greater velocity of the flood tide can be seen in its shorter duration, and the power of this tide can be seen in its ability to cut the deepest channel during the dry season. In many years the deepest channel changes with the seasons: during the wet season, when freshets are coming from the Ganges, there is a predominant ebb channel created by the scouring action of the ebb tide. In the dry season, that channel is abandoned as the deepest path of the river, to be replaced by a flood-tide scoured channel (2). Mitra argues that maintenance of the stability of the ebb channel throughout the dry season would be proof of the effectiveness of the Farakka diversions. In 1978 he told me that the channel of the lower Hooghly had that year remained stable for the fourth year in succession (3).

A second index of success is the ratio of ebb and flood tide durations. If these durations have been equalised then the velocities and sediment carrying capacities of the two tides will have become closer. Tide tables are published annually by the Port Trust and since lives and ships depend on the information they

Table C.1 NAVIGABLE DRAUGHT OF HOOGLY IN 1975 AND 1976

MONTH	RANGE OF DRAUGHT (metres)	
	<u>1975</u>	<u>1976</u>
January	5.5 - 7.8	5.6 - 7.6
February	5.3 - 7.7	5.5 - 7.6
March	5.8 - 8.0	5.6 - 7.8
April	6.5 - 8.2	6.0 - 8.0
May	6.5 - 8.2	6.4 - 8.2
June	6.8 - 8.3	6.8 - 8.1
July	6.9 - 9.4	6.5 - 8.6
August	6.9 - 8.8	6.4 - 8.5
September	6.3 - 8.7	6.3 - 8.7
October	6.3 - 8.5	-
November	5.6 - 8.3	-
December	5.6 - 7.7	-

Source: Paper distributed by Bangladesh delegation at the United Nations, September 1976, which quotes official information issued by the Calcutta Port Commissioners.

contain there is reason to believe it is reliable. Comparison of the tide table for 1973 and 1979 (4) before and after the Farakka diversions does not indicate any significant equalisation of the flood and ebb tide durations.

Nevertheless, Mitra says that 'if there had been no Farakka Barrage, by now the port would probably be dead...' (5). He reports that in 1974 a 26ft draught was available on only 53 days of the year, and in 1977-78 that draught was available for 130-140 days. He further comments that the silt coagulation and deposition at the interface of saline and fresh water, which had concerned Ippen and Wicker (see Chapter Three), has not proved a serious problem, but one which can be tackled with dredging.

In an interview with me, a senior administrator of the Farakka Project suggested that the evidence was less conclusive:

'It is difficult to say [how effective it will be]. There is a team studying the effectiveness [but] their reports are classified. [The diversions have] arrested further siltation, but as to deepening we will have to see how far it is effective.'

(6)

Until the return of Mrs Gandhi, most newspaper reports suggested that the Hooghly was improving (7). Since that time it has frequently been suggested, as the Indian Irrigation Minister did in July 1980, that India is being allowed too little water to maintain the navigation of the Hooghly (8).

There seems to be no doubt that one consequence of the Farakka diversions has been reduced salinity in the Hooghly in the vicinity of Calcutta's water supply intake. Since even Ippen and Wicker did not doubt that such an effect would be observed, there seems no reason to question claims that it has taken place.

Two further, less beneficial consequences of the Farakka Barrage have been noted on the Indian side of the border: erosion of the bank of the Ganges downstream of the barrage and flooding upstream of the barrage. According to one report (9), 84 villages in Murshidabad District have been lost to erosion by the Ganges, and as a result 50,000 people have been made homeless. An inquiry set up by the West Bengal Assembly was unable to establish that the erosion was definitely caused by the barrage (10), and a Lok Sabha committee hearing accepted expert opinion that the Farakka Barrage was not the cause (11). There has almost certainly been flooding upstream of the barrage, but these effects are thought to be neither severe nor insuperable.

In sum, although the evidence is inconclusive, there is a strong presumption that the Farakka diversions are beginning to have the required influence on the problem of the Hooghly, but the barrage itself may also be causing severe erosion of the banks of the Ganges.

Appendix C: NOTES AND REFERENCES

- (1) Interview in Calcutta, 17/10/78.
- (2) This explanation of the rivers operation is given by Longridge, Vernon-Harcourt and the Man Singh Expert Committee (see Chapter One).
- (3) Interview with this writer, Calcutta 17/10/78.

See also Business Standard, 6/5/77, 'Calcutta Port shutdown feared', a report of a press conference given by Mitra (anticipating the Ganges Waters Treaty?) in which he said, 'Since the Farakka water started flowing in 1975 [the ebb] channel was deepened and in 1976 the flood [tide] waters flowed through the same channel.'

- (4) Director of Marine, Port of Calcutta, Tide tables for the Hooghly River 1973, and Tide tables for the Hugli River 1979.

Spring tides at Garden Reach when the moon was at perigree show similar durations:

<u>Date</u>	<u>flood</u>		<u>ebb</u>	
	hrs	min	hrs	min
9/3/73	3	17	9	6
26/2/79	3	19	9	11

- (5) Interview, op cit (1).
- (6) Interview, October 1978.

The membership of this team is given in Bus Std, 18/9/77, 'Farakka study team report on Monday' but nothing more is heard of them after that.

In this report the outspoken Irrigation Minister of West Bengal, Provash Roy, is reported as having told a press conference that in 1976 the Farakka diversions were in the range 35,000-38,000 cusecs (confirming the estimate of Special Studies of 36,000 cusecs, Table 10.8, Chapter 10) which produced a marked improvement in the Hooghly. According to Roy, the diversions in 1977 were 28,000-33,000 cusecs and there was a marked deterioration in the navigability of the Hooghly.

- (7) For example, as early as 1976, 'an improvement 25% more than anticipated' was reported (Statesman, 12/3/76, 'Port officials want supply of Farakka water assured').

Later in the year, teams studying the river reported that 1936 conditions could be restored in about seven years (Hind Std, 17/8/76, 'Farakka water must keep flowing').

- (8) The Hindu Intl Edn, 19/7/80, 'Ganga water talks yield no results'.
- (9) T R Patranabis, 'Farakka Project: Calcutta Port's fate in the balance', Economic and Political Weekly, 29/3/75, p 558.
- (10) West Bengal Legislative Assembly, Committee on Government Assurances, Seventh Report (Regarding checking of erosion at Farakka), Calcutta, 1974, p 1.
- (11) Lok Sabha, Public Accounts Committee, 196th Report, Farakka Barrage Project, Delhi, January 1976, p 141.

## APPENDIX D

### A 'THIRD WAY' OF DEVELOPING THE RIVERS?

Not thus far discussed in this thesis is the question: what sort of water resource development would be appropriate to the needs of the people of the Ganges and Brahmaputra Basins? In addition to the two governmental schemes, described in Chapters 14 and 15, many other basin-wide or national development proposals have been made. India's grandiose National Water Grid has already been mentioned in Chapter 14. In this appendix, three rather different suggestions are described. Two of these suggestions, one for the delta area of the lower basins, and one for the upper basin, involve popular mobilisations to build small-scale decentralised projects; whilst the third is a basin-wide scheme founded on high-technology and large capital investment. As we have seen in Chapters 14 and 15, large engineering proposals tend to express the political priorities of their designers. The suggestions described here, particularly the first two, probably do not reflect the priorities of the present leaderships in South Asia. It is likely therefore that they would only be seriously attempted under different political and economic circumstances.

#### A self-reliant water policy for Bangladesh

At different stages in the Ganges Water sharing dispute, particularly when Bangladesh has been unable to influence Indian decisions, leaders of Bangladesh have begun to articulate independent water development policies. The so-called Ganges Barrage is one example of such thinking. At times it has been proposed as a threat of retaliation against India, and at other times it has seriously been considered as a way of storing dry season water. No doubt somewhere in the archives of the Bangladesh Government there is a detailed plan for autarkic water resource development, prepared ready for the possibility that negotiation with India might break down irretrievably. What is such a plan likely to contain?

Two sources can provide some clues. In 1975 or 1976 a team of Chinese agriculture and water experts visited Bangladesh. Their report has remained confidential, but what little is known about it is suggestive. A second source of ideas is provided by the thinking of Colonel Abu Taher, Bangladesh's martyred revolutionary leader.

According to the Bengali newspaper Haq Katha, the Chinese advisers proposed a policy of self-reliance:

'China does not want to come forward with a fat purse of assistance like the capitalist world. It wants Bangladesh to be self-reliant in this matter.' (1)

It seems that the Chinese proposed land terracing, as a means of accomodating to floods, and water storage within Bangladesh to provide irrigation water during the dry season. Terracing is an unusual suggestion for a country as flat as Bangladesh, but it is possible

that land levels could be raised permanently in some areas where higher yielding varieties of rice could be grown, while elsewhere lower yielding but more flood-tolerant varieties could be sown. In the period 1954-70, flood losses approached 10% of rice production in two years and 5% in a further five years (2). Already villagers adjust their lives, houses, agricultural methods and crop storage utensils to minimise the threat from flooding (3). Possibly terracing could be used to improve this accommodation.

It is accepted wisdom that the flatness of Bangladesh makes it unsuitable for large scale water storage. However, Bangladesh has a tradition of small-scale and decentralised, but nevertheless substantial water storage. The countryside is dotted with 'tanks', small man-made ponds used to provide washing, drinking and sometimes irrigation water. This important national resource has declined as a result of land fragmentation and the construction during the colonial period of flood control embankments, and it is generally overlooked. However, statistics from a plot enumeration survey carried out in 1944-5 suggest that the combined area of Bangladesh's tanks then approached 500,000 acres (4). Assuming that these tanks could be rejuvenated and deepened to an average depth of 8 ft, and taking into account evaporation losses, as much as 2.5 MAF could be stored. Such a volume is not sufficient to provide all Bangladesh's irrigation needs, but it could be a significant contribution.

Colonel Abu Taher believed (5) that the severity of flooding in Bangladesh has increased since British conquest as a consequence of a decline in channel maintenance and of the construction of roads and railways across natural drainage paths. Prior to British rule there were societies with a greater concern for agriculture and water control (6). Taher argued that during the Moghul period drainage channels were improved during each winter but that this tradition declined under the British Raj and ceased after partition. There is little doubt that channel improvement could ameliorate flooding in Bangladesh (7). Taher proposed labour mobilisation to carry out this work and also the building of a Brahmaputra-Ganges link canal wholly within Bangladesh. The flow from this canal, he thought, would be adequate with revived and rationalised river channels to prevent saline water intrusion and provide irrigation water.

The four measures here described - terracing, tank water storage, river channel maintenance and an intra-Bangladesh link canal- do not constitute a coherent water development policy, but they are ideas worthy of further investigation.

#### Deforestation in the Himalayas and the Chipko movement.

Erosion of the Himalayas contributes a heavy silt load to the Ganges, causing river channel deterioration and flooding in the lower reaches. Deforestation and erosion also tend to increase run-off during the monsoon season, thereby exacerbating floods and at the same time reducing the recharge of groundwater and thus reducing dry season flows. Laban (8) has estimated that human interference has raised annual erosion rates in Nepal from 1-10 tons/ha to average rates of between 20 and 50 tons/ha with local rates as high as 200-500 tons/ha.



Deforestation without replanting, roadbuilding with inadequate drainage and increasing demand for firewood are amongst the factors which have increased erosion rates.

In the Indian Himalayas, in the state of Uttar Pradesh, a popular movement arose in 1973 to oppose indiscriminate felling by commercial timber companies. The movement took the name Chipko (from the verb to hug, cling to, or embrace) from an early civil disobedience organised by village women, when they took spontaneous action to physically prevent felling (9). Governmental control of deforestation has not been noticeably effective in South Asia. Conceivably, a spontaneous popular mobilisation, like the Chipko movement, could make a significant contribution to water resource development.

#### The Pugwash proposal: a Ganges Water Machine

The origins of the Harvard University, Center for Population Studies' research into the water resources of the Ganges Basin have been described in Chapter Six. From that research arose the proposal for a scheme to:

'lower the normal groundwater in the basin by heavy pumping along the rivers during the low flow season so that monsoon flows are stored by induced groundwater recharge.' (10)

The scheme is imaginative in its conception and possibly revolutionary in its consequences. The Harvard researchers are perhaps optimistic in believing that this one measure will solve floods, drought, food shortage, population problems and provide the foundation for rapid economic growth (11). On the basis of their calculations, possibly as much as 15% or 30% of the total annual flow of the Ganges could be stored as rechargeable groundwater (12). Two of the researchers, Revelle and Lakshminarayana, see the problem in these terms:

'Deeply embedded cultural, social, and economic problems inhibit modernisation of agriculture and fuller utilisation of water resources...'

and the solution as:

'the introduction of technological changes on the required scale might break the chains of tradition and injustice that now bind the people in misery and poverty.' (13)

The technological changes they propose are the machines required for, and the processes of, increasing groundwater storage. To do this, fallow land would be contoured to delay rainwater run-off, and a lower water table would reduce evaporation from the ground water, but the most significant new source of water would be percolation from purpose built canals into which river water would be diverted during the monsoon season, with pumping from well-fields to retrieve this water during the dry season.

The Harvard articles note various engineering problems which they

have already identified but believe can be overcome. However, the Indian Government has not so far been receptive to this scheme. The Central Water Commission is studying it, but it has been left to Pakistan to initiate major field trials (14). The cost of the scheme would be large. Harvard researchers have estimated that the 170,000 large tubewells required would alone cost US \$1,700 million. The costs of canals, diversion structures, and of generating and transmitting 3,000 MW of electricity would be additional to this.

A number of criticisms have been made of the Harvard scheme (15). In particular, it has been suggested that it would increase the control of central government in the Ganges Basin, and the dependency of the countries of the Basin on foreign aid and foreign technology (16). Nevertheless, the scheme offers an imaginative and daring approach which, if it works, could store more water than either government's proposal.

Appendix D: NOTES AND REFERENCES

- (1) Hag Katha, 27/8/76, 'Why apathetic in accepting the Chinese suggestion for flood control?' The report was widely republished by Indian newspapers a day or two later.
- (2) World Bank, Report PS-13, Land and water resources sector study, Bangladesh, VIII, TR 24, Table 5.
- (3) Kathleen A Ralph, Perception and adjustment to flood in the Meghna flood plain, MA thesis, University of Hawaii, 1975, pp 76-88.
- (4) D V Smith, 'Opportunity for village development: the tanks of Bangladesh', Bangladesh Economic Review, 1, 3, July 1973, pp 297-308.
- (5) For this account of Taher's thinking on water resource development I am indebted to Lawrence Lifschultz, who held long conversations on the subject with Taher. The story of Taher is told in Lifschultz's book, Bangladesh: the unfinished revolution, Zed, London, 1979.
- (6) See, for example, K L Rao, India's water wealth, pp 114-5, Orient Longman, Delhi, 1975.
- (7) World Bank, op cit (2), VIII, TR 24, p 16.
- (8) Laban, 'Field measurements on erosion and sedimentation in Nepal', Gov't of Nepal/FAO/UNDP Integrated Watershed Management Program, IWM/WP/05, Sep 1978, p 1.
- (9) Guardian, 7/1/80, 'Hugging trees'.  
A Lopatin, unpublished note on Chipko movement, Rochester University, USA.
- (10) M C Chaturvedi, R Revelle; and V K Srivastava, 'Ganga water machine II - induced groundwater recharge', p 196 in Water for Human Needs, Second World Congress on Water Resources, Delhi, 1975, Vol III.  
  
See also Revelle and V Lakshminarayana, 'The Ganges water machine', Science, 9 May 1975, 188, pp 6111-616.
- (11) Chaturvedi et al, op cit, p 196.  
Revelle et al, op cit, p 611.
- (12) Chaturvedi et al, op cit, pp 196-7.  
Revelle et al, op cit, Table 1, p 612.
- (13) Revelle et al, op cit, p 611.

- (14) Writer's interviews with Rogers, now of the Department of City and Regional Planning, Harvard University.
- (15) 'Harnessing Ganga and Brahmaputra: implications of Anglo-American move', in Economic and Political Weekly, 13, 28 Jan - 4 Feb 1978, pp 129-30.

In an interview with a civil servant of the Ministry of External Affairs of India, I was told that a paper giving the following criticisms of the Harvard scheme was being circulated in the Ministry:

1. It is experimental and untried, why try it in India?
2. Why try it on the Ganga? Other river basins in India have water shortages.
3. Technical problems. a) The ground must be porous, even then pores may be blocked by sediment. b) If the water level is lowered, irrigation based on shallow tubewells will have to be abandoned. c) What will happen to vegetation during the three months when the water table is lowered by pumping? d) Will lowering of the table cause subsidence and collapse? e) Recharging the groundwater may introduce pollution.

- (16) EPW, op cit (27).

Some of these criticisms can also be levelled at the two government's proposals. But, it is the lowering of the water table which is the unique detrimental feature of the Harvard scheme. Quite suddenly, one year, many of the hundreds of thousands of hand pumps in the Ganges basin, providing household water as well as irrigation water, would become unusable. Many traditional water lifting devices might also suffer and open wells would at the least require deepening.

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