E.C. No. 573

ESTIMATES COMMITTEE (1968-69)

(FOURTH LOK SABHA)

SIXTY-EIGHTH REPORT

MINISTRY OF IRRIGATION AND POWER

KOSI PROJECT

LOK SABHA SECRETARIAT
NEW DELHI
February, 1969/Phalguna, 1890 (S)
Price : *Rs.* 1.30

LIST OF AUTHORISED AGENTS FOR THE SALE OF LOK SABHA SECRETARIAT PUBLICATIONS

Sl No.	Name of Agent	Agency No.
	ANDHRA PRADESH	
1.	Andhra University General Cooperative Stores Ltd., Waltair (Visakhapatnam)	8
2.	G.R. Lakshmipathy Chetty and Sons, General Merchants and News Agents, Newpet, Chandragiri, Chittoor District.	94
	ASSAM	
3.	Western Book Depot, Pan Bazar, Gauhati.	7
	BIHAR	
4.	Amar Kitab Ghar, Post Box 78, Diagonal Road, Jamshedpur.	37
	GUJARAT	
5.	Vijay Stores, Station Road, Anand.	35
6.	The New Order Book Company Ellis Bridge, Ahmedabad-6.	63
	HARYANA	
7	M/s. Prabhu Book Service, Nai Subzimandi, Gurgaon. (Haryana).	14
	MADHYA PRADESH	
8.	Modern Book House, Shiv Vilas Palace, Indore City.	13
	MAHARASHTRA	
9.	M/s. Sunderdas Gianchand, 601, Girgaum Road, Near Princess Street, Bombay-2	6
10.	The International Book House (Private) Limited, 9, Ash Lane, Mahatma Gandhi Road, Bombay-1.	22
11.	The International Book Service, Deccan Gymkhana, Poona-4.	26
12.	Charles Lambert & Company, 101, Mahatma Gandhi Road, Opposite Clock Tower, Fort, Bombay.	30
13.	The Current Book House, Maruti Lane, Raghunath Dadaji Street, Bombay-1.	60
14.	Deccan Book Stall, Ferguson College Road, Poona-4.	65
15.	M/s. Usha Book Depot, 585/A, Chira Bazar, Khan House, Girgaum Road, Bombay-2 BR.	
	MYSORE	
16.	M/s. Peoples Book House Opp. Jaganmohan Palace, Mysore—1.	16
	RAJASTHAN	
17.	Information Centre, Government of Rajasthan, Tripolia, Jaipur City.	38
	UTTAR PRADESH	
18.	Swastik Industrial Works, 59, Holi Street, Meerut City.	2
19.	Law Book Company, Sardar Patel Marg, Allahabad-1.	48
	WEST BENGAL	
20.	Granthaloka, 5/1, Ambica Mookherjee Road, Belgharia, 24 Parganas.	10
21	W. Newman & Company Ltd., 3, Old Court House Street, Calcutta.	44
22.	Firma K.L. Mukhopadhyay. 6/1A, Banchharam Akrur Lane, Calcutta-12	82
23.	M/s. Mukherji Book House, 8B, Duff Lane, Calcutta—6.	

CORRIGENDA
To

68th Report of the Estimates Committee (Fourth Lok Sabha) on the Ministry of Irrigation & Power - Kosi Project.

Page (v), line 22, for 'Appendix V' read 'Appendix VI'

Page 5, Para 1.18, line 4, for 'annual' read 'annually'

Page 7, line 4 from below for 'Embankment' read 'Embankments'

Page 8, para 1.27, line 6, for 'internal' read 'integrated'

Page 15, Line 3, for 'unavoidable' read 'avoidable'

Page 18, Para 2.26 line 5, after 'barrage' insert 'and'

Page 22, Para 2.38, line 8, for 'devised' read 'revised'

Page 23, Para 2.42, line 5, for 'condition' read 'conditions'
Foot-note, line 3, for 'Governmen' read 'Government'

Page 37, Line 3, for 'us' read 'use'

Page 38, para 3.42, line 2, for 'fecilitate' read 'facilitate'

Page 44, last line, for 'stas' read 'staff'

Page 53, para 4.6, line 23, for 'has' read 'ha.'

Page 55, para 4.11, line 10, delete 'and' after 'protection'

Page 57, para 4.16, line 7, for 'holds' read 'holes'

page 64, para 5.2, line 6, for 'supauj' read 'supaul'

Page 66, line 18, for 'consideably' read 'considerably'

Page 67, para 5.6, read as recommendation in bold type.

CONTENTS

3015 Ail L.S.—1.

ESTIMATES COMMITTEE
(1968-69)

CHAIRMAN

Shri P. Venkatasubbaiah

MEMBERS

2. Shri B. Anjanappa
3. Shri R. S. Arumugam
4. Shri Panna Lal Barupal
5. Shri Onkar Lal Berwa
6. Shri Tridib Chaudhuri
7. Shri Ganesh Ghosh
8. Shri Hardayal Devgun
9. Shri Y. Gadilingana Goud
10. Shri J. M. Imam
11. Shri Tulshidas Jadhav
12. Shri C. Janardhanan
13. Shri S. Kandappan
14. Shri Yashwant Singh Kushwah
15. Shri K. Lakkappa
16. Shri J. M. Lobo Prabhu
17. Shri Inder J. Malhotra
18. Shri Yamuna Prasad Mandal
19. Shri Bibhuti Mishra
20. Shri F. H. Mohsin
21. Shri Kartik Oraon
22. Shri Chintamani Panigrahi
23. Shri Gajraj Singh Rao
24. Shri Erasmo de Sequeira
25. Shrimati Jayaben Shah
26. Shri Shantilal Shah
27. Shri Rajdeo Singh
28. Shri Arangil Sreedharan

29. Shri K. Subravelu
30. Shri Tula Ram

SECRETARIAT

Shri N. N. Mallya—*Joint Secretary.*

Shri B. K. Mukherjee—*Deputy Secretary.*

Shri K. D. Chatterjee—*Under Secretary.*

INTRODUCTION

I, the Chairman, Estimates Committee, having been authorised by the Committee to submit the report on their behalf, present this Sixty-eighth Report on the Ministry of Irrigation & Power—Kosi Project.

2. The Committee took evidence of the representatives of the Ministry of Irrigation and Power and the Kosi Project authorities on the 18th July, 1968. The Committee wish to express their thanks to the Secretary and Joint Secretary, Ministry of Irrigation and Power, Chairman and Members, Central Water and Power Commission, Secretary, River Valley Projects Department, Government of Bihar and the Chief Engineer, Kosi Project and other officers of the Ministry of Irrigation and Power for placing before them the material and information they wanted in connection with the examination of the estimates.

3. They also wish to express their thanks to Shri P. R. Guha, Retired Chief Engineer, Bihar and Shri Moti Ram, Retired Chief Engineer, Rajasthan for furnishing Memoranda to the Committee.

4. The report was considered and adopted by the Committee on the 22nd January, 1969

5. A statement showing the analysis of recommendations contained in the Report is also appended to the Report (Appendix V).

P. VENKATASUBBAIAH,
Chairman,
Estimates Committee.

NEW DELHI;
February 20, 1969.
Phalguna, 1, 1890 (*Saka*).

CHAPTER I

INTRODUCTORY

A. Historical Background

The Kosi Catchment

1.1. The Kosi is one of the most turbulent rivers of India. Rising in Tibet at a height of about 18,000 feet, the river joins the Ganga near Kursela after traversing about 450 miles. It is called 'Sapt Kosi' by the Nepalese from the fact that Seven Streams, namely (1) the Sun Kosi, (2) the Bhotia Kosi, (3) the Tamba Kosi, (4) the Dudh Kosi, (5) the Barun Kosi, (6) the Arun Kosi and (7) the Tamur, unite together to form the main Kosi Channel. The three main tributaries of the Kosi, namely (i) Sun Kosi from the west, (ii) Arun from the north, and (iii) Tamur from the east meet at Tribeni. The river then flows in a narrow gorge for a length of about 6 miles, till it debouches in the plain at Chatra. From this point the river runs in a sandy alluvial plan through Nepal terrai upto nearabout Bhimnagar, after which it flows on the boundary between Nepal terrai and north Bihar for some miles till it wholly enters into North Bihar. Thereafter, it flows throughout North Bihar with many interlacing channels upto a few miles beyond Mansi-Koparia Railway line, from which point, it forms a single deep channel till it finally joins the Ganga a few miles below the Kursela Railway Bridge. The length of the river from Chatra to Kursela is about 192 miles. The flood-slope varies considerably in this reach.

1.2. From Chatra upto a distance of about 26 miles the slope is as steep as 4.64 ft. per mile. From this point upto Dagmara, a distance of about 16 miles, the slope drops to about 2.35 ft. per mile. Thereafter, over a distance of 41 miles upto Bhaluahi the slope further reduces to 1.48 ft. per mile. Beyond Bhaluahi, the slope gradually flattens to about 0.34 ft. per mile.

1.3. Hydrographs of the Kosi river exist from the year 1948 onwards. The maximum flood discharge in any year during the period varied from 1.91 lakh cusecs to 8.55 lakh cusecs. The minimum flow of the river recorded in these 18 years was 9,186 cusecs in the month of March, 1948. The Kosi river carries about 87,000 acre feet of silt (average of 1958 to 1964) in suspension. "Silt" load varies from year to year depending on the flow of the river.

1.4. Owing to steep bed slope below of the foot-hills, high flood discharges and heavy charge of silt and detritus in the river, the

course of the river is very unstable and during the last 130 years the river has moved nearly 70 miles from East to West. During this continuous shift, the river has, by deposition of sand, destroyed vast tracts of agricultural land, roughly estimated at between 5,000 and 6,000 sq. miles in the district of Purnea and Saharsa in Bihar and 300 and 500 sq. miles in Nepal, washed away towns and villages and created large swamps. Therefore, rightly it has been called the "River of Sorrow".

1.5. The Kosi commands a catchment basin of 22,986 sq. miles upto Chatra (Nepal) in the foothills of the Himalayas, of which 2,228 sq. miles are under glaciers. Rainfall in this catchment progressively increases from about 70 inches in the foothills to about 140 inches on the southern slopes of the Himalayas in the Tibetan plateau. It then gradually decreases to 10 inches at the northern extremity of the catchment.

Early Attempts for Taming the River

1.6. Various surveys were carried out for the control of this dangerous river, conferences were held between 1893 and 1937 but no serious step were taken to control the ravages of the river.

1.7. In 1893, there was an apprehension that the Kosi river might make a sudden change in its direction of flow and that it might return to one of the form channels a long way to the east. Mr. W. A. Inglis was consequently deputed to make a reconnaissance survey of the area both in India and the Nepal and to suggest suitable means for controlling the river. After the Survey, he came to the conclusion that it was not advisable to make any attempt to interfere with the natural flow of the river. His conclusions were acceptable to Government and the river was practically left to itself.

1.8. In a conference held in 1896-97 at Calcutta, the question of building extensive embankment to control the river, and prevent its swinging movement to the west was considered. After due consideration, the consensus of opinion was that no steps were feasible for controlling the course of this big river, with its numerous channels, and their wide and elevated beds, beyond protecting, by short lengths of embankments isolated tracts exposed to its floods.

1.9. In November, 1937, a Conference of officials and non-officials was called by the then Government of Bihar, to discuss the problem of floods in North-Bihar. At this conference the controversy centred mainly round 'embankment' or 'no embankment'. Differing opinions were expressed by the participants in the Conference. The deliberations of this conference, however, do not, appear to have led to

any constructive approach towards the solution of the flood problem of north Bihar.

Chanda Inglis Report

1.10. In 1941, Mr. C. C. Inglis, Director, Central Irrigation and Hydro-dynamic Research Station made a comprehensive inspection of the Kosi River, both in Nepal and in Bihar and submitted a report on the 'Factors affecting the westerly movement of the Kosi River, with suggestions for further investigation'. He wanted some more data to be collected for the lower reaches of the river but no action was taken by Government on this report.

1.11. Owing to shortage of personnel and equipment during the war years, no further action seems to have been taken in dealing with the problem of the Kosi beyond including in the Bihar-postwar plan a proposal for the construction of marginal embankments, right from the Nepal foot-hills to the Ganga, to control the river by confining it to a definite channel. The scheme was estimated to cost roughly about Rs. 10 crores.

1.12. The above proposal of marginal embankments was considered by the Labour Department of Government of India, and the Secretary referred it to the Chairman, the then Central Waterways, Irrigation and Navigation Commission (now Central Water and Power Commission), who opined that a more effective control would be secured by the construction of storage reservoir in the hills, which would give effective control of floods in the river, and, in addition, provide water for use in irrigation, navigation, power generation etc. As a result of correspondence with the Government of Bihar, a further note was recorded on the 29th August, 1946, to the effect that "no satisfactory scheme for the control of the Kosi and its flood damage can be prepared except after a comprehensive survey of the entire field of possibilities *viz.* the construction of a high dam across the Chatra gorge, training the Kosi in the lower reaches, and exclusion of floods from the low lying areas which are susceptible to water logging."

1.13. The Kosi River was inspected upto its junction with the Tamur tributary by officers of the Commission and Geological Survey of India, and of the Government of Bihar and His Majesty's Government of Nepal under difficult conditions mainly due to want of communications. There was a great paucity and in most cases, complete absence of basic data, in respect of rainfall, flood discharge, minimum and normal flows, silt load, surface contours, subsoil water levels, and the correct magnitude of the damage caused by the vagaries of the river. The Chairman, Central Waterways, Irrigation and

Navigation Commission (now Central Water and Power Commission) gathered such information as was possible, as a result of inspection, discussions and investigations, and prepared the preliminary report on the project in March, 1946.

Discussions with Government of Nepal

1.14. As the dam site and several other works lay in Nepal the Chairman visited Kathmandu, accompanied by the Superintending Meteorologist and held discussions with the Government of Nepal. The Government of Nepal accepted the recommendations concerning Nepal made in the preliminary report and authorised the Navigation Commission and other organizations working under its direction or control to carry out the full programme of surveys and investigations required for the Kosi Dam Project, in the Nepal territory. This was followed by discussions between the Government of India and the Government of Bihar and investigations were taken in hand thereafter.

Multi-purpose Scheme, 1950

1.15. As a result of these surveys, a multi-purpose scheme costing Rs. 177 crores was evolved in June, 1950, the salient feature of which were:

(a) a dam at Barahkshetra, of an upprecedented height of 783 feet above foundation rock to impound 6.9 million acre feet in the reservoir of which 3.1 million acre feet was dead storage to provide silt reserve and minimum head for power generation, the remaining 3.8 million acre feet providing flood absorption capacity to regulate floods so as not to let them exceed a safe maximum of 2 lakh cusecs, to generate hydro-electric power to the extent of 1.8 million KW, and to provide navigation facilities in the reservoir and the river below.

(b) a barrage at Chatra and canals for irrigating annually 38.4 lakh acres in Nepal and Bihar, flushing drainage channels, and situation of low lying areas, and for generating 90,000 KW hydro-electric power on the eastern canal.

1.16. In view of the huge cost of the Project and the limited financial and material resources available in the country the scheme was divided into seven phases, each self-supporting and independent of the other and yet capable of being superimposed on the preceding one, without involving any engineering difficulties or wasteful expenditure.

1.17. When the Report on Stage I of the above multi-purpose scheme was submitted to the Government of India for sanction they appointed an Advisory Committee consisting of four engineers to go into the details of the project, and to advise them on the general soundness of the scheme, on its adaptability to staging, and as to the economies of the project as a whole. The Advisory Committee considered the project proposal for providing a high dam at Barahkshetra and barrage at Chatra, with irrigation and Power System in the Nepal and North Bihar area as sound in principle. They did not, however, agree to the proposed stages of construction. Further they thought that the estimate would require upward revision. The Committee submitted its report in September, 1951, suggesting certain modifications and recommended the construction in the very first stage of a dam at Belka Hill nose, 9 miles below Chatra. This dam was to impound 1.75 million acre feet of water, of which 0.78 million feet was to be the dead storage, to provide silt reserve and minimum head for power generation, the remaining 0.97 million acre feet providing flood absorption capacity for regulation and moderation of floods, and generation of Hydro-electric power to the extent of 90,000 KW. The spillway portion was to be in concrete and the rest of the dam in earth. The Western end was to be enclosed into the Belka Hill and the earth dam on the eastern flank was to be tied into the high ground at the foothills The dam was to have a maximum hydraulic height of 85 ft.

1.18. The Advisory Committee recommended further (i) the construction of Eastern Kosi Canal, taking off from the tail race of the power house at the dam for irrigating. This canal was to have a discharge of 10821 cusecs at the head, and was to irrigate annual 14.36 lakhs acres in Purnea and Saharsa District of North Bihar. (ii) The construction of the Eastern Nepal Branch taking off, like the Eastern Kosi Canal, from the tail race of the power house at the dam for irrigating areas in the Morang District of Nepal. This canal was to have discharge of 1369 cusecs, and was to irrigate annually 1.82 lakh acres. (iii) The construction of Western Flood Protective embankment running parallel and some distance away on the west of the present rain channel of Kosi and extending from right bank of Bhati Balan to Bhit Bhagwanpur opposite Supaul, a length of some 23 miles. This embankment was intended to prevent further westward movement of Kosi.

Central Water & Power Commission Proposals 1953.

1.19. Based on the investigation at Belka site, estimates were prepared for the Belka dam. Since these estimates were far in excess of the figures assumed by the Belka Advisory Committee, the Central

Water and Power Commission made alternative studies, among which was a low detention dam at Belka with FRL 350. The proposal regarding the detention dam at Belka was discussed with some of the members of the Advisory Committee (1951) and the Planning Commission in July, 1953. Estimates were asked to be prepared. The Kosi flood in 1953 highlighted the urgency of the matter and the late Shri Jawaharlal Nehru, who was visibly moved after a personal inspection of the affected area, desired that a tangible scheme must be taken in hand immediately to alleviate the suffering of the people caused by annual floods. The Chairman, C.W. & P.C. inspected the Kosi area and as a result of the inspection and comprehensive study of the data collected formulated the present proposals for controlling the river, known as the 'Kosi Project, 1953'.

B. Genesis of the Project

1.20. The sanctioned proposals consisted of the construction of a barrage at Hanuman Nagar, the Right Bank extending from Hanuman Nagar to Jhamta and the Left Bank diverting 50,000 cusecs of water into the old Dhars of Kosi and the Eastern Kosi Canal System to irrigate 14 lakh acres of land in the districts of Purnea and Saharsa, Later, the scheme of the Diversion Barrage was abandoned mainly because of cost consideration and the work was authorised to be started on the following three units:—

(i) A barrage across the river at Hanumannagar with appurtenant works;

(ii) Embankments on either side of the river of a total length of 150 miles; and

(iii) Eastern Kosi Canal System.

The scheme included construction of a Hydel Power Station also but it was not sanctioned at this time.

1.21. As there was considerable controversy about the advisability of constructing embankments for the purpose of flood control in the Kosi river, which carries a large quantity of coarse silt, the Central Water and Power Commission invited several experts from other countries to review. "The 1953 Project". Most of them agreed that the problem of flood control in the Kosi was a long drawn affair posing difficult issues and would require constant attention for the protection of a vast region of thickly populated area. Some useful suggestions were received and taken note of.

1.22. Work on the Project was started in 1953. Construction of the embankments was taken up first and was started in January, 1955. Substantial reaches of the embankments were completed by 1957. The annual spill of the river Kosi was thus confined between

the embankments and flood control benefits started accruing from 1957 onwards.

1.23. When the embankments were nearing completion, the Government of India constituted a team in September, 1957 under the Chairmanship of Shri A. C. Mitra to review the necessity of constructing a barrage at Hanumannager. This team came to the conclusion that considering the limited period for which the benefit of the barrage would accrue, the construction of a barrage purely for the purpose of flood control and safeguard of embankments was not justified. If, however, the construction of a barrage was taken up for the purposes of irrigation and power, as contemplated in the project, it would be useful in respect of flood control also. The team also suggested that in case the barrage was built, the regulating structure to divert 50,000 cusecs into old dhars be omitted.

1.24. The report of the team was examined in the Central Water & Power Commission and detailed comments were made in October, 1957. The Central Water & Power Commission insisted that the construction of the barrage was necessary for control of the river as a first step, even if the benefits in respect of flood control were found to be for a limited period. It was of the opinion that by developing the technique of silt control, there was every possibility that the time of benefit might extend beyond 20 to 25 years. Also, the observations that would be made during the period, would be of immense value in formulating further proposals. Central Water and Power Commission also expressed the view that the Kosi Project of 1953 made a start in the right direction. No injury could be done by the construction of the barrage. On the other hand, it would prove to be a forerunner of measures for evolving economic control of the Kosi for a much longer period than contemplated in the 1953 project. The project was, consequently, accepted by the Government of India.

1.25. During the Third Five Year Plan, certain new schemes were sanctioned for execution. These are (1) Western Kosi Canal with an estimated cost of Rs. 13.49 crores and designed to irrigate an area of 8.03 lakh acres annually in the district of Darbhanga. (2) Rajpur Canal which is a branch canal from the Eastern Kosi Main Canal with an estimated cost of Rs. 4.67 crores and is intended to irrigate an area of 3,97,000 acres in the district of Saharsa. (3) Extension of Embankment. As the end points of the Eastern and Western Kosi embankments were not tied up to high grounds due to local condition of topography, there was a considerable back-water flooding and so there were persistent demands for extension of the embankments.

1.26. Government of India appointed a Committee to consider the disposal of waters of the Kosi, the Kamla and the Bagmati in the lower reaches. The Committee recommended that the Eastern Embankments should be extended upto Mansi-Supaul Railway line (distance of about 16 miles) and the Western Embankment to the length of 2½ miles from Bhanti. This scheme of extension of the Kosi Embankments were sanctioned and a sum of Rs. 80 lakhs was admitted in the Third Five Year Plan.

(4) Kosi Hydel Station—A Power House with an installed capacity of 20,000 KW in the Eastern Kosi Main was sanctioned and is under construction.

1.27. When asked if the Project was presented as an integral project wherein certain portions were taken for execution first and other portions afterwards, the representative of the Ministry of Irrigation and Power stated during official evidence "So far as the Rajpur canal is concerned, it was a subsequent addition. So far as the barrage and embankments are concerned, they were an internal part of the project. So far as the extension of the embankments is concerned, no final view had been taken at that time because these embankments have no finality. It depends on how the river is going to behave. Subsequently in the light of experience, an extension of embankment was considered necessary."

1.28. The Committee note that while attempts were being made since 1893 for taming a turbulent river like the Kosi, no concrete steps could be taken in this direction till the achievement of independence. It redounds to the credit of Indian engineers that they could prepare a comprehensive multi-purpose project for providing flood protection in the Kosi flood plane, irrigation facilities in Nepal and Bihar, generation of hydro-electric power and navigation on an extensive scale.

1.29. The Committee note that the various items of the project were sanctioned on a piecemeal basis and new schemes were added up from time to time. This naturally led to the recasting of the project in material details. While the Committee appreciate that in a project of such magnitude as Kosi, which was taken up for the first time in India, there was an absence of a complete integrated plan at the very beginning, they feel that steps should be taken, as far as possible, before sanctioning new projects to draw up an integrated plan in the initial stages so as to obviate the possibility of subsequent changes which usually result in delay and considerable additional expenditure.

CHAPTER II

ESTIMATED COST AND ADMINISTRATIVE SET UP

A. Preliminary estimates and Revised estimates

2.1. The work on the Kosi Project was authorised to be started on a very rough estimate framed by the Central Water and Power Commission in 1954 totalling Rs. 37.31 crores as given below:—

(i) Hanumannagar Barrage and appurtenant works	Rs. 13.27 crores
(ii) Flood Banks and Protective Measures	Rs. 10.67 crores
(iii) Eastern Kosi Canal	Rs. 13.37 crores
TOTAL	Rs. 37.31 crores

2.2. But before work could be started, Government of India desired that the State Government should make a pre-construction review. As Chief Engineer, Kosi had not joined by that time, a Special Officer was entrusted with the review. As per review report, there was considerable increase in the estimate and his figure stood at Rs. 62.08 crores. The review was discussed by the Central Water and Power Commission with the Kosi Project Administration in August, 1954 and the original figure of Rs. 37.30 crores was revised to Rs. 41.99 crores. This, however, did not include a sum of Rs. 57 lakh on account of investigation cost which was ordered to be kept under suspense head "51 B-Investigation of River Valley Project," cost on the increase of free board of the embankment, provision for rehabilitation and provision for soil conservation.

2.3. The Chief Engineer (Kosi) who had, in the meantime, joined in November, 1954 was asked to study the Project and give his views. The Chief Engineer (Kosi) prepared a revised Project Estimate in 1955, amounting to Rs. 53.01 crores and gave it to the Central Water and Power Commission and also placed it before the Control Board on 28-7-1955. The revised estimate was in three units as given below:—

Unit I-Barrage	Rs. 19.44 crores
Unit II-Flood Banks and Protective Measures	Rs. 18.55 crores
Unit III-Canals	Rs. 15.02 crores
TOTAL	Rs. 53.01 crores

The Control Board.

2.4. A Sub-Committee consisting of Chairman, Central Water and Power Commission, Member (D&R), Joint Secretary, Ministry of Finance, Joint Secretary, Ministry of Irrigation and Power, a representative of the Planning Commission, the Chief Administrator, Kosi and the Chief Engineer, Kosi examined the estimate in March, 1956 at Delhi. It was considered inadvisable to make any change in the provision under Unit III-Canals as the detailed investigations had not yet been carried out. The following table gives the original estimate of the Central Water & Power Commission, their subsequent revised figures and the Sub-Committee's recommendations:—

Unit	Original estimate of 1953 (CW & PC)	Tentatively accepted by the CW & PC in 1954	As recommended by the Sub-Committee
		(In crores of rupees)	
I	13.27	16.85	18.00
II	10.67	11.15	14.02
III	13.36	13.99	13.99
TOTAL :	37.30	41·99	46.01

2.5. As a result of further discussion with Member (D&R), the Chief Engineer (Kosi) reported that the total amount of Project Estimate would be Rs. 44.6 crores instead of Rs. 46.01 crores. The review of provisions under Unit III-canals was made after some detailed investigation was done in the canals. The Chief Engineer submitted an estimate amounting to Rs. 19.52 crores as against the previously adopted figure of Rs. 13.99 crores. The increase was mainly because of increase in cost due to actual detailed designs, increase in the number of falls and bridges and excess under distributories. The revised estimate under Unit III-Canals was placed before the Control Board in its meeting on 28-10-1957 and the estimate was reduced from Rs. 19.52 crores to Rs. 16.42 crores. This was further discussed with the Central Water and Power Commission. As a result of these discussions, the final figure of the Project Estimate stood at Rs. 44.76 crores, with the following Unit-wise break-up:—

Unit I-Barrage & Headworks	Rs. 16.79 crores
Unit II-Flood Embankments	Rs. 11.55 crores
Unit III-Canals	Rs. 16.42 crores
Unit IV-Power Generation	OMITTED
	Rs. 44.76 crores

The estimate was accepted by the Control Board and the State Government issued its administrative approval in 1958.

2.6. However, as the work was under progress, increases under various items were noticed. A revision of the Project estimate became necessary and the then Chief Engineer prepared a revised Project estimate of Rs. 52.25 crores which was placed before the Control Board in its 23rd meeting held on the 20th May, 1962. The major factors which had contributed to the increase were as follows:—

(1) Since the preparation of the original estimate, there had been a major change in the design of the Barrage. The Diversion Barrage which was originally contemplated to divert about 50,000 cusecs of the Kosi Flood through the resusciated old channels of the Kosi on the east of Eastern Kosi Embankment was omitted. The length, orientation and protection works of the guide banks had to be changed as per recommendations of Central Water and Power Research Station resulting in increase in cost.

(2) The provision in respect of Guide Banks, Earth Dams etc. was found to be inadequate as the length of the Guide Bank was increased as per recommendations of the Central Water and Power Research Station.

(3) Increase in the basic cost of material after the preparation of the original estimate including the cost of controlled commodities like cement, steel etc.

(4) Increase in labour wages as per Minimum Wages Act.

(5) Inadequate provision for the cost of compensation for lands particularly in Nepal territory.

(6) Increase in the quantity of earth-work in canals from 152 crore cft to 182 crore cft.

(7) Inadequate provision for the cost of distribution.

(8) Inadequate provision for the cost of major canal structures especially Cross Drainage Works.

(9) Increase in the expenditure on establishment over what was provided for in the sanctioned estimate.

2.7. While this estimate of Rs. 52.25 crores was under examination of the Central Water and Power Commission in consultation with the Project Engineer, some increase over some items became inevitable and the Chief Engineer had to raise the estimate to Rs. 54.50 crores. By then, a decision to construct water courses at the cost of Government had been taken. The Chief Engineer kept

a rough estimate on account of "Water Courses" amounting to Rs. 3.13 crores, separate from the above mentioned amount of Rs. 54.50 crores. He also anticipated increase in the cost of protection works on account of the breach at Dalwa. Thus the estimate which the Chief Engineer had sent to the Central Water and Power Commission for examination was in effect for about Rs. 58 crores.

2.8. In 1965 the Chief Engineer sent a second revised estimate of Rs. 63.46 crores, to the Chairman of the Central Water and Power Commission, which later rose to Rs. 64.23 crores on account of increase in the estimate of water-courses from Rs. 3.98 crores to Rs. 4.75 crores. When the new Chief Engineer joined in 1967, he found that the estimate prepared in 1965 would not cover the expenses to be incurred on the Project. He accordingly revised the estimate. His revised estimate amounting to Rs. 85.34 crores was sent to the Central Water and Power Commission in January, 1968. Thus it will be observed that before the estimate of Rs. 64.23 crores prepared in 1965 could be cleared, another upward revision of the estimate had been undertaken. A comparison of the 1968 estimate with the estimate prepared in 1965 is given below:—

Unit of Work	Revised Estimate (1965)	Revised Estimate (1968)	Excess
	(Rs. in Crores)		
Unit I—Barrage & Head works	25.47	32.00	6.53
Unit II—Flood Banks & Protective measures . .	12.66	14.00	1.34
Unit III—Canals .	26.10	39.34	13.24
TOTAL	64.23	85.34	21.11

2.9. The revised estimate under Unit I is Rs. 32 crores out of which an expenditure of Rs. 30 crores has already been incurred under this Unit till March, 1968. A sum of Rs. 2 crores has been included for protection works at Jalpapur in Nepal above the barrage.

2.10. Under Unit II-'Flood banks and protective measures' the increase is about Rs. 1.34 crores. This is due to the fact that flood protection works on a larger scale had to be executed at Kanauli and Kusaha, the estimated cost of which was about Rs. 1.15 crores.

2.11. Under Unit III-'Canals' the increase is of the order of Rs. 13.24 crores. It has been stated that the following items account for increase under this Unit:—

(i) The estimate for water courses has risen from about Rs. 4.75 crores to Rs. 7.87 crores on account of subsequent decision to construct water courses up to one cusec capacity instead of up to 2 cusec capacity.

(ii) An additioinal provision for drainage amounting to Rs. 3.78 crores.

(iii) Cost of additional structures, bridges, and cross drainage, additional buildings etc. for permanent set up amounting to Rs. 2 crores.

(iv) Other increases are made up of small items.

2.12. While asked to state the reasons for these large variations between the original estimate, mid-term estimate and the final estimate and the steps taken to avoid variations in future, the representative of the Ministry of Irrigation and Power has stated during his evidence before the Committee that, "the Planning Commission has been reviewing this matter and early this year or late last year, they issued a detailed memorandum about the proper preparation of feasibility project reports, taking the various works into account, and they have issued a further memorandum on proper preparation of project reports. The Nijalingappa Committee also have suggested that full investigations should be done before they are sanctioned and a realistic estimate should be prepared. We also have during these years learnt from experience because we find that the rates now are higher than those estimated.....Having regard to these things, we hope that better results will be available hereafter. I have mentioned earlier that quite a few of those estimates have increased due to circumstances over which the officials or we had no control. Owing to the change in scope, rise in the cost of labour and so on and inadequacy of funds, the whole thing went up again."

2.13. Chronologically the following were the revisions in the estimates since 1954:—

Year	Figures (Rs. crores)
1. 1954	37·31
2. 1954 (estimate of Special Officer)	62·08
3. August, 1954	41·99

Year		Figures (Rs. Crores)
4. 1955 (estimate of Chief Engineer)		53.01
5. 1956 (estimate of Sub-Committee)		46·01
6. 1956 (estimate by Chief Engineer)		44·60
7. 1957 (estimate by Chief Engineer approved by Control Board)		44·76
8. 1962 (estimate by Chief Engineer)		52·25
9. 1962	Do.	58·00
10. 1965	Do.	63·46
11. 1965	Do.	64·23
12. 1968 (Jan.)	Do.	85·34

2.14. The Committee note that the estimated cost of the project has undergone as many as 12 revisions—generally in an upward direction—with the result that the original rough estimate of Rs. 37.31 crores prepared in 1954 is now estimated to cost in the neighbourhood of Rs. 85.34 crores i.e. an increase to about 130 per cent. While increase in cost of materials and wages has been partly responsible for this increase, the cost has also gone up because of changes in the design and scope of works and inclusion of new items. There has been a lack of any clear-cut demarcation of the responsibilities with regard to the preparation of project estimates as is evident from the fact that several authorities were at one stage or the other engaged in the preparation and scrutiny of the estimates, which frequently were at variance with each other. It is also on record that there have been differences among experts in regard to the construction of the barrage and its utility for the purpose of flood control and safeguarding of embankments.

2.15. The Committee cannot help concluding that frequent changes in the estimates of the project, due principally to change of designs and addition of items, could have been avoided, if the project had been sanctioned after a full investigation and preparation of a complete project report with carefully worked out estimates of cost. This underlines again the necessity of drawing up even in the initial stages an integrated project report after obtaining competent technical advice in regard to various components of the project so that the necessity of consulting different experts later on is obviated.

2.16. The Committee would stress that it should be ensured that when a new project is taken up for execution, it should be sustained

at the required optimum pace so as to complete it within the scheduled time, as any undue delay in the execution of the project leads to unavoidable increase in cost as well as the postponement of realisation of benefits from the project which again means slowing down the economic progress of the people in that area.

2.17. The Committee further note that the Central Water and Power Commission has taken quite a long time to scrutinise and approve the revised estimates when submitted. For example, even before the revised estimates submitted in 1965 could be cleared, another upward revision of the estimates became necessary in 1968. The Committee would like to stress that as and when revised estimates for any project are unavoidable, the same should be examined fully and expeditiously by the Central Water and Power Commission so as to avoid delays, doubts and uncertainties about execution.

B. Organisational Set-up

2.18. The Kosi Project Scheme is being executed by the River Valley Projects Department of the Government of Bihar. For execution of the Kosi Project, the Bihar Government set up in 1954, a new Department of the Secretariat known as the Kosi Project Department, with the usual Secretariat staff. Later, when Gandak and the Sone Project were sanctioned, the execution of these projects were also entrusted to this Department, and its name was changed to River Valley Project Department. In 1964-65 the execution of the Tenughat Dam was also entrusted to this Department. Thus, there is a common Secretariat Department known as the River Valley Projects Department, which is incharge of the four major river valley projects of the State Government. The Chief Administrator is the administrative head of the Department. He is also Secretary to Government. The other Secretariat officers to assist him are at present one Joint Secretary, one Deputy Secretary and one Under Secretary with the usual ministerial and supervisory staff. For the Kosi Project there is a Chief Engineer who is the technical head of the Project. He has the usual technical officers and staff under him *e.g.* Superintending Engineers, Executive Engineers, Assistant Engineers and others. The Headquarters of the Chief Engineer were till recently at Patna. The Secretariat Office and the office of the Chief Engineers is the same. The functionaries at the headquarters are the Chief Accounts Officer-*cum*-Financial Adviser, the Director of Land Acquisition and Rehabilitation and the Director of Purchase and Transport, common for all the projects. The Chief Accounts Officer is responsible for maintaining accounts of all the projects and in his capacity as Financial Adviser, he gives advice to the Project

authorities on financial matters. The land acquisition and rehabilitation works are looked after by the Director, Land Acquisition and Rehabilitation. The Department has a system of centralised purchase and a set of rules has been approved by the State Government for making purchase and obtaining supplies. This organisation, under a Director, Purchase and Transport also looks after movement.

2.19. In 1965, Government posted an officer of Divisional Commissioner's status in the Kosi area for taking up work connected with the development of irrigation from the Kosi Canals. His designation is Kosi Area Development Commissioner.

2.20. When asked if there has been any reduction in the number of administrative and technical staff employed in the Kosi Project in view of the fact that the work of the Project is nearing completion, and if any steps are being taken for providing, alternative employment to those rendered surplus, the Committee have been informed in a written note submitted by the Government that "The staff has been reduced by abolition of one Circle and three divisions. The running and maintenance of the Kosi Project so far completed involves (i) improving the river regime and maintaining the embankments, and (ii) maintaining the irrigation system with potential of irrigation for 18 lakh acres of land. Maintenance of irrigation has become more extensive as even construction of water courses upto one cusec has been taken up though initially the idea was that water courses only upto 5 cusecs would be constructed by Government. This has meant increase in length of Channels from 1200 miles to 7500 miles in the Eastern Kosi Main Canal system itself. The number of engineering personnel required for doing this additional work-load has to be maintained till the work is completed. Hence it has not been possible to reduce the number of staff to the maintenance level. Uptil now the problem of retrenchment or finding alternative employment as a result of reduction in volume of work has not arisen because surplus staff is transferred to Gandak Project and Tenughat Dam Project where work is in progress."

Kosi Control Board.

2.21. There is a Control Board which under the general supervision of the State Government, is in overall charge of the project including its technical and financial aspects. Chief Minister, Bihar is the Chairman of this Board. The other members are Irrigation Minister, Minister of State for Irrigation, Development Commissioner, Chief Engineer, Kosi Project and a respresentative each of the Ministry of Irrigation and Power, Government of India and a representative of the Central Water and Power

Commission. The Chief Administrator is the Member-Secretary of the Kosi Control Board. The function of the Board is advisory. Important technical matters and the estimates and contracts beyond the power of the project officers are placed before the Board for approval.

2.22. As regards the functioning of the Kosi Control Board, the Committee have been informed that the Chief Minister being the Chairman of the Board, the date of a meeting is fixed after obtaining his approval and after ascertaining the convenience of the representatives of the Government of India. The agenda notes prepared by the Project Administration are circulated by the Member-Secretary (Chief Administrator) to the members of the Board and special invitees well ahead of the date of the meeting. The decision taken in the meeting are executed by the Project administration. Where the orders of Government on these decisions are required to be taken, according to the rules of business of the State Government, such orders are obtained. The important decisions taken by the Board include delegation of special powers to the functionaries of the Project establishment of a Finance and Accounts Wing, introduction of the scheme for public co-operation in the execution of the Kosi Project, award of contract for construction of the Kosi Barrage to the National Projects Construction Corporation, sanction to major estimates, settlement of issues relating to the alignment of the embankments, rehabilitation of the people living within the embankments, programme of construction for each working Session, location of the Hydel Power Station. So far 26 sittings had been held (Dates of the sittings of the Kosi Control Board may be seen at Appendix I).

Organisation in the Government of India.

2.23. As regards organisation in the Ministry of Irrigation and Power for the work, direction and policy decisions in respect of the Kosi Project, the work is being looked after by a Joint Secretary in the Ministry of Irrigation and Power who functions under the overall control of the Secretary of the Ministry. The Joint Secretary is assisted by a Deputy Secretary and other normal Secretariat staff *viz.* the Under Secretary and supervisory staff below him. The Kosi Project is, however, only one among several projects handled by these officers. The technical advice of the Central Water and Power Commission is taken as and when required.

2.24. The Committee are aware that as the work of execution of the Kosi Project and its various units are completed, there will be need for reduction in the strength of staff at present employed. Especially, after the work on construction of water courses tapers

off, the staff at present employed thereon would be surplus. The Committee suggest that the State Government endeavour, by advance planning, to see that as and when the staff becomes surplus in the Kosi project, they are gradually absorbed in other projects in the State.

2.25. The Committee note the composition and functions of the Kosi Control Board. From the list of meetings of the Control Board given in Appendix I, it is observed that no meeting of the Control Board was held during 1963 and 1964 and no meeting appears to have been held since 1965. In view of the fact that work on the construction of the Rajpur Canal, Western Kosi Canal, Extension of embankments and the Kosi Hydel Station is still outstanding, the Committee feel that the Control Board should meet frequently to review the progress of work and give necessary direction to the project authorities for accelerating the pace of work.

C. Finances for the Project

2.26. The Kosi Project is being financed by the Government of India by cent per cent earmarked loan assistance. Terms of the loan for 'Irrigation' and 'Flood Protection' are different. Half the cost of the barrage, and full cost of the embankments are chargeable to 'Flood Protection' while half of the cost of the barrage, full cost of the canals is allocable to 'Irrigation'. The terms and conditions for the loans sanctioned by the Government are as follows:—

2.27. *A Terms applicable to loans sanctioned upto* 19-12-1962.

(i) *Flood Control Component*

(a) In respect of the loans sanctioned upto the end of March, 1958. These loans will be interest free for the first five years and unless any agreement for earlier payment is agreed to between the two Governments, they will be repayable in 25 annual equated instalments of both principal and interest commencing from the sixth year.

(b) Loans sanctioned after 31st March, 1958: These loans will carry interest from the date of commencement of the loan. During the first five years interest will be paid by the State Government annually. Thereafter, unless any arrangement for earlier payment is agreed to between the two Governments, payment of both principal and interest will commence from the 6th year.

However, a subsidy will be given to the State Government to cover the amount of interest which the State Government will have to pay to the Centre in respect of the first five years of such loans.

(ii) *Irrigation component*

(a) Financial assistance will be in the form of 40 years loans carrying interest from the date of commencement of such loans. These loans together with the interest will be repayable in 20 annual equated instalments commencing from the 21st year. During the first 20 years interest charges will be payable annually.

(b) The Government of India have also advanced as loan further amounts to the State Government to meet the interest charges on these loans (for irrigation component) sanctioned upto 31.3.1962. These loans are repayable in the same manner as other loans.

(iii) *Terms applicable to both components.*

2.28. (a) Loans sanctioned upto the 31st March, 1958, will carry interest at the rate of 4½ per cent per annum in respect of the period upto 31st March, 1958. For period subsequent to 31st March, 1958, the rate of interest on these loans and outstandings would be 3 per cent per annum.

(b) Loans sanctioned after 31st March, 1958 will carry interest at the rate specified in the sanctions.

(iv) The State Government will levy betterment fees and flood cess in the areas benefited by the Kosi Project and the income thus derived should go towards the payment of interest charges and also the principal, as far as possible.

B. Revised Terms applicable to loans sanctioned after 19-12-1962

Irrigation Portion

2.29. Loans are repayable in 30 years in annual equated instalments of principal and interest commencing from the eleventh anniversary of payment of each loan, interest alone being recovered annually during the first ten years. The interest charges will be as prescribed for each loan.

Flood Control Portion

2.30. The loans are repayable in 20 annual equated instalments of principal and interest commencing from the sixth anniversary of drawal of each loan, interest alone being recovered during the first five years. During the first five years, when interest alone will be annually payable, a subsidy will be paid to the State Government to cover the interest charges. No subsidy will, however, be payable in respect of flood control loans advanced during and after 1966-67 and

the State Government is expected to pay to the Central Government the full interest on such loans.

Terms and Conditions of Loans sanctioned for Kosi New Schemes (Rajpur Canal and Western Kosi Canal)

2.31. The loans will be repayable in twenty annual equated instalments of principal and interest commencing from the eleventh anniversary of payment of each loan. During the first ten years interest charges will be payable annually. No moratorium is admissible in respect of interest payment.

2.32. As regards reasons for fixing the different rates for 'irrigation' and 'flood protection', it has been stated that the Kosi Project was originally envisaged as a flood control scheme. The terms of loans for the flood control portion were therefore fixed on the pattern of Central loan assistance for other flood control works in the country. As regards the irrigation portion, it was considered that the scheme would be fully productive fourteen years after completion. The construction period was estimated to be six years. It was, therefore, decided that the loans for this portion should be 40 year ones and repayment of the principal, covering twenty annual equated instalments should commence from the 21st year of each loan.

2.33. By way of explanation of the reasons for variations in the rate of interest, the Ministry have informed the Committee in a written note that 'Loans have been provided to the Government of Bihar for financing the Kosi Project since 1954-55. Until 1962 these loans were repayable in forty years in twenty annual equated instalments of principal and interest commencing from the 21st anniversary date of their drawal. The loans carried interest at 4½ per cent as prescribed by the Ministry of Finance. In pursuance of the recommendations of the Second Finance Commission, the interest rates on loans sanctioned upto 31st March, 1958, were reviewed by the Commission. Instructions were thereafter issued in February, 1958, by the Ministry of Finance to all State Governments indicating uniform rates, according to the categories of loans to be applied to loans outstanding as on 31st March, 1958. In the case of loans advanced to State Governments for multipurpose river valley projects, interest on loans allocated for power was revised to 4 per cent and for residuary loans to 3 per cent per annum. Loans sanctioned subsequent to 31st March 1958 carried the normal rate of 4½ per cent prescribed by the Ministry of Finance'.

2.34. Asked to state how the terms and conditions of the loans advanced to the Government of Bihar for financing Kosi Project com-

pared with those sanctioned to other State Governments for execution of multipurpose river valley projects in those States, the Ministry have informed the Committee as under:

> "The terms and conditions of loans advanced to the Government of Bihar for financing Kosi Project are consistent with those of loans advanced to other State Governments for financing river valley projects. A statement showing the terms and conditions of loans sanctioned for Kosi Project and those sanctioned in respect of other multipurpose projects after 20th December, 1962 is attached (Appendix II).

Expenditure on the Project

2.35. A sum of Rs. 63 crores approximately had already been spent on the Kosi Project till the end of the Third Five Year Plan period. The actual provision made for the Kosi Project and actual expenditure incurred during the Three Five Year Plan period is as follows:

	Provision (Rs. in lakhs)	Expenditure (Rs. in lakhs)
First Five Year Plan . . .	..	431
Second Five Year Plan . . .	2515	2397
Third Five Year Plan . . .	2355	3499
	4870	6327

2.36. The year-wise provision and actual expenditure for the Kosi Project during the last four years has been as follows:—

Year	Revised estimates (Rs. in lakhs)	Actual Expenditure (Rs. in lakhs)	
1	2	3	
1964-65	299·86	655·90	
1965-66	279·47	442·47	
1966-67	343·48	487·58	(Prov)
1967-68	353·00	353·00	(-do-)

Adequacy of funds

2.37. During their visit to the Kosi Project in September, 1967, the Study Group of the Committee was informed by the representatives of the Government of Bihar that 'Of late there has been difficulty in securing adequate funds for completion of the remain-

ing works. The Project is financed entirely through earmarked loan assistance from the Government of India. The amount of loan to be made available annually, gets tied up with the total plan allocation for the year and thus a limit comes to be imposed upon the amount of loan assistance which can be made available by the Government of India. The obvious remedy is for such large projects to be financed, outside the State Plan, directly by the Government of India'.

2.38. The Committee wanted to know the details of the amount provided in the budget of the Ministry of Irrigation and Power for 1967-68 for giving loan assistance to the Bihar Government for financing Kosi Project. In a written note furnished to the Committe the Ministry have stated:

> "A sum of Rs. 4 crores was provided in the Budget of the Ministry as a tentative provision against the State Government's request for a devised budgetary provision of Rs. 535.23 lakhs (excluding a grant of Rs. 100 lakhs for flood protection works in Nepal territory). It has been possible to provide only Rs. 353 lakhs as the revised budget provision in the Ministry's budget against the aforementioned original grant of Rs. 4 crores."

2.39. When asked to state the reasons for this cut, the representative of the Ministry of Irrigation and Power has stated in his evidence before the Committee:

> "Rs. 4 crores were provided in the budget but ultimately only Rs. 3.5 crores could be fitted into the State Plan."

He added:

> "We are giving money outside the State Plan only for 6 or 7 projects. Kosi is not one of them."

2.40. The representative of the Government of Bihar has stated during evidence that out of the provision of Rs. 353.00 lakhs during 1967-68, Rs. 328.00 lakhs was provided for irrigation and Rs. 25.00 lakhs for flood control. The actual expenditure exclusively on flood control was, however, Rs. 104.00 lakhs.

2.41. As regards provision for Kosi Project for 1968-69, the representative of the Ministry of Irrigation and Power has stated:

> "In this year's budget, Rs. 3.25 crores were notified as the requirements of the Bihar Government. The intention is to provide the entire amount when the annual plan and the State Budget will be finalised."

The representative of the Bihar Government has added that "We have a total budget of Rs. 4,38,00,000. For the Rajpur Canal which is included in that estimate the amount is Rs. 54 lakhs. The rest is for the Kosi Project. This budget was presented to the Legislature and that is before the President now.**"

2.42. The Committee wanted to know what measures were being taken for flood control so that the expenditure incurred on the embankments is not rendered infructuous by sudden floods. The representative of the Ministry has stated during evidence: 'Each year we watch the river condition, make surveys and in the light of that make provision as to what will be required next year. In fact, it will vary from year to year depending on the actual condition. We cannot take any risk. Supposing flood is attacking a bund, then we have to take precautions..... Flood Control maintenance is extremely important and any calamity can take place if flood is not properly controlled. At the beginning of each year we check sections and after that we have model experiments done to see what preventive measures and what spurs are necessary and they are constructed as soon as possible before the next season. We should never spare on the maintenance of flood control measures".

2.43. From the pattern of provision and expenditure made for the Kosi Project during the first three Five Year Plans, the Committee note that the project authorities have not only been able to utilise the Plan provisions in full but have also incurred expenditure in excess of the Plan Provisions. They are glad to note that there has been fuller utilisation of the budget provisions from year to year.

2.44. While there has been difficulty in providing adequate funds in the form of loan assistance for the project during 1967-68, the Committee are happy to note that in 1968-69 the entire amount required by the Government of Bihar for the Kosi Project is being provided. Considering the present stage of development of the Kosi Project and the need for providing irrigation on a massive scale, the Committee hope that shortage of funds will not be allowed to stand in the way of speedy execution and completion of the residual items of work, namely, the construction of the various canals and the water courses.

**A sum of Rs. 4,94,00,000 has been provided for Kosi Project under the Major Head—98—Capital outlay on Multi-Purpose River Schemes" in the Budget Estimates of Government of Bihar for the year 1968-69 which has been presented to and passed by Parliament.

2.45. In this connection, the Committee would like to emphasise that alongside the construction of the canals and the water courses, suitable measures should be taken for flood control including maintenance of the embankments, etc., so that the expenditure incurred on the project is not rendered infructuous by sudden and heavy floods. The Committee are glad to note that at the beginning of each year, sections are checked and model experiments are done with a view to see what preventive measures, if any, could be taken.

CHAPTER III

COMPONENTS OF THE PROJECT

A. Barrage

3.1. The Kosi Project as approved in 1953 proposed *inter alia* construction of a barrage at Hanumannagar. This was to serve as a controlling structure and to provide gradient control in the steep reach of the river below Chatra. The barrage was designed to discharge the following functions:—

(a) To raise water level in the barrage sufficiently to cause flattening of the slope of the river during floods.

(b) To create such pond level as to enable flow irrigation over a large area on the eastern side of the river.

(c) To distribute flood water in the main Channel and eastern *Dhars* in proportion to their safe discharging capacities.

3.2. The barrage was also expected to help reduce the silt carrying capacity of the river, minimise erosion and divert water to feed the Eastern and Western Canal Systems.

3.3. The Hanumannagar Barrage with a length of 3770 feet has 56 gates. The preliminary works on the barrage were taken in hand in 1955. These works included 27 miles long access road from the nearest rail-head Bathnaha to Bhimnagar near the barrage site, 76 mile long narrow gauge railway line from Bathnaha to Bhimnagar and from Bhimnagar to Chatra and Dharan in Nepal for transporting boulders etc. and construction of camps for the staff and employees etc. Work on the actual construction of the barrage was started in 1959. The barrage was completed in 1963 with its gates and a road bridge over it. Since its diversion on the 31st March, 1963, the Kosi is now flowing through the barrage. To make the unruly Kosi follow a set course has been termed as a 'remarkable feat of engineering'. The salient features and statistical data about the barrage are given at Appendix III.

Cost of the Barrage

3.4. When work on the Hanumannagar barrage was started, the cost of the barrage and appurtenant works was estimated in the neighbourhood of Rs. 13.27 crores. However, when the Government of Bihar issued its administrative approval for the Kosi Project in 1958, the cost of the Project had already risen to Rs. 16.79 crores. Since then there have been further revisions in the cost of the barrage. The latest estimated cost of the barrage stands at Rs. 32.00 crores out of which an expenditure of Rs. 30 crores had already been incurred under this Unit till March, 1968 and a sum of Rs. 2 crores has been included for protection works at Jalpapur in Nepal above the barrage.

Benefits of the Barrage

3.5. The Kosi river had a tendency to swing towards the West and the area above Hanumannagar used to be eroded almost every year. Construction of Kosi barrage at Bhimnagar has provided stability for at least upto 8 miles upstream of the barrage where effect of ponding will extend and for a few miles on the downstream side. Moreover, after the completion of the Barrage it has become possible to provide an all-weather permanent communication between western and eastern portions of Nepali Tarai where the only means of communication previously was country boats which were risky to ply during floods. The traffic between these two districts has considerably increased and the customs duty collected has gone up correspondingly.

3.6. Asked about the prediction of the life of the Kosi barrage, the Committee have been informed through a written note that "There has been some difference of opinion in regard to the prediction of the life of the Kosi Barrage. The quantum of coarse silt being carried by the River Kosi is very heavy and some experts have predicted short life for the barrage considering the annual deposition of silt. The Barrage has two operation levels (245 to 255), and it is considered that by proper operation of the barrage, causing sudden draw down of the head between these levels such a high velocity can be created as will force down the silt, and the life of the barrage can thus be extended considerably."

Maintenance of Kosi Barrage

3.7. Since the Kosi Barrage has been completed and has provided protection to large areas of land, the main problem is now to maintain the barrage. The Committee have been informed in a written

note that the following amounts has so far been provided during the period 1965-66 to 1967-68 for maintenance of the barrage:

Barrage and Headworks	1965-66	1966-67	1967-68
		(Rs. in lakhs)	
Amount required	10·00	75·93	58·07+ 30·00*
Amount provided . .	9·38	44·64	30·00+ Rs. 3 lakhs (provided by re-appropriation)
Actual expenditure	22·75	65·37	128·48

* This amount had been asked for for the prevention of erosion in Nepal. No amount was actually allotted against this estimate.

Second Barrage at Dagmara

3.8. In 1965 the Government of Bihar appointed the Kosi Technical Committee under the chairmanship of Shri Kanwar Sain, ex-Chairman of the Central Water and Power Commission, to make a study of the residual flood problems of the Kosi River. This Committee had enumerated the "Control of gradient from Bhimnagar to Dagmara" as one of the residual flood problems and for that purpose proposed the construction of a structure on the river lower down at Dagmara to control the steep gradient in the reach. The Kosi Technical Committee pointed out that the slope in the reach is 2.35 ft. per mile and the Kosi has a tendency to swing within the embankments. This had resulted in heavy attacks at Dalwa and Kanauli which had entailed an expenditure of more than Rs. 3 crores on bank protection so far. The Kosi Technical Committee had pointed out that the construction of a road bridge was under consideration of the road authorities and the same authorities were prepared to combine the road bridge with the barrage. A Railway barrage could also be combined with the proposed barrage to restore the railway link between Nirmali and Bhaptiahi which existed before 1930 and which was disrupted by the shifting of the Kosi.

3.9. The Kosi Technical Committee further pointed out that the Bihar area on the right bank of the Kosi could be more conveniently served from the proposed Dagmara barrage. It would be possible to command a gross area of 8 lakh acres against 9.35 lakh acres from Bhimnagar barrage. The proposal would minimise the acquisition of

fertile irrigated land in Nepal territory. Only an area of 70,000 acres in Nepal and 1.35 lakh acres of Bihar would in this case have to be put on the right bank canal from Bhimnagar barrage. The Kosi Technical Committee further pointed out that if at any time in future, the Bhimnagar barrage is damaged for any unforeseen cause, Dagmara barrage could command practically the entire Eastern Canal System area and thus ensure irrigation under all conditions.

3.10. Asked to state the action taken on this recommendation of the Kosi Technical Committee the Ministry have stated in the written note furnished to the Committee in February 1968 that "The Kosi Technical Committee has recommended construction of a barrage near Dagmara 20 miles below the Hanumannagar Barrage. The model experiments conducted at Central Water and Power Research Station, Poona, however show that it would not be desirable to construct a second barrage due to progressive accretion. The Government of India, therefore, feel that the Second barrage should not be constructed. The matter is, however, being examined further."

3.11. Asked during evidence if any decision in the matter had since been taken the representative of the Ministry of Irrigation and Power has stated that "it is under examination. It was examined by the C. W. P. C. and it was felt that this barrage was not necessary and that it may, probably, do some harm also. Thereafter further examination has been done by Bihar Government. After we receive their views on it, we shall examine it further because there is difference in the opinion."

3.12. In a subsequent note submitted to the Committee in September, 1968 the Ministry have stated that "With regard to the recommendation about the barrage at Dagmara, Central Water and Power Research Station, Poona has come to the conclusion that the barrage at Dagmara was technically not advisable. The matter was referred again to the Chairman and members of the Kanwar Sain Committee. After studying the recommendations of the Central Water and Power Research Station, Poona the Committee reiterated its earlier recommendation. The question is still under examina- and a final decision has not been taken."

3.13. The Committee note that the Kosi Project which was approved in 1953 contained as one of its major components a barrage

designed principally to control the floods in the Kosi river. They also note that the work on the barrage was completed in 1963 at a total cost of Rs. 30 crores. The Committee would like to emphasise that now that the barrage has been completed, the question of its proper maintenance should be given the attention it deserves so that there may not be any breaches in future and the life of the barrage may be extended considerably.

3.14. The Committee are unhappy to state that there have been differences of opinion among experts as regards the probable life of the barrage. They would like to be assured that the barrage, which has been built at an enormous cost, is expected to give satisfactory service for a long period.

3.15. The Committee are also unhappy that there has been delay in the consideration of the suggestion made by the Kosi Technical Committee for the construction of a second barrage at Dagmara. They feel that it would have been better if experts from Central Water and Power Commission and the Central Water and Power Research Station, Poona, had been associated with the work of the Kosi Technical Committee in their official capacity in the initial stages so that agreed decisions could have been taken. As matters stand at present, the Committee find tnat the proposal is under consideration of the Government of Bihar and a final decision will be taken by the Central Water and Power Commission after receiving the opinion of the Bihar Government. The Committee hope that an early decision in the matter will now be taken.

B. Marginal Embankments

3.16. The Kosi is a meandering river and the real problem of this river is its constantly changing course. This meander is attributed largely to the excessive coarse silt content of the flowing river. The first task, therefore, was to confine the river to a set course and thus provide protection to the long suffering people from floods. It was with this view that the construction of two lines of embankments each about 75 miles long was taken up in 1955 and completed by the end of 1959. These embankments were constructed on either side of the river, the right embankment extending from Jalpapur to Jhamta and left embankment from opposite Belka to Bangaon.

3.17. The utility of the marginal embankments had been a subject-matter of controversy. The original Kosi Project prepared by the Central Water Inland & Navigation Commission in 1950 did not provide for the construction of any marginal embankment for preventing spilling of the river, as it was realised that such marginal embankments would be a constant source of trouble in an aggrad-

ing river like the Kosi. However, the "1953 Kosi Project" provided for the construction of marginal embankments on both sides of the river.

3.18. When asked during evidence as to the considerations which weighed with the Government in taking the decision to construct the embankments, the representatives of the Ministry of Irrigation and Power stated before the Committee "Originally in the forties, the scheme contemplated was a high dam in Nepal as a storage dam. If that had been taken up the embankments would not have been necessary because water could be regulated from time to time. It is only because the high dam could not be constructed that bunds and embankments were provided to keep the river in check within a width of four to five miles. So the embankment became necessary because we did not have a high dam as originally contemplated."

Extension of Embankments.

3.19. The Eastern Embankment ends near Maina, and the Western near Bhanti. The end points of the two embankments were not tied up to high grounds due to local condition of topography. This led to considerable back-water flooding, and so there were persistent demands for extension of the embankments. The Government of India in the Ministry of Irrigation and Power set up a Committee to consider the disposal of waters of the Kosi, the Kamla and the Bagmati in the lower reaches. One of the terms of reference was to suggest further Flood Protection measures. The Committee recommended that the Eastern Embankment should be extended upto Mansi-Sapaul Railway Line (distance of about 16 miles), and the Western Embankment to a length of 2½ miles below Bhanti. The seheme of extension of the Kosi Embankments was sanctioned, and a sum of Rs. 80 lakhs was admitted in the Third Five Year Plan.

Work on the extension of embankments has been completed.

Cost of Embankments.

3.20. When work was started on the Kosi Project in 1955, the Flood Banks and Protective Measures were expected to cost Rs. 10.67 crores. However, in the administrative sanction issued in 1958, the cost of the Flood Embankments was estimated at Rs. 11.55 crores. The estimates have since undergone several changes and a sum of Rs. 14 crores has so far been spent on the Flood Banks and Protective Measures.

3.21. The flood embankments on both banks of the Kosi river, most of which were completed as early as 1957, have on an average protected 5.28 lakh acres of land from the ravages of annual flooding. Kharif crops on this land were formerly damaged and even Rabi sowing was sometimes affected by standing water and excessive moisture. Severe damage was also caused to properties like buildings, orchards etc. Moreover, the unique translatory movement of Kosi river has in about 130 years caused a shift in its course of about 70 miles and in the process an area of about 6,000 sq miles in North Bihar and Nepal has been devastated. However, after the construction of the Embankments, the river has been confined to a regular course and the people living in the protected zone are feeling more and more secure as is apparent from the increasing public and private investments in the locality.

Maintenance of Embankments.

3.22. But all the above benefits are dependent upon the proper maintenance of the embankments. As already observed by the Kosi Technical Committee "after the construction of the embankments, the people of the area are investing in land as well as in buildings outside the embankments and more and more prosperous conditions are being created in the tract, which had previously been subject to ravage of floods and has now been protected by the embankments." The Kosi Technical Committee further observed that "while there is no cause for alarm, it is necessary to take all precautions beforehand to minimise the damage, should any breach in the embankment ever occur due to any unforeseen cause whatsoever. Such precautions become all the more necessary as the embankments having encouraged accelerated development of flood plane, the damage that would occur in the present circumstances would be much higher than was formerly the case".

3.23. Since the completion of the embankments in 1959, several attacks have already been experienced on the Kosi embankments. In the flood of 1961, a channel developed about 4 miles downstream of the barrage site, which touched the eastern embankment near 15 KM and flowed parallel to it upto 28 KM after which it took a westerly turn to join the main river. Several permeable and impermeable spurs were constructed before the next flood season and an unsuccessful attempt was made to block the mouth of the new channel in April-May, 1962. A severe attack on the eastern embankment was again experienced during the flood of 1962 which was successfully met. In the 1963 flood there was a minor attack opposite

65 KM. Protective measures like permeable spurs and screens were used to protect the embankment.

3.24. On the Western bank, erosion was experienced for the first time during the flood of 1962, when the river come as close as 120 ft. from the toe of the embankment, by cutting the right bank to the extent of 1500 ft. opposite village Dalwa in Nepal territory in 8 miles downstream of the barrage site. The main river was diverted through the barrage in March, 1963. During the subsequent flood of that year, the river renewed its attack on the west bank near Dalwa. The embankment here could not be retired in time due to non-availability of land in Nepal. An all-out effort was, therefore, made to protect it by 3 big impermeable spurs and a series of short permeable spurs. A breach by erosion in the Western embankment could not, however, be altogether averted in spite of strenuous efforts. As, however, the bank at the breach site was high, there was very little spilling of flood water and only negligible damage to crops. In the following year 1964, effective flood protection works were constructed at Dalwa at an estimated cost of Rs. 1.56 crores which included the cost of new spurs, strengthening of old spurs and metalling the top of the embankment.

3.25. In 1964, the Western Embankment near Kanauli, about 2 miles below Dalwa became the target of attack by the river. River conditions at Kanauli remained normal upto the end of July, 1964, when the river was about 1,000 ft away from the toe of the embankment. All of a sudden on the 30th July, 1964, erosion started opposite Kanauli. Strenuous efforts avoided a breach, but the distance of the toe of the embankment from the river ridge was reduced to only 160 ft. at the end of the flood season. Here also, extensive flood protection works *viz.* construction of new permeable and impermeable spurs, strengthening the old ones, crated stone protection and construction of retired line of embankment, were carried out at a cost of Rs. 1.14 crores. These works faced the flood of 1965 satisfactorily.

3.26. In 1964, the Western embankment was attacked lower down also at Bhalauhi. The branch channel of the main Kosi flowing parallel to the embankment started eroding the bank and the distance of the river edge from the toe of the embankment was reduced to only 25 ft. In 1965, three new impermeable spurs were constructed and two existing impermeable spurs were extended.

3.27. Recently in the first week of October, 1968, there were very high floods in the Kosi River. As a result of the high floods, there

were in all 4 breaches at the tail end of the Western embankment at the following places:—

(Distance below Gogardiha)

(i) Between Km. 42 and 43, 350 ft. length with scour depth 3 to 4 ft.

(ii) & (iii) Between Km. 43 and 44 two breaches one of 340' with scour depth 10 to 12' and the other of 225' with scour depth of 3-4'.

(iv) Between Km. 45 to 46—335 ft. length with scour depth of 2 to 3'.

In addition the embankment sank at a couple of places near Km. 42.

These breaches have been mainly attributed to the leakage that took place through the embankment.

3.28. When asked what steps are being taken for maintaining Kosi embankments satisfactorily, the Committee has been informed through a written note that "The recommendations of the Kosi Technical Committee for the improvement of maintenance of Kosi embankments are under consideration of the State Government. So far as preventive steps are concerned, every year sections of the river are taken, and model tests are also got done in the Central Water and Power Research Station. Roughly about 70 to 80 lakhs of rupees per year on an average has come to be spent on the maintenance of the Kosi embankments in the last few years". When asked if the requisite funds for the maintenance of embankments are being provided, the Committee have been informed through another written note that the amount that was considered necessary, the amount provided and the amount actually spent on maintenance of Kosi embankments during the last three years are as follows:—

	1965-66	1966-67 (Rupees in	1967-68 Lakhs)
Amount required	30·00	66·03	73·84
Amount received	30.29	47·60	7 (later on raised to 51 by re-appropriation & Supplementary grant)
Actual Expenditure	103·89	78·34	49·28

3.29. When asked if any measures had been taken to check the lateral movement of the river, the Chief Engineer (Floods) of the Central Water and Power Commission stated before the Committee that in the last two years, there was attack on the western side of the river. On that side now it has been fairly stabilised. Still there is some attack. But we are taking care of those things and measures are being adopted. There are some spill channels on the eastern side also. We are also adopting certain measures including dredging and closing of the bars well in time, so that they do not develop during the flood season. There is also an idea to reduce the width between the two embankments. For that we are making some studies. After they are over, some conclusions will be arrived at". The representative of the Government of Bihar added that "The importance of flood control and preventive measure are adequately considered by the State Government. In the State budget, we have provided Rs. 68 lakhs. The total expenditure we are going to incur in 1968-69 on new schemes and maintenance is of the order of Rs. 1.25 crores. That shows the importance that we attach and the amount we spent on this work. But, in spite of it, there are some works which we should do but which we are not able to do because there are some other pressing demands on the State budget for which money is diverted". When asked if all precautionary measures against change in the course of the river are being taken, he stated "As long as the two embankments are maintained, the river will never be able to change its course. It is only when the embankments are breached that the river will be able to take a different course".

3.30. The Committee note that the entire flood control benefits of the Kosi Project are dependent upon the proper and adequate maintenance of flood embankments. Now that the river has been confined to a set course within the embankments, a lot of developmental activities have taken place all around the area and any major breach in the embankment is likely to lead to very heavy loss of life and property. The Committee have further noted that the embankments have been subjected to repeated attacks year after year and breaches have already taken place on several occasions. From the very beginning, the experts visualised an efficient and effective maintenance organization, for the preservation of the embankments. The Committee would like to emphasise that top priority should be accorded to the maintenance of embankments. The Committee would also like to emphasise that a system of round-the-clock vigil particularly in the flood season should be developed. For this purpose the co-operation of the local population should be solicited and a suitable training scheme introduced.

3.31. The Committee further suggest that a careful and thorough study of the tendency of the river to attack particular points (as at Dalwa) should be immediately made and preventive steps taken forthwith so that breaches may not occur at those points after repeated pressure from the rived.

3.32. It is also desirable to investigate thoroughly the reasons for the breaches that have occurred from time to time to ensure that appropriate preventive measures to avoid recurrence are taken in time.

3.33. The Committee would also like to emphasise that all the steps suggested by the Kosi Technical Committee and the Central Water and Power Research Station, Poona should be undertaken without any delay and shortage of funds should not be allowed to stand in the way of effective and efficient maintenance organization for the embankments.

C. Canals

3.34. The Kosi Canal System on the eastern and western sides of the river has been designed to provide annual irrigation to an area of about 26 lakh acres in the districts of Saharsa, Purnea and Darbhanga of Bihar and Saptari of Nepal. The Canal system consists of Eastern Kosi Canal, Rajpur Canal, Western Kosi Canal and the Chatra Canal.

(i) *Eastern Kosi Canal*

3.35. The Eastern Kosi Canal System consists of a main canal, four branch canals and a number of distributaries and minors. When completed in all respects, it would provide annual irrigation to an area of 14.34 lakh acres of land in the districts of Purnea and Saharsa. This Canal System will secure an additional annual production of 360 lakh maunds of agriculture products valued at approximately Rs. 32 crores at 1965 prices. The relevant data regarding the Canal are as follows:—

(a) Length of the Canal System	
(i) Main Canal	27 miles.
(ii) Murliganj Branch Canal	40 miles.
(iii) Jankinagar Branch Canal	51 miles.
(iv) Purnea Branch Canal	40 miles.
(v) Ataria Branch Canal	36 miles.
(b) Annual irrigation	14.051 lakh acres.
(c) Water courses	7272 numbers.

3.36. Digging of the Canal was taken up in April, 1957 and by now most of the earth work in the main canal, branch canals and distributaries have been completed.

3.37. Irrigation facility was given from the Eastern Kosi Canal for the first time in the year 1964, the target being to irrigate about 10,000 acres. Very soon it was realised that unless water-courses of one cusec capacity were constructed at the cost of Government, development of irrigation would be very slow. As a result of this conclusion, the following steps were taken:—

(i) A special staff was sanctioned for getting water-courses upto one cusec constructed on an emergency basis. Over 7000 water-courses, of an average length of two miles, are being constructed under this programme. The work will be completed in three working seasons. This was not included in the original Project Report and the decision to get this done was taken in September, 1965.

(ii) An officer of the rank of Commissioner was appointed to coordinate all activities connected with the utilisation of irrigation potential right upto the cultivator's field. He has been given over-riding powers over staff of all development departments operating in this region.

(iii) The State Government also decided to recover water rates at concessional rates. In the first year only 25 per cent was recovered, in the second year 50 per cent, in the third year 75 per cent and only in the fourth year, full rates are going to be charged. This step was taken with a view to inducing cultivators in utilising the irrigation water and to enable them to make capital investments for bringing the lands under irrigation.

3.38. When asked about the present position of the Eastern Kosi Canal, the representative of the Ministry of Irrigation and Power has stated in his evidence before the Committee: "This canal will be ready by about 1969. The Water-courses will take longer. But we expect that by 1971-72 or 1972-73, the entire potential should have been effectively utilised". When asked if there was any phased programme to give water as and when canals are ready, the added "yes, simultaneously water courses are being laid and lands developed. About 3½ lakh acres were irrigated last season; this season I think, 5½ lakh acres will be irrigated in the coming *Khariff* Season. The potential created is much more than that. Roughly

at the end of the current season the potential created will be 8 lakh acres. . . . Just now because the power house is not ready, they could not us the main canal and therefore they had to use these two by pass channels. Once the power house comes in Octo-Nov., 1968 the entire water will be passing through the Canal. The Canal is mostly ready, it only depends upon the water courses now . . . . . On a conservative side, out of 7000 miles of water-courses, 4500 miles have been constructed".

3.39. Asked about the area already brought under irrigation and likely increase in the annual production of foodgrains and other cash crops, the Ministry of Irrigation and Power have intimated in a written note, "The target of providing annual irrigation to about 14 lakh acres of land is likely to be achieved by 1973-74. The additional area which has already been brought under irrigation as a result of completion of the Eastern Kosi Canal System is 4,50,000 acres in 1967-68. The target for 1968-69 is 6,50,000 acres. The likely increase in the annual production of foodgrains and other cash crops, according to Bihar Government estimates is as follows:—

Variety	Acreage in lakhs acres	Addl. production in lakh tons.
High Yielding Varieties of wheat	4	6
High Yielding Varieties of paddy . .	4	6
High Yielding Variaties of potato . .	0·5	4
Additional area under crop	2·5	1·875
Traditional crop	3·0	0·75
		18·625

3.40. The Committee note that the Eastern Kosi Canal when completed will have a considerable impact on the economy of Purnea and Saharsa districts of Bihar. The Committee have also noted that when the full irrigation potentialities are created, the canal would provide additional irrigation to about 14 lakh acres and would result in additional production annually of 18 lakh tons of foodgrains and other crops. During their visit to the Kosi Project Area, the Committee were shown some of the areas where benefits of irrigation have already been realised and the Committee were greatly impressed by the results of the irrigation system introduced as a result of the Kosi Project. The Committee also appreciate the various steps taken by the Government for making the irrigation water available to the cultivators, as and when the

canals are ready. The Committee are inclined to agree with the views of the Project Authorities that if all the steps for the utilisation of irrigation potential had been taken a year or two earlier the benefits flowing from irrigation would have been correspondingil advanced.

3.41. The Committee would like to emphasise that in the present context of the economic situation of the country, when there is an all-round need for attainment of self-sufficiency in food-grains, the early realisation of irrigation benefits from Kosi Canals has assumed increased importance since the availability of irrigation facilities from Eastern Kosi Canal is not dependent upon rainfall. The Committee need hardly stress that every endeavour should be made to complete the remaining works of the Eastern Kosi Canal at an early date and effort should be made to achieve optimum utilisation of irrigation potential, if possible, earlier than the target date as the same would go a long way in transforming the economic situation in the country.

(ii) *Rajpur Canal*

3.42. Originally, there was a proposal to construct a Diversion Barrange, the idea being that this would fecilitate release of 50,000 cucses of water in the old Dhars of the river Kosi for their resuscitation. The Dhars were to pass through the area between the Bhenga Dhar and the Eastern Kosi Embankment. After the scheme of the Diversion Barrage was abandoned, the need for irrigating this area arose, and a plan for taking a Branch canal from the Eastern Kosi Main Canal was prepared. This Branch canal is known as the Rajpur Canal. This scheme was sanctioned later on in the Third Five Year Plan period. This scheme consists of a branch canal, four sub-branch canals and a number of distributories and minors. The relevant data about the canal are as follows:—

(a) Length of canal system.	
(i) Rajpur Branch Canal	6 miles
(ii) Length of Sub-branch canals	203 miles
(b) Gross Commanded Area	4.91 lakh acres
(c) Culturable Commanded Area	3.27 lakh acres
(d) Annual irrigation	3.97 lakh acres

(e) Annual Yield of Crops expected

(i) Jute	1.30 lakh mds.
(ii) Paddy	6.71 ,, ,,
(iii) Rabi	3.92 ,, ,,
(iv) Sugarcane	4.25 ,, ,,
(f) Monetary value of additional yield per year	Rs. 1.87 crores

3.43. Work on the Rajpur Canal was started during the Third Five Year Plan period. Work on the canal is making progress and is expected to be completed in 1971-72. The canal which was originally expected to cost Rs. 4.67 crores, is now expected to cost about 6.50 crores.

3.44. Against a provision of Rs. 250 lakhs in the Third Plan a sum of Rs. 277 lakhs was spent on this scheme and a further sum of Rs. 51 lakhs was spent upto March, 1967 bringing the total to Rs. 328 lakhs. Special importance had been attached to this scheme, because the headworks had already been completed and as soon as the canal alongwith the water-courses is ready, a large block of 3.97 lakh acres would get irrigation. About 15,000 acres have been irrigated during *Khariff* of 1967 and full development of irrigation from this canal system will begin from 1971, if the required funds become available every year.

3.45. During their on-the-spot visit to the Kosi Project in September, 1967 the Study Group of the Committee was informed by the representative of the Government of Bihar that "so far as the Rajpur Canal System is concerned, the original programme of work envisaged irrigation being given in 1969-70 but this was stepped up and the intension was to complete it by 1967-68. While the revised programme could not be adhered to due to lack of funds, irrigation is being given in the upper reaches in the current year (1967)". When asked what steps were being taken to push through the work on the canal, the representatives of the Government of Bihar stated "So far as the Rajpur Canal is concerned, in the current year (1967-68), programme of work had been framed involving expenditure of Rs. 100 lakh, but due to difficult resources position, this has been reduced to Rs. 56 lakhs. Since the construction of this Canal is being financed by the Government of India and they advance earmarked loan assistance for it, the total outlay could have been raised according to the requirements, but for the loan assistance getting tied up with the overall resources of the State". Asked to comment on the reasons for not providing funds for accelerated programme of work

on the canal, the Committee was informed by the Ministry of Irrigation and Power through a written note in February, 1968, that "Due to the overall constraint of resources it has not been possible to provide additional funds this year (1967-68)". In another note, the Ministry have stated that "It is recognised that the Rajpur Canal should be pushed through as quickly as possible. However, funds for Rajpur Canal are provided within the State Plan ceiling. Subject to this limitation, efforts are always made to provide the maximum fund for this canal system".

3.46. Asked about the amount demanded for the Rajpur Canal by the Government of Bihar and the amount sanctioned, the representative of the Ministry of Irrigation and Power has stated in his evidence before the Committee, "For the current year, the Chief Engineer has asked for one crore and the State Government had provided Rs. 54·45 lakhs. The final picture will depend upon the budget". In reply to a question as to when the work on the Canal is expected to be completed, the representative of the Government of Bihar has stated before the Committee, "it is largely a question of funds. If we can get money we can do it. Every year we are in a position to spend more money than what is allotted". When asked if a sort of priority within the amount given to the State Government could not be fixed for schemes as have got immediate benefit, the representative of the Government of Bihar has stated in evidence "The same position obtains with regard to the rest of the Kosi Project, Gandak Project and the Sone Project. This is to say, as soon as we are in a position to give some water for irrigation, we take steps to do so, so that there may be immediate returns on projects of this type".

3.47. The Committee note that on completion, the Rajpur Canal is expected to irrigate an area of about 3.97 lakh acres and that while special importance has been attached to this scheme which promises to provide immediate benefits, an accelerated programme for its completion could not be put through because of shortage of funds. In 1967-68, against a requirement of Rs. 100 lakhs, only a sum of Rs. 56 lakhs could be provided and in the current year only half of the requirements of the canal are being met. The Committeee recommend that in view of the magnitude of the irrigation benefits which are accruable on the completion of the canal and keeping in view the declared policy of the Government to give accelerated financial assistance to the Projects which are in an advanced state of construction, additional funds should be provided to the Bihar Government for the early completion of the Canal parti-

cularly when the Bihar Government claim that they are in a position to utilise more funds than what are being allotted to them.

(iii) *Western Kosi Canal*

3.48. The Western Kosi Canal was not included in the original Kosi Project, but was subsequently included during the Third Five Year Plan. The Head Regulator of this canal had however, been sanctioned as a part of the Barrage itself, because it was thought that in the event of the Western Kosi Canal being sanctioned at a later date, the construction of the Head Regulator would have been difficult. The estimated cost of the Canal was Rs. 13.49 crores. The relevant data about the canal is as follows:—

(a) Length of Canal System

(i) Main Canal	. 70 miles
(ii) Branch Canal distributaries etc.	. Under Investigation

(b) Annual Irrigation

(i) In Darbhanga dist.	. 7.73 lakh acres
(ii) In Nepal	. 0.70 lakh acres
	8.43 lakh acres

3.49. The first 22 miles of the Canal pass through Nepal. In September, 1961, the alignment of the Canal had been approved by His Majesty's Government of Nepal with the suggestion that the alignment might be shifted to the north, with a view to irrigating some more areas in Nepal. It was also suggested by the Government of Nepal that the Project Administration should take up renovation and development of their existing Chandra Canal System, and provide for adequate number of bridges. Preliminary works were commenced in 1962, but when the measurements of lands to be acquired and handed over were started, there was opposition from villagers. The matter was taken up with the local officers of His Majesty's Government of Nepal but with no effect. Later His Majesty's Government of Nepal held that in the original Agreement this Canal was not included in the Kosi Project works. A revised agreement was signed in 1966. Under Clause 2(i) of this Agreement, permission of His Majesty's Government of Nepal is necessary for survey of the area in Nepal in which a part of the Western Kosi Canal system is to be constructed. Soon after signing of the Revised Agreement, permission for this was asked for, and His Majesty's Government of Nepal accorded permission in their letter, dated the 6th January, 1967. The survey and

investigation report, after finalisation, was sent by the State Government to the Central Water and Power Commission on 28th October, 1967. An Officer of the Central Water and Power Commission was deputed to inspect the Western Kosi Canal alignments. He inspected the Western Kosi Canal alignments and held discussions with the Bihar Government. The proposals sent by the Bihar Government had to be re-cast after inspection and discussion. The course of the canal has been finalised and forwarded to the Government of Nepal for their concurrence. The approval of the Government of Nepal with regard to the alignment of the Western Kosi Canal in Nepalese territory has not been received (till early in November, 1968) and His Majesty's Government of Nepal has been requested at the highest level to expedite approval.

Cost of the Canal

3.50. The original estimate of the Western Kosi Canal was Rs. 13·49 crores. It has been stated that due to overall increase in the cost of labour and materials as also the construction of watercourses in the command area of this canal, the total estimate is expected to go up to Rs. 20 crores. A provision of Rs. 200 lakhs was made for the Canal during the Third Five Year Plan period. The amount was considered insufficient, but the advice of the Government of India to the Project authorities was that work on this canal should be speeded up from the third year of the Plan, so that it could be completed by the end of the Fourth Plan. When the Third year was about to begin, the Government of India declined to raise the provision, in view of the emergency in the country, and a suggestion was made that work on this should be slowed down.

3.51. When asked what stood in the way of the early completion of the Western Kosi Canal, the representative of the Ministry of Irrigation and Power has stated in his evidence before the Committee that "The Kosi River is a meandering river and its journey has a westward movement. That was why it was felt that while the idea of Western Kosi Canal was there earlier in a general way, the behaviour of the western embankment should be watched before finalising the ideas about the nature and alignment of the Canal. This was done for about three to four years from 1958, and in 1960-61 it was felt that the time was then ripe to work out a plan. Immediately thereafter, negotiations were started with Nepal near about 1963-64, and it was only at the end of 1966 or so, that is, a year and a half ago, that the negotiations were finalised. Even afterwards, the condition was that the alignment of the canal in Nepal would have to be done with the consent of His Majesty's Government of Nepal and

the surveys had to be made and they have just been completed". Asked why surveying was not done simultaneously while negotiating with the Nepal Government, he added "The predominant idea was to watch the performance of the embankments. As soon as we found this was all right, we also started the head regulator work of the Western Kosi and finished it. Then it took time to negotiate and finalise the agreement".

3.52. The Committee note that the scheme for Western Kosi Canal was approved in 1960-61 but work on the Canal has not yet started with the result that the water potential has remained unutilised. Now that an agreement has been signed with His Majesty's Government of Nepal and surveys of the alignment of the Canal have been finalised, the Committee would like to stress that work on this canal should be started as early as possible and every effort should be made to complete the construction of the canal during the Fourth Plan period.

(iv) *Chatra Canal*

3.53. The Chatra Canal is being constructed in Nepal territory and the scheme is being executed by the Kosi Project Administration on behalf of the Government of India. The scheme consists of (a) Head Regulator (b) Reinforced Cement concrete Conduit (c) excavation of 35 miles long Chatra main Canal (d) digging of 16 distributories of a total length of 185 miles; and (e) construction of 450 canal structures and about 230 outlets for water-courses.

3.54. The Chatra Canal Project forms part of the Indian Aid Programme to "supplement the efforts of His Majesty's Government of Nepal to develop the country's economy and to raise the living standard of the people". Two previous schemes, namely, the Chatra Barrage Scheme and the Belka Dam Scheme, drawn up by the Central Water and Power Commission in 1950 and 1951 respectively, had provided for annual irrigation of 1.82 lakh acres of land in the Morang district of Nepal. The two Schemes, however, fell through. Then came the present Kosi Project which was sanctioned for execution by the Union Government in December, 1953. However, the Kosi Project included only a preliminary report on the Chatra Canal scheme. To carry out detailed investigation, a Chatra Canal Division was sanctioned in 1956, and a scheme for providing irrigation to lands in the Morang and Saptari districts of Nepal was drawn up in 1958. Pending formal approval of the Scheme, the Union Government authorised the State Government of Bihar in May, 1960 to incur expenditure on the preliminary items of work. The Scheme,

therefore, was subjected to scrutiny by experts, resulting in changes in the alignment of the canals, and subsequent revision of the estimates in November, 1960. The Union Ministry of Irrigation and Power accorded administrative approval to the revised Scheme, which was estimated to Cost Rs. 4 crores. The permission of His Majestry's Government of Nepal, allowing construction work to be taken up, was obtained in August, 1951. The formal Chatra Canal Agreement between India and Nepal, was signed on the 2nd November, 1964.

3.55. The estimate of the canal had been revised to Rs. 657 lakhs in March, 1966. Another revised estimate amounting to Rs. 890:21 lakhs has been prepared which is in the final stage of scrutiny.

Benefits of the Canal

3.56. The Chatra Canal system when completed will provide irrigation to 2·12 lakh acres of land in the Saptari and Morang districts of Nepal yielding additional annual production of 39 lakh maunds valued at Rs. 4·75 crores. It is expected that irrigation would commence from June, 1969. With the introduction of this irrigation programme, the lot of 480 villages, situated in the command area, will considerably improve within a few years, and this region may turn out to be a big grannary for Nepal. Moreover, there are a large number of swamps and depressions in the Chatra Canal command area. They are filled up with rain water which remain stagnant throughout the whole year, creating an unhealthy and malarious atmosphere. A sum of Rs. 9:50 lakhs has been earmarked for drainage work in the area. This will go a long way in improving the health of the people residing in the locality.

3.57. Numerous fair weather roads constructed along the canal would solve to a great extent the communication problem for the area. Construction of bridges across the rivers and Kholas would similarly contribute to the development of the local communication system and trade. In addition construction works in the area have opened up avenues of employment to the local Nepalese nationals.

3.58. The Construction work of the canal has made considerable progress. The excavation of the head regulator and excavation of the main Chatra Canal is in progress. Excavation of most of the distributories is nearly complete. In addition, construction of a diesel electric power station, diesel depot, workshop and other ancillary facilities for the construction of the headworks have already been completed. Construction of buildings, belder sheds and accommodation for the maintenance stac is also completed.

3.59. The Committee are glad to note that the Government have undertaken the construction of this Canal which will result in great benefits to the people of Nepal. The Committee are also glad to note that considerable progress of work has been made on the construction work of th Canal and irrigation is expected to be provided from this Canal from June 1969. The Committee hope that its completion will further strengthen the traditional friendship between the two countries.

D. Kosi Hydel Station

3.60. The originally sanctioned Kosi Project Scheme included construction of a Hydel Power Station also but it was not sanctioned at the time. Hence in the administrative sanction issued for the Kosi Project, no provision was made for "Power Generation". However, when a few new scheme were sanctioned as stage II of the Project and included in the Third Five Year Plan of the State, it included the construction of a Kosi Power House on the Eastern Kosi Canal. For generation of Power, a fall of 13 ft. is available in the Canal bed, and advantage has been taken of it to locate the generating sets in the canal instead of the barrage.

3.61. The Power House will have an installed capacity of 20,000 KW of which 10,000 KW has been earmarked for Nepal and the balance would be available for use in Bihar. It has been stated that though the power output of the Station will be small compared to the total requirements of North Bihar, it would be advantageous on account of very low recurring cost. The Bihar State Electricity Board has taken up the work of building the transmission lines from Kataiya Power House and Rajbiraj (a divisional headquarters in Nepal) and Biratnagar. The 33 KV transmission line from Bharda to Rajbiraj is ready. The transmission lines in Nepal are being constructed as AID projects in that country. The Power House will have 4 units of 5,000 KW each. There is provision for four irrigation vents also to release water through the Power House for irrigation purposes. This Power House happens to be the first of its kind in India and, in fact, one of the few in the world. The structure is subjected to unusually high stresses and is heavily reinforced. The design, being rather unique and unconventional, had to be prepared with great care and attention.

3.62. The construction of the Power House has been entrusted to the State Electricity Board of the Government of Bihar. The civil works of the Power House is being done by the River Valley Projects Department as an agent of the State Electricity Board.

Expenditure incurred on these works upto October, 1967 amounts to Rs. 267 lakhs.

3.63. The construction of the civil works of the Power House was started in the later part of the working season, 1964-65 when the foundations designs were finalised. Preliminary works such as excavation of foundation, collection of materials, planning etc. were also taken up. It was originally expected that the structure of the Power House would be completed by 1965 and the power generation will start from the year 1966-67. However, work on the Power House suffered a serious set-back on account of machinery being impounded by Pakistan during the 1965 hostilities.

3.64. According to the Indo-Nepal Agreement on the Kosi Project, 50 percent of the power generation has been earmarked for use in Nepal. Clause 4(ii) and 4(iv) of the Revised Agreement between His Majesty's Government of Nepal and the Government of India on Kosi Project read as below:—

"(ii) His Majesty's Government of Nepal shall be entitled to obtain for use in Nepal any portion upto 50 percent of the total hydro-electric power generated by any power house situated within a 10 mile radius from the barrage as His Majesty's Government of Nepal shall from time to time determine and communicate to the Union.

Provided that—

(ii) His Majesty's Government shall communicate to the Union any increase or decrease in the required power supply exceeding 6,800 KW at least three months in advance.

(iv) The tariff rates for electricity to be supplied to Nepal pursuant to the provisions of this clause shall be fixed by mutual agreement."

3.65. The Power House is expected to cost Rs. 6.16 crores. Completion of the Power House will result in fifty percent of the power generated being available for use in a remote area of Bihar where no other source of power is available at present. Similar benefits will accrue to Nepal also.

3.66. An eminent Engineer in a Memorandum furnished to the Committee has stated "The Kosi Agreement with the Nepal provided that half the quantity of power to be generated by the Project will be supplied to Nepal at cost price without any profit or loss to Bihar. Instead of trying to generate only about 20,000 KW of hydro-Power at an estimated cost of Rs. 4.7 crores, now Rs. 6.16 crores, it would have been much better and cheaper to supply 10,000 KW power to

Nepal from Barauni Thermal Power Station at a much cheaper tariff." Regarding the location of the Hydel Station, he has stated that "Financial Provision was fairly adequate to achieve the target and physical performances. But due to the location of the Hydro-power station in the main canal instead of a bye-pass channel, no water could be passed in the first year for irrigation purposes. A bye-pass channel was thereafter hurriedly constructed with a fall capacity pass only 2,000 as against the designed discharge of about 10,000 cs. This also proved inadequate and another bye-pass channel with a fall for passing 4,000 cs. additional discharge was constructed in the second year. Due to lack of proper planning, not only such additional costs had to be incurred but irrigation potential could not be developed as targetted".

3.67. When asked to offer their comments on the above statements, the Committee have been informed through a written note "The Barauni Thermal Station was approved for execution in the Second Plan period. The Kosi Agreement was signed in 1954. The Kosi Hydel Scheme was part of the multi-purpose Kosi Project and was considered advantageous on account of the low recurring cost." As regards the location of the Hydel Station, it has been stated that "The question whether the Power Station should be located in the main canal or in a bye-pass channel was examined in great detail and it had been estimated that if the Power House was located in a bye-pass channel additional cost would be of the order of Rs. 20 lakhs. After considering all the pros and cons of the two alternatives, the Kosi Control Board finally decided in favour of the Power House being located in the Main Canal. Some unforeseen events delayed the execution of the Power House. Due to the very tight foreign exchange position, it took time to decide from which country and which type of generating sets should be imported. This delayed the finalisation of the drawings of the Power House. The Barrage and Canal were ready, and water for irrigation had to be let down through the bye-pass channels which had to be constructed in the circumstances." During their on-the-spot visit to the Project, the study group of the Committee was informed by the officials of the Government of Bihar that: "It is a fact that due to location of Hydro-Power Station in the main canal, only partial irrigation could be given in the first year, and in the subsequent years, two bye-channels had to be constructed. It cannot be said that there was lack of proper planning in setting up the Hydro-electric Power Station in the main canal, or its construction. The fact of the matter is that at all stages such as preparation of the design of the civil works, and placement of order of the

generating sets, there was delay and to cap it all, the essential parts of the Hydro-electric Generators were seized by Pakistan during the course of hostilities in 1965. These difficulties were unforeseen."

3.68. When asked about the progress of work of the Hydel Station and when the same was expected to be commissioned, the representative of the Ministry of Irrigation and Power has stated in his evidence before the Committee on 18-7-1968 that "The Hydel Station is under construction. The civil works are nearing completion. The machines are being installed. The first set will be ready by October-December this year. There are four sets of 5 MW each. The other three will be ready after every three months each."

3.69. The Committee feel that there has been considerable delay in the construction of the Kosi Hydel Station which was expected to start power generation from 1966-67. This has deprived a large number of people of cheap electricity in an area where no other source of power is available at present. This delay has also affected the utilisation of irrigation potential, since due to the location of the power house in the main canal, water could not be utilised and bye-pass canals had to be constructed later. While appreciating that some of the reasons contributing to the delay like seizure of machinery by Pakistan and shortage of foreign exchange were unforseen, the Committee cannot help reaching the conclusion that lack of proper planning has also been partly responsible for the delay. The Committee hope that the present target regarding the Commissioning of power house would be adhered to.

CHAPTER IV

FLOOD CONTROL AND RECLAMATION

A. Flood Control

4.1. The Kosi Technical Committee studied the flood problems of the Kosi River in detail and submitted their report in April, 1966. In their report, the Committee grouped the problems of the Kosi River under the following categories:—

(1) Inundation of large agricultural areas and habitations on both banks of the river when the flood goes above 1 lakh cusecs.

(2) Gradient control in the first 25 miles below Chatra where the slope is 4.64 ft. per mile.

(3) Gradient control in the next reach upto Dagmara in which the slope is 2.35 ft. per mile.

(4) Silt control by soil conservation measures in the upper catchment.

(5) Silt control by river conservancy in the middle and lower reaches of the river.

4.2. The Kosi Technical Committee was of the opinion that the first two problems stated above had been satisfactorily tackled by the 1953 Kosi Project. The evidence at the disposal of the Committee of the detailed cross-sections observed every year did not show any significant silting either above or below the barrage between the embankments. The Committee emphasised the necessity of continuing these observations in the future. They were, however, of the opinion that as there was a free board of 6 ft. provided above the highest design flood of 9.5 lakh cusecs, the problem of inundation by floods was well taken care of. The barrage had provided an effective gradient control of at least for about 8 miles upstream of the barrage. They, therefore, expressed the view that the residual problems of the Kosi were as stated in group (3), (4) and (5) above.

4.3. The Kosi Technical Committee suggested training works, dredging and bandalling, as river conservancy measures to stabilise the channel and to increase the hydraulic efficiency and consequently the silt carrying capacity of the Kosi. They believed that in course of time these efforts by concentrating the flow in a single deep chan-

nel would help in creating a water-way for navigation, which would provide cheap means of communication in this area. The Committee also suggested a number of precautionary measures including a flood warning system, demarcation of flood hazard zones and adjustment of farming practices in the areas subject to flooding. The Committee also recommended that as a first step a comprehensive soil conservation plan should be prepared for the Tamur tributary of the Kosi. This tributary, though its catchment area was only 10 per cent, brought in over ¼ of the total coarse silt. They further suggested that advantage should be taken of the experience which existed in New Zealand on similar soil conservation problems. The Kosi Technical Committee also suggested quick annual reconnaissance survey of the river immediately after the floods, periodic aerial survey, installation of water-level gauges along the river, two additional silt and discharge observation stations at Koparia and Kursela and regular observation of ground water levels within the irrigated area.

4.4. When asked about the action taken by the Government on the various recommendations|observations made by the Kosi Technical Committee, the Committee have been supplied with the following statement:—

Recommendation of the Kosi Technical Committee (1)	Action taken thereon (2)
1. Survey of the river condition after every flood.	1. Survey of the river for a length of about 20 miles upstream of Barrage and 75 miles below if is done every year after the floods, taking cross-section of river at almost one mile interval to enable study of its behaviour with a view to planning action for the next year's flood fighting. Attempts are being made to procure modern-river survey boats and instruments and to take help of an aerial survey.
2. River conservancy measures suggested: (i) Dredging:	2. (i) One dredger has been imported from USA which will start functioning, after its assembling is completed.
(ii) Bandalling, Bedpanalli cleaure of bifurcating channels etc.	(ii) These are done every year wherever found necessary and useful.
(iii) Construction of permeable and impermeable spurs etc.	(iii) These are constructed wherever found useful and necessary. Advice of Central Water and Power Research Station, Poona is also taken whenever necessary.
(iv) Gradient control in the next reach upto Dagmara in which the slope is 2·35 feet/mile.	(iv) This is linked up with the proposal for a Second Barrage, which is under examination.
(v) Silt control by soil conservation measures in the upper catchment.	(v) This involves extensive work in Nepal. A soil conservation centre is working at Chatra in Nepal. Its activities have to be considerably expanded.

(1)	(2)
(vi) Protection of the area from Badlaghat to Paharpur on the right bank from inundation.	(vi) Irrigation Deptt. of the State is to do this work which has not yet been done.
(vii) Well observation within irrigated area.	(vii) This is being done the ground water table in the irrigated area is already somewhat high, regular observations are being taken before and after the rains.
(viii) *Flood Warnings*: A system should be set up to provide adequate warnings to people in the area likely to be flooded if a breach occurs. State Government officials must be altered and plans made for steps to be taken should an emergency arise.	(viii) Flood patrolling rules are framed every year by the Chief Engineer and they are issued to all concerned for implementation. River discharge is communicated to all Civil Officers concerned and to other Project officials The rules provide *inter alia* as follows: "On receipt of the warning for flood discharge of 1·50 lakh cusecs and above, the Civil Officers concerned and the Rehabilitation Officer will alert the inhabitants of the villages lying within half miles from the embankments to keep themselves ready for evacuation The Executive Engineer Nirmali should ensure that the gates of Tiljuga marg embankment are opened all the times during the flood period for drainage of water crossing from North of Marginal Embankment. When the discharge ranges between 1·50 lakh cusecs and 2 lakh cusecs arrangements for evacuation may have to be started from the villages situated in the low lying area. When the discharge exceeds 2 lakh cusecs, this will have to be extended to the villages lying comparatively on high grounds. Necessary steps in the matter will be taken by the District Authorities concerned. When the discharge exceeds 2 lakhs cusecs the Project Executive Engineer shall alert the Project SDO's Overseers and Rehabilitation Officers for maximum vigilance and they themselves must remain in the embankments.
(ix) Demarcation of flood hazard areas: In order that the flood warnings may have maximum utility it is necessary to have maps showing area liable to inundation. Wherever possible flood hazard areas should be classfied in the following Zone:— Zone 1. Areas with maximum possibility of flooding. This would include low land within embakment. Zone 2. Areas with moderate chance of being flooded. This would include the land bordering the chars or formers drainage channels of Kosi.	(ix) Demarcation of flood hazard zons has not yet been taken up' but so far people living within the embankment are concerned, arrangements have been made for their shifting to houses constructed by them with assistance from Government outside the embankments. Arrangements for evacuation are done by the District Authorities who maintain sufficient number of boats and boatmen readily available during the flood period.

Recommendat on of the Kosi Technical Committee	Action taken thereon
(x) Building and land use Regulation and advice. When an area like the Kosi Basin is protected by the embankments, there is a natural tendency for investment in buildings to be increased and for establishment of industries and other important structures. It is suggested that on the basis of the flood area hazard maps, prepared in accordance with (2) above, the follwing regulation or advice be enacted or provided: Zone 1. Construction of new pucca buildings should be discouraged. Zone 2. All new pucca buildings to have plinth at least one foot above the maximum flood level. The Committee recommends that the local Civil officials to be equipped with the maps showing ground levels and possible flood levels in case of breach, so that they may give suitable advice to builders.	(x) This will involve passing of legislation which will be done in due course.

4.5. When asked during evidence about the measures being taken to save the Kosi catchment area from water-logging after the high floods, the Chief Engineer, Central Water and Power Commission has stated in his evidence before the Committee "The water logging problem in the real sense is not there. But when the Kosi is in high floods, the backwater or the drainage congestion does occur and to that extent water is held up in those tributaries which are coming into that and then that water spreads. As soon as Kosi gets down all those waters again come back to the main river." The Chairman of the Central Water and Power Commission added "I do not know about this area in particular. But wherever we have embankments on river this is an inevitable consequence. In fact in the Krishna-Godavari and Cauvery deltas, where we have completely embanked from the barrage right down to the sea, our biggest problem is that the various streams which drain into the river are blocked whenever the river is in floods for quite a long time. Various methods have been tried, and several expert committees have been appointed. The only solution we could think of is to pump the water. There is no other way except to pump into the river. Otherwise the area does get waterlogged. The Chief Engineer of the Kosi Project has further added, "Actually, we have not got any such area which we can say is completely water-logged. But there are some areas which during the rainy season remain practically covered under water for sometime. Our problem is that we cannot provide drainage sluices because our past experience is that more than once drainage sluices had given trouble and ultimately a breach had occurred at Dalwa.

Even at Gopalpur, the trouble started at the drainage sluice and a breach was practically going to occur but somehow or other it was averted. If we have to take any measures to provide drainage sluice, we have to make a rather very careful study of it and then only we can provide anything." When asked about the nature of the area which is water logged, he has stated "Some area is temporarily under water during rainy seasons. It is about 5,000 acres on the western side of the Western embankment."

4.6. In spite of the construction of embankments and the construction of Hanumannagar barrage, the danger of floods in the River Kosi has not yet been entirely eliminated. An account of the various attacks on the embankments experienced during the last few years has already been given in Chapter II under "Marginal Embankments". Only recently in October 1968, due to intense rainfal early in the first week of October, in the plains of North-eastern parts of Bihar and in the hills, the river Kosi and its tributories were in spate affecting Purnea, Saharsa Darbhanga and Monghyr districts. The Kosi experienced an unprecedented flood of 25,853 cumecs on October 5, against the earlier maximum flood of 24,210 cumecs in 1954. The water level within the marginal embankments rose to within 0.9 metre from top of the embankments. Four breaches occurred in the Western Kosi embankments on October 6 near the tail end. Some erosion occurred on the left guide bund of the barrage. The barrage and the canal head regulator were not affected. Most of the villages between the eastern and the western embankments falling in the Saharsa and Darbhanga district were inundated. The area between the Kosi embankment and adjoining rivers Sugarwa, Kamla Balan etc., was affected by the breaches. Spill water of Kosi caused floods in the Kali Kosi which affected Alam-Nagar and Chause blocks of Saharsa District. The October floods affected an area of 7:9 lakh has including a cropped area of about 1:4 lakh ha. Eleven human lives and 7,821 cattle heads were lost and over 76,000 houses were damaged. The damage to crops had been estimated at Rs. 9 crores, of which a loss of nearly Rs. 4 crores occurred in the Purnea district. After making an aerial inspection of the Kosi embankments on October 11, the Minister for Irrigation and Power suggested the following measures to be taken up immediately:—

1. Extending the Kamla Balan embankment to join the Kosi Western embankment.
2. Providing a 3 metre strip on the land side of the embankments to serve as roads for inspection purposes.
3. The Western embankment downstream of Nirmali which is at present unapproachable during floods, should be provided with road facilities.

4. The embankments should be continuously watched, and where found necessary, raising and strengthening should be undertaken.

5. Measures should be taken to shift the people at present settled within the embankments.

6. The dredger should be commissioned expeditiously.

7. A bridge should be constructed accross the Kamla Balan to reach the Western embankment below Nirmali during flood season.

4.7. It has been mentioned that the damage from the Kosi floods this year is mostly confined to the areas within the embankments where a large number of people have settled, in spite of persistent efforts made by the State authorities to evacuate them by offering alternative village sites.

4.8. The Chief Engineer (Flood Control) in the Central Water and Power Commission undertook an inspection of breaches on Western Kosi embankment and of Barrage and the whole Kosi embankments on 12th and 13th October, 1968. In his report on the causes of the breaches in the western embankment, he has stated that there were a number of holes of foxes. Some holes of rates were also there. The fox holes were big. The embankments had clod as well and showed that it was not properly consolidated during construction. The embankments were not over-topped anywhere. Nor was there foundation failure as the embankment near the ground at the sites of the breaches was found to be quite good. The failure was due to piping through the embankment itself. The local people also stated that when the water rose very high, it started coming out on countryside slope of the embankment through fox holes, and then the embankment sank and breached. He reached at the conclusion that the main causes of these breaches were the fox holes. The situation got aggravated due to floods in the upper layers of the embankment. He further added that the floods in October were not expected by the staff. The watching arrangements were slack. The overseers incharge of this reach were on leave. Perhaps the S.D.O. was also not present when the piping started in the early hours of 6th October 1968. The rate of rise of water was also rapid, and it rose to such heights for the first time since the completion of the embankments. All these factors aggravated the situation and piping developed into breaches very quickly.

4.9. As regards the barrage, on 5-10-1968 at 10 P.M. the river while in falling stage attacked the nose of U|S left guide bund. First a crack was noticed near the nose, then it started slumping down and

by 1 A.M. of 6-10-1968, about 110 ft. of the nose slumped and washed away. Immediately, stones in crates were launched. The total length of 150 ft. of the guide bund was eroded by 8 A.M. of 6-10-1968, and thereafter the erosion got arrested by the dumping of stone crates, and judicious regulation. The situation is now well under control.

4.10. As regards the Eastern Kosi embankment which is about 125 Km. long, no damage was reported. However, there was seepage noticed in countryside at 19 Km. and 63 to 65 Km., 92 to 96 Km. and 105 Km. There was, however, pressure of water on almost all the spurs.

4.11. The Chief Engineer (Flood Control), Central Water and Power Commission, in his report has made the following suggestions/observations:—

1. The problem of erosion of the nose of left guide bund of the barrage be immediately referred to Director, Central Water and Power Research Station, Poona for his advice.
2. Other spurs which have been damaged or attacked need to be recouped in consultation with the Central Water and Power Research Station, Poona. In fact, a detailed note on the behaviour of river, the protection and works be prepared and sent to Director, Central Water and Power Research Station, Poona for his suggestions for future works.
3. There are rain cut on the slopes of the embankments. The slopes at places are also steep. These need to be made up.
4. There are shrubs on the slopes of the embankments. These should be rooted out.
5. There are two reaches, one on the U/S portion on Nirmali ring bund and other near 50 Km. which have not got the free board of 6 ft. These should be made up.
6. There was some seepage noticed on the slope and near the toe of the embankment like 16 Km. in Kanauli reach. Causes of seepage should be investigated and steps taken to strengthen them.
7. Similarly, in some reach, the side slopes were noticed less than designed one. These should be made up. In fact, cross-sections of all the embankments be observed and wherever found, deficiencies made up.
8. In a number of reaches, there are trees growing on the slopes of embankments. These render the embankment

weak. This needs investigation for taking suitable measures.

9. It was noticed that the telephone lines on the Western Kosi Embankment were in damaged condition. It was learnt that these did not work during this year's floods. This needs serious consideration and steps should be taken to ensure that the telephone communications along the flood embankments are restored. These must work during the flood seasons.

10. At present whenever the Bhutali-Balan is in floods which is frequent during the flood season the Western Embankment d|s of Goghardah is approachable by train only from Nirmali. Moreover, the only route to inspect this Embankment is from Kosi Barrage. In the event of any breach anywhere the reach|d|s of the breach becomes difficult to approach except by boat. This is time-consuming and so harmful during emergencies in flood seasons. For improving the situation, alternate route of connecting the tail reaches by road should be investigated. For this the road bridge over the Kamla-Balan near Jhanjharpur seems necessary. This matter needs to be taken up by Kosi authorities on priority basis. Till this bridge is constructed, some arrangements of plying a motor launch during flood seasons for negotiating left embankment of Bagmati with the Western embankment near its tail be made.

11. The flood patrolling rules need to be revised in the light of the experience gained during the recent floods. In these emphasis should be given to the prompt and effective closing of the fox holes and rat holes throughout and to keeping the slopes of embankment clear of all jungles etc.

4.12. The Committee note that although the constructions of the barrage and embankments have by and large solved the flood problem of the River Kosi and provided protection to a large area, the dangers created or likely to be created by the river have not yet been completely eliminated.

4.13. The river has been subject to floods and it has been exerting great pressure on the embankments practically every year. It is, however, gratifying to note that the barrage and the embankments have on the whole withstood the onslaught of the yearly floods quite well and except in the case of 1968 floods, there has not been any major breach.

4.14. The Committee feel unhappy that although more than two and a half years have elapsed since the Kosi Technical Committee submitted their report, final decisions and effective follow up action have not been taken on a number of recommendations. The Committee would urge that action on the pending recommendations of the Kosi Technical Committee should be taken without any further delay and the matter given the utmost consideration that it deserves.

4.15. The Committee would in particular like to emphasise the need for developing a fool-proof floodwarning system so that evacuation measures could be resorted to on an emergency basis when needed and loss of lives and property averted.

4.16. The Committee regret to observe from the report of the Chief Engineer, Central Water and Power Commission that because of a number of fox holes and rat holes, water could pass through the embankments causing them to sink and be breached, thus resulting in heavy loss of life and property. The Committee would emphasise that adquate measures should be taken to check the embankments thoroughly and continuously and plug the holds as soon as they are noticed. The Committee are constrained to observe that the fact that the Overseer concerned and the S.D.O. were not present at the time of breach of embankment only shows the casual manner in which the work of superintendence and supervision is being carried out. The Committee would like that the circumstances under which no responsible official could be present at the time of breach of embankment should be investigated and adequate measures such as issue of guide lines be taken to avoid the recurrence of such eventualities in future.

4.17. The Committee note that a number of suggestions have been made by the Minister of Irrigation and Power and the Chief Engineer, Central Water and Power Commission for solving the flood problems of the River Kosi. They would urge that early and speedy action on these recommendations should be taken. The Committee feel that there cannot be any cut and dried formulae for solving the flood problem of the river Kosi. Continuous studies of the behaviour of the river should be made by project authorities and the problems discussed periodically at seminars which should be attended by experts already working on other river valley projects, universities and research institutes.

4.18. The Committee would also like to stress that a thorough research into the waterlogging problem in the Kosi area should be undertaken particularly in view of the fact that this problem is

going to be a normal feature in the case of practically all the river valley projects.

B. Reclamation of Land in Kosi Command Area

4.19. The construction of the Kosi embankments have protected a large area from the annual flooding. In its westward movement, the river had laid waste large tracts of land in the districts of Purnea and Saharsa by depositing coarse sand. The devastated tracts got covered with jungles of "KANS" and "PATER" and the low lands got water-logged. In those areas where crops were grown up, khariff crops were generally badly damaged and even Rabi sowing was sometimes affected by standing water and excessive moisture.

4.20. After the completion of the Eastern Kosi Canal, the entire command area has been surveyed. The gross area to be irrigated in the Eastern Kosi Canal system is 15.04 lakh acres. The net culturable command area is 12.95 lakh acres. Out of this, 50 per cent. of the area does not require any levelling. Out of the balance 50 per cent. *i.e.* 6,48,000 acres, 3,24,000 acres are expected to be levelled by the cultivators. This is without any outside assistance. The State Government has worked out that for the balance 3,24,000 acres, assistance has to be given to the cultivators. It has been worked out with reference to contour maps that 1,78,200 acres have a slope of 0 to 0:3 per cent, 1,13,400 acres have a slope of 0:3 to 0:6 per cent and 32,400 acres have a slope of 0:6 to 1 per cent. Main items of reclamation work are:—

(1) Earth Work for levelling.

(2) Application of organic manure.

(3) Clearance of shrubs.

4.21. The cost (excluding clearance of shrubs) was estimated at Rs. 4.06 crores. Loans are to be advanced to the cultivators through the agency of branches of the Bihar State Land Development Bank at Purnea and Saharsa. The loans are repayable in 8 years in six instalments, no payment being made in the first and second year.

4.22. So far an area of one lakh acres has been reclaimed by the cultivators themselves without any financial assistance. An area of 25,000 acres has been reclaimed with the help of loans granted by the Land Development Bank and Agro-Industries Corporation. More than 100 tractors have been purchased by the cultivators and are at present being used for reclamation.

4.23. The above scheme has been slightly modified and recast recently to provide for a fleet of 60 tractors to be operated either by the Agro-Industries Corporation or Co-operatives to help levelling the lands of small farmers who have not got the means to purchase tractors. Bullock-driven kurels are also to be made available to small cultivators with small size holdings. The kurels are being manufactured in the Kosi Workshop at Birpur and are being sold to the cultivators through the blocks.

4.24. The programme for the reclamation of land year-wise is as follows:—

Year	Area to be reclaimed
	(Acres)
1967-68	7,250
1968-69	70,250
1969-70	95,250
1970-71	1,14,000
1971-72	37,250
	3,24,000

4.25. Asked about the details of assistance and loan facilities being provided to the farmers through the land mortgage banks, co-operative banks etc. in the area, the Committee have been informed that the cultivators are being given a loan of Rs. 100 per acre for land having a slope of 0 to 0:3 per cent, Rs. 140 per acre for slope of 0:3 per cent to 0·6 per cent and Rs. 195 per acre for slope of 0:6 per cent to 1 per cent through the Land Development Bank. Besides the cultivators are also being given loan through the Cooperative Societies under the crop loan system for raising crops both in kind and in cash for fertilizers, pesticides etc. The cultivators are already being given loan upto Rs. 25,000 for purchase of a tractor and scraper and other appliances. The Purnea General Cooperative Bank whose financing was Rs. 16 lakhs in 1964-65 has financed about Rs. 1 crore in 1967-68. The advancement of Madhopura-Supaul Central Cooperative Bank has also increased from Rs. 6 lakhs to Rs. 40 lakhs. The total amount likely to be made available for reclamation and development of land is of the order of Rs. 4 crores.

4.26. When asked if any attempt has been made to develop suitable cropping pattern and growing of hot weather wheat, rice etc., the Committee have been informed through a written note that an Area Development Commissioner has been appointed to co-ordinate

the working of all development wings of the Government. Attempts are being made to improve the cropping pattern in the irrigation command. A three crop pattern is being adopted in place of the normal single Kharif crop. High yielding varieties of paddy like Taichung Native I, IRA 8 etc., of wheat like Lorma Rojo (Mexican), of maize like hybrid maize have been introduced and are becoming popular. The yield of Taichung paddy has been more than 50 mds. per acre, the highest yield being as high as 125 mds. per acre. The yield of hybrid maize has also been about 50 mds. per acre the highest yield being 82 mds. per acre. The average yield of Lorma Rojo wheat has been 45 mds. per acre.

4.27. There is stated to be tremendous enthusiasm among the people in the area to adopt the improved methods of cultivation. With a view to stimulating all round development in the area an integrated programme has been undertaken envisaging simultaneous activity in the agricultural and allied field in the command of the project. The programme is based on the maximum exploitation of the irrigation potential created by the construction of the Eastern Kosi Canal system, by proper water distribution and management, providing lift irrigation by sinking tubewells for areas which cannot be served by canals, arranging for proper drainage to prevent water-logging and alkanity and salinity. Provision has also been made for land development measures for optimum utilisation of the irrigation water. In addition, there is supporting programme of inputs and essential services for proper utilisation of the irrigation facilities for maximum production. Agricultural development, Pisciculture and Livestock Development and Agro-Industries for procession have also been included in the programme. An outline of the programme may be seen at Appendix IV.

4.28. When asked what steps have been taken for the development of the Kosi Command Area, the representative of the Government of Bihar has stated in his evidence before the Committee, "The entire area has been surveyed and we have determined which areas are straightway fit for cultivation and which will require partial reclamation and which more thorough reclamation. On the basis of this, programme has been drawn up and the cultivaters are being assisted financially and otherwise. Our estimates are that approximately Rs. 4 crores are to be advanced to the cultivators to bring the entire command area under cultivation. We have made arrangements to provide funds through the land mortgage banks on long

term basis. About credit facilities, as I said, we have set up a number of land mortgage banks branches all over the command area and there is also a scheme for under-writing loans by the Agricultural Refinance Corporation. Some foreign organisations were much impressed by the tremendous change and have come forward to assist us, such as the Swedish credit of about Rs. 4 crores worth of fertilizers which will be supplied free but which we will sell to constitute a revolving fund for improving the entire area."

4.29. When asked if any Agricultural Research Stations were being established in Bihar for the benefit of the Kosi Command Area, the representative of the Government of Bihar has stated "Actually in the Kosi area itself we have two Agricultural Research stations. They were set up almost from the very beginning of the Kosi Project. The idea was that keeping in view the soil conditions of the Kosi, the Agricultural Research Stations determine the best possible cropping pattern as in irrigated conditions. Since we did not have the irrigation facilities, when these Research stations were started, we installed tubewells and for the last decade records have been kept. This organisation plays a very important part in advising not only about the cropping pattern but even with regard to the number of waterings, when to water and how much to water. That programme is there. Apart from that the Agricultural Department of Bihar is fairly well developed. We have a Rice Research Institute and we have got several institutes doing research on sugarcane and wheat and so on and so forth. All those are operating in the Kosi area. They all work under the Kosi Area Commissioner. His requests and requisitions are given highest possible importance. There is only one difficulty which we have not been able to solve very satisfactorily. That is about the supply of improved variety of seeds. For that also there is a proposal to set up 10,000 acre seed farm. Some of the commercial firms are also in touch with the State Government to permit them to have the land so that they can produce the improved variety of seeds particularly the hybrid maize. The hybrid maize seed is not very easy to get. We do hope that the problem will receive the highest possible attention at the hands of the Agriculture Ministry in Bihar."

4.30. The representative of the Government of Bihar has further added that "There is a tremendous lot of prosperity coming along. The prosperity of the cultivators which has come can be gauged from the fact that in the last two years the Life Insurance Corporation business has shot up from Rs. 55 lacs to Rs. 365 lacs. There are particular police stations where 18 to 20 jeeps have been bought in a year. But we have not yet reached anywhere near the optimum or even half the optimum. There is much to be done under the

leadership of the Kosi Area Commissioner and with the assistance that is pouring in we should be able to do fairly well. The Government of India have sent a very specialised team of plant protection officers who are operating in the Kosi area. The Kosi area is getting importance at the hands of all concerned including the Government of India."

4.31. Regarding the use of chemical-fertilizers in the area, the representative of the Government of Bihar has stated, "The quantity of consumption of fertilizers has gone up 15 times in 2-1/2 years. The Agriculture Department is giving highest importance to the Kosi Area. The consumption of chemical fertilizers in 1963-64 was 950 tonnes. For 1967-68 it is 30,000 tonnes."

4.32. The Plan for the development of the Kosi Command area has won acclaim from a Canadian Task Force also which visited India in October-December, 1967. The objective of the Task Force was to identify possible agricultural programmes of high priority in India's development requirements which would be within Canadian capacity to implement and be consistent with Canada's External Aid Policies. The task Force has commended the set-up of the Kosi Area Development Commissioner for adoption on similar big projects.

4.33. When asked if any survey has been made to assess the rural benefit and the economic development in the Kosi Command area, the representative of the Ministry of Irrigation and Power has stated before the Committee "I believe that some survey was attempted but there were some difficulties because the pre-1954 yardstick was not available. So only some field studies and random sample surveys were made. But I feel myself that it would be an interesting thing to have a scientific survey made in this regard by the National Council of Applied Economic Research. I think we should really have such surveys to find out how far the benefits of these projects have accrued to the community in general both directly as well as indirectly, because the relief due to flood control is not directly seen."

4.34. The Committee hope that the Kosi Command area a major part of which was so far unfit for cultivation and was simply a devastated track of swampy land covered with jungles of 'Kans' and 'Pater' would be reclaimed and modern methods of cultivation introduced there. The Committee are glad that there is great enthusiasm among people of the area to adopt triple cropping pattern

and utilise the latest techniques of cultivation. They hope that necessary financial assistance and inputs for agricultural purposes will be provided to them in time.

4.35. The Committee would further recommend that a survey of the Kosi Command Area should be undertaken by the National Council of Applied Economic Research or some other suitable agency to assess the extent and magnitude of the benefits that have accrued to the people of the area and its impact on the economy of Bihar. The Committee feel that such a study would be highly beneficial for the development of culturable command area in other river valley projects also.

CHAPTER V

ACHIEVEMENTS OF KOSI PROJECT

A. Benefits to Bihar

5.1. As already stated, the main problem in the River Kosi was to confine the river to a set course and prevent its lateral movement. For that purpose work on the Flood embankments on both banks of the Kosi River was taken up in 1953 and completed in 1959. It was for the first time that the river was confined to a set course. This has on an average protected 5.28 lakh acres of land in Darbhanga (1.17 lakhs) and Saharsa (4.11 lakhs) districts of Bihar from the ravages of flooding. This area has been selected by the State Government for levy of betterment levy on account of benefits from flood control measures. Kharif crops on this land were formerly badly damaged and even Rabi sowing was sometimes affected by standing water and excessive moisture. Severe damage was also caused to properties like buildings, orchards etc.

5.2. It has been stated that the prevention of flooding in this area has resulted in:—

(i) Construction of a network of metalled roads providing improved communications and thereby adding to the convenience and prosperity of the people.

(ii) Communications on the Mansi-Supauj and Saharsa-Purnea sections of the North-Eastern Railway which were formerly cut off in the wet season are now possible throughout the year. The longer running period will mean a rise in railway earnings from fares and freights. The villagers served by these lines will have better facilities for carrying their produce to markets.

(iii) Replacement of improvised and temporary thatched houses of private individuals, commercial concerns and Government departments by pucca buildings reflecting a better standard of living and a sense of security.

(iv) Reclamation for cultivation of large areas of land which was formerly infested with 'Kans' and 'Pater'.

(v) Opening of small scale industries and even major factories like the Sugar factory proposed at Banmankhi.

(vi) Reduction of flooding and water-logging and consequential improvement in general health.

(vii) Considerable reduction in expenditure on annual flood relief and loss due to remission of land rents.

5.3. It has been stated that in addition, the following additional benefits will accrue from the Kosi Project:

1. The Eastern Kosi Canal System will provide annual irrigation to 14.34 lakh acres of land in Saharsa and Purnea districts. The Canal System is nearly complete. This canal system will secure an additional annual production of 360 lakh maunds of agricultural products valued at approximately Rs. 32 crores at 1965 prices.

2. Rajpur Canal System will provide irrigation to an area of 3.97 lakh acres in Saharsa and Monghyr districts. This scheme will serve additional annual production of 54 lakh maunds of agricultural products valued at Rs. 9 crores approximately.

3. The availability of water from the Canal system during hot weather from the latter part of March onwards has helped in the cultivation of a better variety of jute which is sown in March-April and harvested in July. Goods made from this variety of jute have very good demand outside India and this will help in earning foreign exchange.

4. The Kosi Barrage has opened up all weather communication between Saharsa and Purnea districts on the one bank and Darbhanga district on the other.

5. The Project visualises opening of blocked drainage channels and drainage of water-logged depression in Purnea and Saharsa districts. Investigations for a comprehensive drainage scheme have already been taken up. The works when executed will help in further improving this area.

6. A metalled road from Bathnaha to Bhimnagar has been constructed. This road provides much needed means of communication in this locality.

B. Benefits to Nepal

5.4. It has been stated that the Kosi Project will result in the following benefits to Nepal:

(1) The flood embankments on both sides of the river Kosi have protected an area of 1.27 lakh acres in Nepal from annual flooding

against a moderate flood of about 3.5 lakh cusecs. As compared to the maximum flood of the order of 8.5 lakh cusecs, which actually passed through the river in 1954, the area protected will be considerably larger. The embankments have confined the river to a regular course and the people living in the protected zones are feeling more and more secure as is apparent from the increasing public and private investments in the locality.

(2) The river had a tendency to swing towards the West and the area above Hanumannagar used to be eroded almost every year. Construction of Kosi Barrage at Bhimnagar has provided stability for at least upto 8 miles upstream of the Barrage where effect of ponding will extend for a few miles on the downstream side.

(3) After the completion of the Barrage it has become possible to provide an all weather permanent communication between Western and Eastern portions of Nepal Terai where the only means of communications previously was country boats which were risky to ply during floods. The traffic between those two districts has consideably increased and the custom duty collected has gone up correspondingly.

(4) The Chatra Canal System will provide annual irrigation facility to 2.12 lakh acres of land in Morang and Saptari districts of Nepal, resulting in an additional annual production of 39 lakh maunds of agricultural products valued at Rs. 4.75 crores at 1965 prices.

(5) A further area of 70,000 acres will be irrigated in the Saptari District of Nepal if work on Western Kosi Canal is taken up and this will secure additional annual yield of 12 lakh maunds of agricultural products valued at Rs. 1.65 crores.

(6) Execution of the Project has opened up vast opportunities for employment. Many have been trained as Mechanics, Drivers, etc. Irrigated agriculture will open up further opportunity for employment in agriculture based industries.

(7) Half the power available from Kosi Hydel power station will be given to Nepal on rates to be mutually agreed upon.

(8) Conditions in areas benefited by embankments have improved considerably and better facilities for communications have become necessary. India is, therefore, constructing all-weather metalled roads from Hanumannagar to Kanauli, Hanumannagar to Fatahpur and Hanumannagar to Rajbirij at an estimated cost of Rs. 70 lakhs.

5.5. The Committee note the achievements of the Kosi Project, which now is in an advanced stage of completion. They have no doubt that the Project, when finally completed, will stand as a landmark in the mighty endeavour of the people of the country for their economic upliftment and will symbolise man's perennial struggle against the ravages of nature.

5.6. The Committee have been told in the course of evidence that the Government of India are giving financial assistance outside the State Plan for six or seven selected Projects in 1968-69. In view of the fact that accelerated assistance to such projects of national importance outside the State Plans will go a long way in their expeditious completion, the Committee suggest that Government may examine the desirability of providing funds to them outside the State Plans in future also. The Committee trust that paucity of funds wil not be allowed to stand in the way of early completion of such projects.

NEW DELHI;
February 20, 1969
Phalguna 1, 1890 (*Saka*)

P. VENKATASUBBAIAH,
Chairman,
Estimates Committee.

APPENDIX I

(*Vide* para 2.22 of the Draft Report)

Statement showing the dates of the sittings of the Kosi Central Board

1st meeting	2-12-1954
2nd ,,	31-3-1955
3rd ,,	6-7-1955
4th ,,	8/9-10-1955
5th ,,	2-3-1956
6th ,,	13-6-1956
7th ,,	5-9-1956
8th ,,	4-10-1956
9th ,,	4-12-1956
10th ,,	11-1-1957
11th ,,	23-3-1957
12th ,,	26-6-1957
13th ,,	28-10-1957
14th ,	15-7-1958
15th ,,	17-12-1958
16th ,,	12-9-1959
17th ,,	1-10-1959
18th ,,	31-1-1960
19th ,,	20-9-1960
20th ,,	22-3-1961
21st ,,	15-7-1961
22nd ,,	20-11-1961
23rd ,,	28-5-1962
24th ,,	18-12-1962
25th ,,	22-1-1965
26th ,,	16-12-1965

APPENDIX II

(*Vide* para 2·34 of the Report)

Comparative Statement showing terms and conditions of loans sanctioned in respect of multi-purpose river valley projects.

Sl. No.	Name of Multipurpose Project	Components of the Project	Period of repayment	Rate of interest.
1	2	3	4	5
1.	Kosi (Main Scheme)	Irrigation & Flood Control.	Loans for 'Irrigation' portion are 30 year loans repayable in 20 annual equated instalments of both principal and interest commencing from the 11th anniversay of payment of each loan, interest being payable during the first 10 years. Loans for 'Flood Control' portion are 25 year loans repayable in 20 annual equated instalments of both principal and interest commencing from the sixth year interest alone being payable during the first five years. During the first five years, when interest alone is payable, subsidy is given to the State Govt. to cover the amount of interest which the State Govt. pay to the Central Government in respect of the first five years. No subsidy is, however, payable in respect of flood control loans given for 1966-67 onwards.	The rate of interest depends upon the borrowing rate of the Govt. of India for the year in which the loan is sanctioned and this rate may vary from time to time. The present rate of interest in respect of loans where the period of repayment exceeds 15 years is 5¾.
2.	Chambal Project (Stages I & II)	Irrigation & Power.	25 year loans repayable in 17 annual equated instalments of both principal and interest commencing from the 9th anniversary of the payment of each loan, interest being payable annually during the first 8 years.	Do.

1	2	3	4	5
3.	Beas	Irrigation & Power.	25 year loans repayable in 17 annual equated instalments of principal and interest commencing from the 9th anniversary of payment, interest being paid annually during the first 8 years.	Do.
4	Ukai	Irrigation & Power.	25 year loans repayable in 17 annual equated instalments of both principal and interest commencing from the 9th anniversary of the commencement of each loan, interest being payable annually during the first 8 years.	Do.

NOTE: 1. With effect from the 10th June 1968.

(a) Loans are repayable in *equal* instalements of principal together with interest due on the outstanding principal from time to time *instead* of equated instalments of both principal and interest.

(b) A rebate of ¼% will be admissible for timely repayment of principal and/or interest. In the event of any default in the repayment of loan and/or interest thereon, interest at a rate higher than the normal rate by 2½ % would be chargeable on all overdue instalments.

2. The general pattern of earmarked loan assistance for major Irrigation & Power Projects is:

(a) in the case of purely irrigation projects, the assistance is in the form of 30 year loans and during the first 10 years interest alone is payable.

(b) in the case of purely power projects, the assistance is in the form of 20 year loans and during the first 5 years interest alone is payable; and

c) in the case of multipurpose projects the assistance is fn the form of 25 year loans and during the first 8 years interest alone is payable.

APPENDIX III

(*Vide* para 3.3 of the Report)

Salient features of Hanumannagar Barrage

(a) Total length between abutment faces	3,770 ft.
(b) Crest level of barrage:	
(i) Wier	EL 235 ft.
(ii) Undersluice	EL 230 ft.
(c) Road level	EL 255 ft.
(d) Width of roadway	22'-6" with 4'-9" walk way on one side.
(e) Gates:	
(i) Spillway	46 of 60'×21'
(ii) Undersluice	10 of 60'×26'
(f) Eastern Earth Dam (length)	6,218 ft.
(g) Western Earth Dam (length)	12,200 ft.
(h) Eastern Afflux Bundh (length)	43,000 ft.
(i) Western Afflux Bundh (length)	44,237 ft.
(j) Present Pond level	EL 245 ft.
(k) Future Pond level	EL 255 ft.
(l) Top of pier	EL 260 ft.
(m) Top of gate overbridge	ELE 298 ft.
(n) Maximum design discharge through Eastern Kosi Head regulator	17,000 cusecs
(o) Gates of left Head regulator	7 of 40' each.
(p) Maximum discharge through Western Kosi Head regulator (right side)	17,000 cusecs.
(q) Gates of right Head regulator	3 of 40' each.
(r) Submerged area due to ponding including river bed	16 sq. miles.

APPENDIX IV

(*Vide* para 4.27 of the Report)

Kosi Valley Development Scheme at a Glance

1. The Barrage across river Kosi was completed in 1963. The Eastern Kosi Canal System is also almost complete except for the extension scheme known as Rajpur Canal. Irrigation Development is proceeding very fast.

1.2. In its westward movement the river had laid waste large tracts of land in the district of Purnea, Saharsa, by depositing coarse sand. The devastated tracts got covered with jungles of "KANS" and 'PATER' and the low lands got water-logged. The earthquake of 1934 also threw up large quantities of sand. Paddy and jute were the main crops of the area. Wheat was unknown. Some maize was grown in the Kharif. With the limited irrigation provided so far the change over in the cropping pattern has been very encouraging. Wheat including the High Yielding Varieties of Lorma Rojo has since been introduced and accepted. Irrigated jute with foliar spray has been established. Summer crop of paddy including High yielding varieties of Taichung Native-I has been introduced. The crop in the canal command has been 300 percent of the normal crop. As a result, there is tremendous enthusiasm. Given the support of inputs, credit and marketing and given proper supply of water at the required time, a rapid agricultural revolution in this area is within sight.

1.3. In this context, and with a view to stimulating all round development in the area an integrated programme has been undertaken envisaging simultaneous activity in the agricultural and allied field in the command of the Project.

The Programme is based on the maximum exploitation of the irrigation potential created by the construction of the Eastern Kosi Canal System by proper water distribution and management providing lift irrigation by sinking tube wells for areas which cannot be served by canals arranging for proper drainage to prevent water-logging and alkalinity and salinity. Provision has also been made for land development measures for optimum utilisation of the irrigation water. In addition, there is a supporting programme of inputs

and essential services for proper utilisation of the irrigation facilities for maximum production, Agricultural Development, Pisciculture and Livestock Development and Agro-Industries for processing have also been included in the programme.

1.4. 21 Blocks of Purnea District and 22 Blocks of Saharsa district will receive irrigation from the Eastern Kosi Canal System when fully developed. The area will get irrigation from 5 Branch Canals taking off from the Main Canal *e.g.* (1) Araria Branch Canal, (2) Purnea Branch Canal, (3) Jankinagar Branch Canal, (4) Murliganj Branch Canal, and (5) Rajpur Branch Canal. The first four Branch canals with distribution systems are complete except for construction of additional watercourses. The work on Rajpur Branch Canal is however, still in progress. The development of the area within the command of Rajpur Branch Canal will take sometime.

1.5. The Northern region close to the Main Canal is getting the full impact of irrigation and can be developed quickly. The development of areas further south will take sometime and the area within the command of Rajpur Branch Canal will take still more time. It is, therefore, proposed to divide the command area into four zones (A) Northern Zone, (B) Central Zone, (C) Southern zone, and (D) area commanded by Rajpur Branch Canal and their development taken up in this order.

The proposals in this Project are in respect of Zone-A, comprising Narpatganj, Forbesganj, Araria, Raniganj, Bhargama and Banmankhi Blocks of Purnea district and Chhatapur, Tribeniganj, Kumarkhand, Basantpur and Raghopur Blocks of Saharsa district, and of zone B comprising Purnea East, Krityanand Nagar, Dhamdaha, Barharakothi, Kasba, Korha and Falka Blocks of Purnea district and Murliganj, Singheshwar and Madhepura Blocks of Saharsa district. Some of the items mentioned in the Project Report are included in the Scheme sanctioned by Government and the Reserve Bank. The requirement of funds for these items have not been included in the Project Estimate. The Project period contemplated is four years during which the various items of the Programme have been phased. This programme is only the first phase of a larger programme, it would be extended in due course to the other two zones *viz.* C. & D.

The Project involves a total outlay of Rs. 597.33 millions over the following items—

(a) *Water-distribution and management*—

Construction of levees on both sides of the river for a total length of 350 miles, the barrage, the main canal, four branch canals and

their distributories, minors etc. are complete. There is provision in the State Plan for completion of Rajpur Branch Canal and water-courses and as such the expenditure over these items has not been included in the Project Estimate. Similarly, the conversion of temporary outlets to permanent outlets is also part of the Kosi Scheme and has not been charged to this Project. The total estimated investment on irrigation portion of the entire Kosi Scheme will be about Rs. 366.20 million, the proportionate cost for the area selected will be about Rs. 234.37.

The only items which have been included in the Project are (1) Rs. 20.23 millions for drainage and (2) Rs. 39.50 million for construction of tube wells by State Government, the cost of construction of tube wells by private individuals will be financed from loan advanced to them and have not been included in the Project Estimate.

(b) *Land & Soils*—

A good deal of land development measures will be required for optimum utilisation of irrigation water. A scheme for reclamation and development of land for the entire command area at a total cost of Rs. 40.61 millions has been sanctioned by the Agricultural Refinance Corporation and the State Government, the proportionate investment on the area in question will be about Rs. 32.81 million. As the Scheme has already been sanctioned and is in operation it has not been included in the Project Estimate. The cost of Tractors, Scrapers and spares required for doing the mechanical part of the work amounting to Rs. 3.52 million has been included in the Project.

Testing of Soil for advising cultivators as to the best manurial dose to be applied is considered necessary and a provision of Rs. 0.21 million has been made for this item.

(c) *Inputs*—A total provision of Rs. 426.72 million has been made for supply of inputs and services for intensive and improved farming. With assured supply of water multi-crops have already been introduced. Cultivators have also taken to High Yielding Varieties Programme and a large area is expected to be covered by the Programme. The major items of expenditure under this head are Seed Farms Rs. 21.17 million, Fertiliser Rs. 362.75, Plant Protection Equipments Rs. 39.14 million and Servicing Rs. 3.66 millions.

(d) *Horticultural Development*—

There is considerable scope for horticultural development in the area and the soil is specially suited for banana, pine-apple, mango,

licchis etc. A provision of Rs. 5.16 millions only has been made under this item, mostly for granting loan to owners.

(e) *Pisciculture—*

There are a large number of State owned and private owned tanks in the area which can be utilised for rearing of fish. A sum of Rs. 7.20 million has been provided for this item, on renovation of Govt. tanks at full cost and private tanks on loan and subsidy.

(f) *Live Stock development—*

Total provision of Rs. 6.01 million has been made on live stock development for cattle development, fodder development and poultry development.

(g) *Servicing, Processing, Marketing, Transport and Storage including Communication.*

A total provision of Rs. 57.18 million has been made under this head, the detailed break-up being (i) Rs. 2.90 on Agro industries for services for supply of chemical pesticides, bone-meals, hime pipes etc. (ii) Rs. 18.95 on processing industries like Rice Mills, Strawboard factories, dehydration, (iii) Rs. 4.20 on Cold Storage, (iv) Rs. 7.29 etc. on Halka godown and Warehouses etc. and (v) Rs. 23.84 million on communication specially for construction of feeder roads connecting trunk roads with other roads and village Mandies.

(h) *Extension & Training—*

Total estimate under this head is Rs. 23.30 million. A sum of Rs. 1.46 million has been provided for training of farmers in the existing Agricultural Schools at the two District Headquarters. Rs. 0.84 million has also been provided for strengthening of the existing District Information Units. Besides, a sum of Rs. 21.00 million has been provided for setting up 210 Farm Service Institutions. Institutes to provide a counter for advancing all inputs to cultivators and or discremination among them, their latest agricultural knowledge and practices.

(i) For a Project of this magnitude and nature it is necessary to ascertain the present position in the various fields and to provide for regular assessment of progress in order to evaluate the working of the programme and make modifications and take corrective measures wherever necessary. A sum of Rs. 0.30 million has been provided for this work.

The Project has a very large loan component. The organisational arrangements for handling the credit to be disbursed under the Pro-

ject is still under the consideration of the State Government and it is expected to be finalised soon. The existing agencies like Cooperatives, Agriculture Department and Revenue Department are being utilised in the meantime.

The Development Commissioner, Bihar, co-ordinates the activities of the various Departments at the State level and the Kosi Area Development Commissioner at the field. A Kosi Advisory Committee has also been formed at the State level under the Chairmanship of the Development Commissioner, Bihar, with the Agricultural Production Commissioner, Bihar, Chief Administrator, River Valley Projects Department, with the Kosi Area Development Commissioner, is Secretary of the Committee leaving Secretaries of concerned Departments of Government.

Subject to any modification that may be necessary at the stages of detailed examination of the proposal, the total cost of programme is estimated at Rs. 597.33 million. The additional yield from the acreage covered by Progdamme may be about 1 tonne per acre in terms of foodgrains for the area put under high yielding varieties and 0.25 tonne per acre for the remaining irrigated area. At an average value of Rs. 700 per tonne, the economic benefit to the farmers may be of the order of Rs. 583.79 million in the last year of the programme on an investment of Rs. 195.44 on this Project (excluding the cost of fertilisers and insecticides) plus Rs. 234.37 million invested in Kosi Scheme and Rs. 32.81 million to be invested on reclamation and development of land *i.e.* Rs. 462.62 million. If the extra production of foodgrains from areas irrigated from the tube well, and the reclaimed areas are taken under consideration, as also the extra production of milk, eggs, chicken and the additional income from the processing industries are taken into account, the additional benefit in 1970-71 will be more than the total investment on all the items including cost of fertiliser, insecticides. The programme is, therefore, economically viable.

AREA-WISE ABSTRACT OF COST

Sl. No.	Description (including service charge for 4 years wherever applicable).	Amount (in million rupees)		
		Zone—A	Zone—B	Total
1	2	3	4	5
I. Water distribution and Management				
(1)	Drainage	15·53	12·70	28·23
(2)	Lift Irrigation from tube wells	22·00	17·50	39·50
		37·53	30·20	67·73
II. Land and Soil				
(1)	Cost of tractors, scrapers and spares	1·76	1·76	3.52
(2)	Soil Testing Laboratory	0·21	..	0·21
		1·97	1·76	3·73
III. Inputs				
(1)	*Seed*			
	(i) Setting up of 5,000 acres seed multiplication farm	19·37	..	19·37
	(ii) Setting up of 1,000 acres hybrid maize seed production farm	1·80	..	1·80
(2)	Fertiliser	198·39	164·36	362·75
(3)	Plant Protection & Pesticides	21·24	17·90	39·14
(4)	Implements & setting up of workshops	2·42	1·24	3·66
		243·22	183·50	426·72
IV. Horticultural Development		2·58	2·58	5·16
V. Pisciculture		3·60	3·60	7·20
VI. Livestock Development				
(1)	Cattle Development	1·815	1·815	3·63
(2)	Fodder Development	1·90	..	1·90
(3)	Poultry Development	0·24	0·24	0·48
		3·955	2·055	6·01

1	2	3	4	5
II. Servicing, Processing, Marketing, Transport & Storage including Communication				
(1)	Agro Industries for service	1·70	1·20	2·90
(2)	Industries for processing agricultural produce .	12·10	6·85	18·95
(3)	*Marketing, storage and transport*			
	(i) Cold storage	2·20	2·00	4·20
	(ii) Halka godown, warehouses etc. . . .	3·77	3·52	7·29
(4)	Communication	8·69	15·15	23·84
		28·46	28·72	57·18
VIII. Extension and Training				
(1)	Farmer's training	0·73	0·73	1·46
(2)	Information Units	0·42	0·42	0·84
(3)	Farm Service Institutes	11·00	10·00	21·00
		12·15	11·15	23·30
IX. Economic studies		0·15	0·15	0·30
	TOTAL .	333·615	263·715	597·33

APPENDIX V

Statement showing summary of Recommendations/Conclusions

S. No.	Reference to Para No. of the Report	Summary of Recommendations/Conclusions
1	2	3
1.	1.28	The Committee note that while attempts were being made since 1893 for taming a turbulent river like the Kosi, no concrete steps could be taken in this direction till the achievement of independence. It redounds to the credit of Indian engineers that they could prepare a comprehensive multi-purpose project for providing flood protection in the Kosi flood plane, irrigation facilities in Nepal and Bihar, generation of hydro-electric power and navigation on an extensive scale.
2.	1.29	The Committee note that the various items of the project were sanctioned on a piecemeal basis and new schemes were added up from time to time. This naturally led to the recasting of the project in material details. While the Committee appreciate that in a project of such magnitude as Kosi, which was taken up for the first time in India, there was an absence of a complete integrated plan at the very beginning, they feel that steps should be taken, as far as possible, before sanctioning new projects to draw up an integrated plan in the initial stages so as to obviate the possibility of subsequent changes which usually result in delay and considerable additional expenditure.
3.	2.14	The Committee note that the estimated cost of the project has undergone as many as 12 revisions—generally in an upward direction—

1	2	3
		with the result that the original rough estimate of Rs. 37.31 crores prepared in 1954 is now estimated to cost in the neighbourhood of Rs. 85.34 crores *i.e.* an increase of about 130 per cent. While increase in cost of materials and wages has been partly responsible for this increase, the cost has also gone up because of changes in the design and scope of works and inclusion of new items. There has been a lack of any clear-cut demarcation of the responsibilities with regard to the preparation of project estimates as is evident from the fact that several authorities were at one stage or the other engaged in the preparation and scrutiny of the estimates, which frequently were at variance with each other. It is also on record that there have been differences among experts in regard to the construction of the barrage and its utility for the purpose of flood control and safeguarding of embankments.
4.	2.15	The Committee cannot help concluding that frequent changes in the estimates of the project, due principally to change of designs and addition of items, could have been avoided, if the project had been sanctioned after a full investigation and preparation of a complete project report with carefully worked out estimates of cost. This underlines again the necessity of drawing up even in the initial stages an integrated project report after obtaining competent technical advice in regard to various components of the project so that the necessity of consulting different experts later on is obviated.
5.	2.16	The Committee would stress that it should be ensured that when a new project is taken up for execution, it should be sustained at the required optimum pace so as to complete it within the scheduled time, as any undue delay in the execution of the project leads to unavoidable

1	2	3
		increase in cost as well as the postponement of realisation of benefits from the project which again means slowing down the economic progress of the people in that area.
6.	2.17	The Committee further note that the Central Water and Power Commission has taken quite a long time to scrutinise and approve the revised estimates when submitted. For example, even before the revised estimates submitted in 1965 could be cleared, another upward revision of the estimates became necessary in 1968. The Committee would like to stress that as and when revised estimates for any project become unavoidable the same should be examined fully and expeditiously by the Central Water and Power Commission so as to avoid delays, doubts and uncertainties about execution.
7.	2.24	The Committee are aware that as the work of execution of the Kosi Project and its various units are completed, there will be need for reduction in the strength of staff at present employed. Especially, after the work on construction of water courses tapers off, the staff at present employed thereon would be surplus. The Committee suggest that the State Government endeavour, by advance planning, to see that as and when the staff becomes surplus in the Kosi Project, they are gradually absorbed in other projects in the State.
8.	2.25	The Committee note the composition and functions of the Kosi Control Board. From the list of meetings of the Control Board furnished to the Committee it is observed that no meeting of the Control Board was held during 1963 and 1964 and no meeting appears to have been held since 1965. In view of the fact that work on the construction of the Rajpur Canal, Western Kosi Canal, Extension of embankments and the Kosi Hydel Station is still outstanding, the Com-

1	2	3
		mittee feel that the Control Board should meet frequently to review the progress of work and give necessary direction to the project authorities for accelerating the pace of work.
9.	2.43	From the pattern of provision and expenditure made for the Kosi Project during the first three Five Year Plans, the Committee note that the project authorities have not only been able to utilise the Plan provisions in full but have also incurred expenditure in excess of the Plan provisions. They are glad to note that there has been fuller utilisation of the budget provisions from year to year.
10.	2.44	While there has been difficulty in providing adequate funds in the form of loan assistance for the project during 1967-68, the Committee are happy to note that in 1968-69 the entire amount required by the Government of Bihar for the Kosi Project is being provided. Considering the present stage of development of the Kosi Project and the need for providing irrigation on a massive scale, the Committee hope that shortage of funds will not be allowed to stand in the way of speedy execution and completion of the residual items of work, namely, the construction of the various canals and the water courses.
11.	2.45	In this connection, the Committee would like to emphasise that alongside the construction of the canals and the water courses, suitable measures should be taken for flood control including maintenance of the embankments, etc., so that the expenditure incurred on the project is not rendered infructuous by sudden and heavy floods. The Committee are glad to note that at the beginning of each year, sections are checked and model experiments are done with a view to see what preventive measures, if any, could be taken.

1	2	3
12.	3.13.	The Committee note that the Kosi Project which was approved in 1953 contained as one of its major components a barrage designed principally to control the floods in the Kosi river. They also note that the work on the barrage was completed in 1963 at a total cost of Rs. 30 crores. The Committee would like to emphasise that now that the barrage has been completed, the question of its proper maintenance should be given the attention it deserves so that there may not be any breaches in future and the life of the barrage may be extended considerably.
13.	3.14.	The Committee are unhappy to state that there have been differences of opinion among experts as regards the probable life of the barrage. They would like to be assured that the barrage, which has been built at an enormous cost, is expected to give satisfactory service for a long period.
14.	3.15.	The Committee are also unhappy that there has been delay in the consideration of the suggestion made by the Kosi Technical Committee for the construction of a second barrage at Dagmara. They feel that it would have been better if experts from Central Water and Power Commission and the Central Water and Power Research Station, Poona, had been associated with the work of the Kosi Technical Committee in their official capacity in the initial stages so that agreed decisions could have been taken. As matters stand at present, the Committee find that the proposal is under consideration of the Government of Bihar and a final decision will be taken by the Central Water and Power Commission after receiving the opinion of the Bihar Government. The Committee hope that an early decision in the matter will now be taken.
15.	3.30.	The Committee note that the entire flood control benefits of the Kosi Project are depen-

1	2	3
		dent upon the proper and adequate maintenance of flood embankments. Now that the river has been confined to a set course within the embankments, a lot of developmental activities have taken place all around the area and any major breach in the embankment is likely to lead to very heavy loss of life and property. The Committee have further noted that the embankments have been subjected to repeated attacks year after year and breaches have already taken place on several occasions. From the very beginning, the experts visualised an efficient and effective maintenance organization, for the preservation of the embankments. The Committee would like to emphasise that top priority should be accorded to the maintenance of embankments. The Committee would also like to emphasise that a system of round-the-clock vigil particularly in the flood season should be developed. For this purpose the co-operation of the local population should be solicited and a suitable training scheme introduced.
16.	3.31.	The Committee further suggest that a careful and thorough study of the tendency of the river to attack particular points (as at Dalwa) should be immediately made and preventive steps taken forthwith so that breaches may not occur at those points after repeated pressure from the river.
17.	3.32.	It is also desirable to investigate thoroughly the reasons for the breaches that have occurred from time to time to ensure that oppropriate preventive measures to avoid recurrence are taken in time.
18.	3.33.	The Committee would also like to emphasise that all the steps suggested by the Kosi Technical Committee and the Central Water and Power Research Station, Poona should be undertaken without any delay and shortage of fund should

1	2	3
		not be allowed to stand in the way of effective and efficient maintenance organization for the ambankments.
19.	3.40.	The Committee note that the Eastern Kosi Canal when completed will have a considerable impact on the economy of Purnea and Saharsa districts of Bihar. The Committee have also noted that when the full irrigation potentialities are created, the canal would provide additional irrigation to about 14 lakh acres and would result in additional production annually of 18 lakh tons of foodgrains and other crops. During their visit to the Kosi Project Area, the Committee were shown some of the areas where benefits of irrigation have already been realised and the Committee were greatly impressed by the results of the irrigation system introduced as a result of the Kosi Project. The Committee also appreciate the various steps taken by the Government for making the irrigation water available to the cultivators, as and when the canals are ready. The Committee are inclined to agree with the views of the Project Authorities that if all the steps for the utilisation of irrigation potential had been taken a year or two earlier the benefits flowing from irrigation would have been correspondingly advanced.
20.	3.41.	The Committee would like to emphasise that in the present context of the economic situation of the country, when there is an all-round need for attainment of self-sufficiency in food-grains, the early realisation of irrigation benefits from Kosi Canals has assumed increased importance since the availability of irrigation facilities from Eastern Kosi Canal is not dependent upon rainfall. The Committee need hardly stress that every endeavour should be made to complete the remaining works of the Eastern Kosi Canal at an early date and efforts should be made to

1	2	3
		achieve optimum utilisation of irrigation potential, if possible, earlier than the target date as the same would go a long way in transforming the economic situation in the country.
21.	3.47.	The Committee note that on completion, the Rajpur Canal is expected to irrigate an area of about 3.97 lakh acres and that while special importance has been attached to this scheme which promises to provide immediate benefits, an accelerated programme for its completion could not be put through because of shortage of funds. In 1967-68, against a requirement of Rs. 100 lakhs, only a sum of Rs. 56 lakhs could be provided and in the current year only half of the requirements of the Canal are being met. The Committee recommend that in view of the magnitude of the irrigation benefits which are accruable on the completion of the canal and keeping in view the declared policy of the Government to give accelerated financial assistance to the Projects which are in an advanced state of construction, additional funds should be provided to the Bihar Government for the early completion of the Canal particularly when the Bihar Government claim that they are in a position to utilise more funds than what are being allotted to them.
22.	3.52.	The Committee note that the scheme for Western Kosi Canal was approved in 1960-61 but work on the Canal has not yet started with the result that the water potential has remained unutilised. Now that an agreement has been signed with His Majesty's Government of Nepal and surveys of the alignment of the Canal have been finalised, the Committee would like to stress that work on this canal should be started as early as possible and every effort should be made to complete the construction of the canal during the Fourth Plan period.

1	2	3
23	3.59	The Committee are glad to note that the Government have undertaken the construction of the Chatra Canal which will result in great benefits to the people of Nepal. The Committee are also glad to note that considerable progress of work had been made on the construction of the Canal and irrigation is expected to be provided from this Canal from June, 1969. The Committee hope that its completion will further strengthen the traditional friendship between the two countries *viz* India and Nepal.
24	3.69	The Committee feel that there has been considerable delay in the construction of the Kosi Hydel Station which was expected to start power generation from 1966-67. This has deprived a large number of people of cheap electricity in an area where no other source of power is available at present. This delay has also affected the utilisation of irrigation potential, since due to the location of the power house in the main canal, water could not be utilised and bye-pass canals had to be constructed later. While appreciating that some of the reasons contributing to the delay like seizure of machinery by Pakistan and shortage of foreign exchange were unforseen, the Committee cannot help reaching the conclusion that lack of proper planning has also been partly responsible for the delay. The Committee hope that the present target regarding the commissioning of power house would be adhered to.
25	4.12	The Committee note that although the construction of the barrage and embankments have by and large solved the flood problem of the River Kosi and provided protection to a large area, the dangers created or likely to be created by the river have not yet been completely eliminated.

1	2	3
26	4.13	The river has been subject to floods and it has been exerting great pressure on the embankments practically every year. It is, however, gratifying to note that the barrage and the embankments have on the whole withstood the onslaught of the yearly floods quite well and except in the case of 1968 floods, there has not been any major breach.
27	4.14	The Committee feel unhappy that although more than two and a half years have elapsed since the Kosi Technical Committee submitted their report, final decisions and effective follow up action have not been taken on a number of recommendations. The Committee would urge that action on the pending recommendations of the Kosi Technical Committee should be taken without any further delay and the matter given the utmost consideration that it deserves.
28	4.15	The Committee would in particular like to emphasise the need for developing a fool-proof flood-warning system so that evacuation measures could be resorted to on an emergency basis when needed and loss of lives and property averted.
29	4.16	The Committee regret to observe from the report of the Chief Engineer, Central Water and Power Commission that because of a number of fox holes and rat holes, water could pass through the embankments causing them to sink and be breached, thus resulting in heavy loss of life and property. The Committee would emphasise that adequate measures should be taken to check the embankments thoroughly and continuously and plug the holes as soon as they are noticed. The Committee are constrained to observe that the fact that the Overseer concerned and the S.D.O. were not present at the time of breach of embankment only shows the casual manner in which the work of superintendence and supervision is being carried out. The Committee would

1	2	3
		like that the circumstances under which no responsible official could be present at the time of breach of embankment should be investigated and adequate measures such as issue of guide lines be taken to avoid the recurrence of such eventualities in future.
30	4.17	The Committee note that a number of suggestions have been made by the Minister of Irrigation and Power and the Chief Engineer, Central Water and Power Commission for solving the flood problems of the River Kosi. They would urge that early and speedy action on these recommendations should be taken. The Committee feel that there cannot be any cut and dried formulae for solving the flood problem of the river Kosi. Continuous studies of the behaviour of the river should be made by project authorities and the problems discussed periodically at seminars which should be attended by experts already working on other river valley projects, universities and research institutes.
31	4.18	The Committee would also like to stress that a thorough research into the water logging problem in the Kosi area should be undertaken particularly in view of the fact that this problem is going to be a normal feature in the case of practically all the river valley projects.
32	4.34	The Committee hope that the Kosi Command area a major part of which was so far unfit for cultivation and was simply a devastated track of swampy land covered with jungles of 'Kans' and 'Pater' would be reclaimed and modern methods of cultivation introduced there. The Committee are glad that there is great enthusiasm among people of the area to adopt triple cropping pattern and utilise the latest techniques of cultivation. They hope that necessary financial assistance and inputs for agricultural purposes will be provided to them in time.

1	2	3
33	4.35	The Committee would further recommend that a survey of the Kosi Command Area should be undertaken by the National Council of Applied Economic Research or some other suitable agency to assess the extent and magnitude of the benefits that have accrued to the people of the area and its impact on the economy of Bihar. The Committee feel that such a study would be highly beneficial for the development of cultiable command area in other river valley projects also.
34	5.5	The Committee note the achievement of the Kosi Project, which now is in an advanced stage of completion. They have no doubt that the Project, when finally completed, will stand as a landmark in the mighty endeavour of the people of the country for their economic upliftment and will symbolise man's perennial struggle against the ravages of nature.
35	5.6	The Committee have been told in the course of evidence that the Government of India are giving financial assistance outside the State Plan for six or seven selected projects in 1968-69. In view of the fact that accelerated assistance to such projects of national importance outside the State Plans will go a long way in their expeditions completion, the Committee suggest that Government may examine the desirability of providing funds to them outside the State Plans in future also. The Committee trust that paucity of funds will not be allowed to stand in the way of early completion of such projects.

APPENDIX VI

Analysis of Conclusions/Recommendations contained in the Report

I. CLASSIFICATION OF RECOMMENDATIONS:

A. Recommendations for improving organisation and working:

Serial Nos. 3, 4, 6, 8, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22, 24, 25, 26, 27, 28, 29, 30, 32.

B. Recommendations for effecting economy:
Serial Nos. 2, 5, 19, 20.

C. Miscellaneous Recommendations:

Serial Nos. 1, 7, 9, 10, 23, 31, 33, 34, 35.

II. ANALYSIS OF MORE IMPORTAN3E RECOMMENDATIONS DIRECTED TOWARDS ECONOMY:

S. No. as per summary of Recommendations (APPENDIX V)	Particulars
(1)	(2)
2.	The Committee note that the various items of the project were sanctioned on a piecemeal basis and new schemes were added up from time to time. This naturally led to the recasting of the project in material details. While the Committee appreciate that in a project of such magnitude as Kosi, which was taken up for the first time in India, there was an absence of a complete integrated plan at the very beginning, they feel that steps should be taken, as far as possible, before sanctioning new projects to draw up an integrated plan in the initial stages so as to obviate the possibility of subsequent changes which usually result in delay and considerable additional expenditure.

(1)	(2)
5.	The Committee would stress that it should be ensured that when a new project is taken up for execution, it should be sustained at the required optimum pace so as to complete it within the scheduled time, as any undue delay in the execution of the project leads to unavoidable increase in cost as well as the postponement of realisation of benefits from the project which again means slowing down the economic progress of the people in that area.
19.	The Committee note that the Eastern Kosi Canal when completed will have a considerable impact on the economy of Purnea and Saharsa districts of Bihar. The Committee have also noted that when the full irrigation potentialities are created, the canal would provide additional irrigation to about 14 lakh acres and would result in additional production annually of 18 lakh tons of foodgrains and other crops. During their visit to the Kosi Project area, the Committee were shown some of the areas where benefits of irrigation have already been realised and the Committee were shown some of the areas where benefits of irrigation have already impressed by the results of the irrigation system introduced as a result of the Kosi Project. The Committee also appreciate the various steps taken by the Government for making the irrigation water available to the cultivators, as and when the canals are ready. The Committee are inclined to agree with the views of the Project Authorities that if all the steps for the utilisation of irrigation potential had been taken a year or two earlier the benefits flowing from irrigation would have been correspondingly advanced.
20.	The Committee would like to emphasise that in the present context of the economic situation of the country, when there is an all-round need for attainment of self-sufficiency in food-grains, the early realisation of irrigation benefits from Kosi Canals has assumed increased importance

(1)	(2)
	since the availability of irrigation facilities from Eastern Kosi Canal is not dependent upon rainfall. The Committee need hardly stress that every endeavour should be made to complete the remaining works of the Eastern Kosi Canal at an early date and efforts should be made to achieve optimum utilisation of irrigation potential, if possible, earlier than the target date as the same would go a long way in transforming the economic situation in the country.

GMGIPND—LS I—3015 Aii LS—11-3-69—1225

Sl. No.	Name of Agent	Agency No.
	DELHI	
24.	Jain Book Agency, Connaught Place, New Delhi.	11
25.	Sat Narain & Sons, 3141, Mohd. Ali Bazar, Mori Gate, Delhi.	3
26.	Atma Ram & Sons, Kashmere Gate, Delhi-6.	9
27.	J. M. Jaina & Brothers, Mori Gate, Delhi.	11
28.	The Central News Agency, 23/90, Connaught Place, New Delhi.	15
29.	The English Book Store, 7-L, Connaught Circus, New Delhi.	20
30.	Lakshmi Book Store, 42, Municipal Market, Janpath, New Delhi.	23
31.	Bahree Brothers, 188 Lajpatrai Market, Delhi-6.	27
32.	Jayana Book Depot, Chapparwala Kuan, Karol Bagh, New Delhi.	66
33.	Oxford Book & Stationery Company, Scindia House, Connaught Place, New Delhi—1.	68
34.	People's Publishing House, Rani Jhansi Road, New Delhi.	76
35.	The United Book Agency, 48, Amrit Kaur Market, Pahar Ganj, New Delhi.	88
36.	Hind Book House, 82, Janpath, New Delhi.	95
37.	Bookwell, 4, Sant Naran kari Colony, Kingsway Camp, Delhi-9.	96
	MANIPUR	
38.	Shri N. Chaoba Singh, News Agent, Ramlal Paul High School Annexe, Imphal.	77
	AGENTS IN FOREIGN COUNTRIES	
39.	The Secretary, Establishment Department, The High Commission of India India House, Aldwych, LONDON W.C.—2.	59

Published under Rule 382 of the Rules of Procedure and Conduct of Business in Lok Sabha (Fifth Edition) and printed by the General Manager, Government of India Press, Minto Road, New Delhi.