



**GOVERNMENT OF INDIA
PLANNING COMMISSION**

Report
OF
THE TECHNICAL COMMITTEE
FOR
THE OPTIMUM UTILISATION
OF THE
KRISHNA & THE GODAVARI
WATERS
AND CONNECTED PAPERS

1953

GOVERNMENT OF INDIA
PLANNING COMMISSION

Report
OF
The Technical Committee
FOR
the optimum utilisation of the Krishna
and the Godavari waters and
connected papers.

1953

PRINTED IN INDIA BY THE MANAGER,
GOVT. OF INDIA PRESS, NEW DELHI

P.C. 13
1600

Price Rs. 2, As. 8 or 4 Sh.

	PAGE
Letter of Transmittal	I

CHAPTER I

THE RIVERS KRISHNA, GODAVARI AND PENNAR

Introductory	9
The Krishna	9
The Godavari	16
The Pennar	19

CHAPTER II

PROJECTS INVESTIGATED ON KRISHNA AND GODAVARI

Projects on Krishna river	21
Krishna-Pennar Project	21
Pulichintala Project	23
Lower-Krishna Project	24
Projects on the Godavari	24
Ramapadasagar Project	24
Sabari Project	26

CHAPTER III

AREAS AFFECTED BY VARIOUS PROJECTS

Areas included in the Krishna-Pennar Scheme	27
Areas included in Pulichinatala Project	27
Areas included in the Lower Krishna Project	28
Areas included in Ramapadasagar Project	28
Areas included in Sabari Project	28
Areas left out of irrigation	29

CHAPTER IV

REMARKS ON THE TECHNICAL AND OTHER ASPECTS OF KRISHNA-PENNNAR PROJECTS

Siddeswaram Dam and Reservoir	30
Someswaram Dam on the Pennar	30
Pick-up Barrage on the Pennar	31
Krishna-Pennar Canal	31

	PAGE
Krishna-Pennar East Canal	32
Krishna-Pennar West Canal	33
Madras Canal	33
Pennar South Canal	34
Pennar North Canal	34
Kaveli Canal	35
Kanupur Canal	35
Irrigable areas	38
Irrigation intensities	38
Duties	39
Water Rates	40
Power Provision	40
Navigation	40
Irrigation development	41
Food production	41
Working tables	41
Estimates and financial forecasts	42
Betterment fees	43
General	44

CHAPTER V

COMMITTEE'S PROPOSALS

General principles followed	46
Areas in need of irrigation	46
Possible sites of reservoirs	47
Development by Stages	49
Siddeswaram dam	52
Nandikonda dam	53
Kurnool-Cuddapah canal	55
Krishna-Pennar east canal	56
Krishna-Pennar west canal	57
Kaveli canal	57
Kanupur canal	57
Pick-up weir or barrage on the Pennar	57

(iii)

	PAGE
Krishna-Pennar link canal	57
Lower Krishna right canal	59
Madras canal	62
Estimates of cost	62
Pick-up barrage on the Pennar	63
Krishna-Pennar link canal	63
Kurnool-Cuddapah canal	63
Lower Krishna right canal	64
Lower Krishna left canal	65
Krishna-Pennar east, Krishna-Pennar west, Kaveli, Kanupur and Madras canals	65
Financial aspects	78
Gandikota project	78
Surveys and investigations	78

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

Krishna-Pennar project	84
Committee's proposals	85

(iv)

APPENDICES

	PAGE
Appendix A.—Planning Commission's letter setting up the Technical Committee	89
Appendix B.—Memorandum of Agreement	91
Appendix C.—Note on the availability of water at the head of Kurnool-Cuddapah canal.	98
Appendix D.—Note on the diversion of Godavari waters into the Krishna basin	101
Appendix E.—Note on the tour of the Technical Committee	104
Appendix F1.—Summary of important representations	107
Appendix G1.—Comments of the Government of Madras	112
Appendix H1.—Comments of the Government of Hyderabad	125
Appendix I1.—Minutes of the conference convened by the Planning Commission on the 8th December 1952	128

LIST OF DRAWINGS

1. Area commanded by various projects	} facing page
2. Area commanded by Committee's proposals . . . . .		110

APPENDIX A

GOVERNMENT OF INDIA

Planning Commission

No. PC (V) 59/1/51

New Delhi, December 17, 1951.

From

Shri N. R. Pillai, I.C.S.,
Secretary, Planning Commission,
NEW DELHI.

To

The Chief Secretary to the Government of Madras,
MADRAS.

SIR,

I am directed to refer to the Madras Government's proposal in respect of the Kistna-Pennar and Ramapadasagar projects for inclusion in the second part of the Five Year Plan and the preference expressed by the State Government in favour of the Kistna-Pennar project in case only one large project can be included in the Plan. The Planning Commission considers that it will not be possible to include in the Plan two large projects like the Kistna-Pennar and the Ramapadasagar, and that it would be useful to have a technical enquiry conducted as to the best and most economical manner of utilising the waters of the Kistna and Godavari allotted to the Madras State before a decision is reached. In consultation with the Ministry of Natural Resources and Scientific Research, the Planning Commission, therefore, proposed to appoint a committee for the purpose.

The composition of the committee will be as below:—

Shri A. N. Khosla, I.S.E., Chairman,
Central Water and Power Commission. *Chairman.*

Shri Moti Ram, Chief Engineer,
Irrigation, U.P. *Member.*

Shri G. R. Garg, I.S.E., Director,
Irrigation, Central Water and Power Commission. *Member-Secretary.*

The terms of reference to the committee will be as follows:-

- (a) How the waters of these rivers can be used to the best advantage, and recommend for inclusion in Part II of the Plan a project which would bring about extension of irrigation facilities to as large an area as possible on the most economic basis which can be completed in a reasonable time;
- (b) Whether there will be sufficient waters left for the needs of the Godavari and Kistna deltas after the utilisation proposed under the Kistna-Pennar project;
- (c) Whether the Kistna-Pennar project is technically sound and economically a better proposition than other schemes considered, and whether, having regard to the urgent need for increased food supply, especially of rice, this project should be included in Part II of the Plan and;
- (d) Whether it can be completed within 3 to 4 years if funds can be provided.

It is expected that the committee will be able to start its work in January, 1952, and to submit its report within a period of about two months.

I am desired to request the Madras Government for its co-operation and assistance in the work of the committee.

Yours faithfully,

(Sd.) TARLOK SINGH

Deputy Secretary

for Secretary, Planning Commission.

Copy forwarded for information to :-

Shri G. R. Garg, I.S.E.,
Director, Irrigation, Central Water & Power
Commission.

R. JAGANNATHAN,

Under Secretary to the Govt. of India.

APPENDIX B

MEMORANDUM OF AGREEMENT

I. THE KRISHNA.

The dependable annual flow in the Krishna basin based on the recorded gauging at Vijayawada is accepted as 1715 t.m.c. ft. This figure may have to be increased to allow for any omissions in respect of existing utilisations in any State.

Shri Venkatchari's statement that the actual flow will be in excess of the recorded gauged flow by 8% is noted.

2. The existing utilisations (subject to corrections mentioned in para 1) plus flows required for projects under construction in the concerned States, as stated below, are hereby allocated to the respective States:—

Bombay	176 t.m.c.ft.
Hyderabad	180
Mysore	98.5
Madras	290
	<hr/>
	744.5

3. The balance of flow for new projects after meeting the above allocations works out to 970.5 t.m.c. ft. For purposes of allocation, this has been taken as 1,000 t.m.c. ft. For this balance upto 1,000 t.m.c. ft. the allocations are made as hereunder:—

	Percent.	t.m.c.ft.
Bombay	24	240
Hyderabad	28	280
Mysore	1	10 (provisional)
Madras	47	470

For balance flow in excess of 1,000 t.m.c.ft. mentioned above, the allocations will be as follows:—

Bombay	30 per cent.
Hyderabad	30
Mysore	1 (provisional)
Madras	39

The allocation to Mysore may have to be slightly adjusted to the extent of additional 1% as a result of further engineering scrutiny. This addition will come out of the share of Madras.

4. The above allocations are subject to the condition that the diversion of supplies across the western ghats for the Koyna Project will be limited to 67.5 t.m.c.ft.

II. THE GODAVARI.

The dependable annual flow in the Godavari basin based on the recorded gaugings at Dowleshwaram is taken as 2,500 t. m. c. ft.

2. The existing utilizations plus supplies required for projects under construction in the concerned States as stated below are hereby allocated to the respective States :—

Bombay	57 t. m. c. ft.
Hyderabad	208
Madhya Pradesh	30
Madras	300
	<hr/>
TOTAL	595

3. Of the balance flow of 1,905 t.m.c. ft. (say 1,900) which remains available after meeting the allocations in para 2, the allocations to the various States will as below:—

	percent.	t.m.c. ft.
Bombay	3	57
Hyderabad	26	494
Madhya Pradesh	24	456
Madras	47	893
		<hr/>
TOTAL		1900

These percentages will apply whether the supplies are in excess or short of the dependable flow assumed above.

III. GENERAL

The allocations in the case of the Krishna and the Godavari have been made on an annual basis. The new utilizations have to be so adjusted as not to interfere with the existing daily utilisation for existing works and agreed utilization for new works.

2. The use of water passed by one State for her use downstream, out of the share allocated to her and passing through the reservoir of another State may be used by the latter State, solely for power purposes, provided that such quantities are not impounded in their passage through the reservoir for more than the period agreed upon between the Governments concerned, which agreement shall not be unreasonably withheld.

APPENDICES

93

3. The allocations made under parts I and II shall be reviewed after 25 years.

4. No major project shall be undertaken for construction in any State unless it has been fully investigated and necessary detailed estimates have been prepared, and duly examined:

Krishna River at Vijayawada
Anicut

Year	t. m. c. ft.	m. a. c. ft.
1895-96	1937	44.47
1896-97	2366	54.32
1897-98	2450	56.24
1898-99	2342	53.76
1899-1900	879	20.18
1900-01	2550	58.54
1901-02	1882	43.20
1902-03	1722	39.53
1903-04	2906	66.71
1904-05	1528	35.08
1905-06	1066	24.47
1906-07	1702	39.07
1907-08	1943	44.61
1908-09	2178	50.00
1909-1910	1857	42.63
1910-11	2087	47.91
1911-12	1218	27.96
1912-13	1756	40.31
1913-14	1576	36.18
1914-15	2751	63.15
1915-16	2146	49.27
1916-17	3473	79.73
1917-18	2652	60.88
1918-19	777	17.84
1919-20	1949	44.74
1920-21	1378	31.63
1921-22	1787	41.02
1922-23	1761	40.43
1923-24	2021	46.40
1924-25	1935	44.42
1925-26	1837	42.17

—May) in t.m.c.ft. and m.a.c.ft.

Godavari River at Dowleswarm Anicut		Pennar River at Sangam Anicut	
t. m. c. ft.	m. a. c. ft.	t. m. c. ft.	m. a. c. ft.
3736	85·77	...	...
4666	107·12	...	...
3444	79·06	...	...
2336	53·63	...	...
438	10·06	...	...
3456	79·34	...	...
2417	55·49	...	...
1417	32·53	...	...
4092	94·94	...	...
1879	43·14	...	...
2141	49·15	...	...
3098	71·12	...	...
5847	134·23	...	...
4042	92·79	...	...
2358	54·13	...	...
4452	102·20	...	...
2492	57·21	...	...
2936	67·40	...	...
2679	61·50	...	...
5308	121·85	...	...
3024	69·42	...	...
4477	102·78	...	...
3868	88·80	...	...
2732	62·72	...	...
3819	87·67	...	...
960	32·04	...	...
3174	72·87	173	3·97
2956	67·86	125	2·87
2616	60·06	19	0·44
2500	57·30	97	2·23
3298	75·60	137	3·15

REPORT OF THE TECHNICAL COMMITTEE

Annual Yield of Krishna, Godavari and Pennar Rivers (June—

Year	Krishna River at Vijayawada Anicut	
	t.m.c.ft.	m.a.c. ft.
1926-27	1904	43·71
1927-28	2039	46·81
1928-29	1920	44·07
1929-30	1655	37·99
1930-31	1901	43·64
1931-32	2533	58·15
1932-33	2371	54·43
1933-34	2640	60·61
1934-35	1759	40·38
1935-36	1622	37·24
1936-37	1677	38·50
1937-38	1704	39·12
1938-39	2165	49·70
1939-40	1792	41·14
1940-41	1804	41·41
1941-42	1334	30·62
1942-43	1678	38·52
1943-44	1582	36·32
1944-45	1213	27·85
1945-46	1491	34·23
1946-47	2289	52·55
1947-48	2063	47·36
1948-49	1922	44·12
1949-50	2049	47·04
1950-51	2098	48·16

—May) in t. m. c. ft. and m. a. c. ft.

Godavari River at Dowleswaram
Anicut

Pennar River at Sangam Anicut

t.m.c. ft.	m.a.c.ft.	t.m.c.ft.	m.a.c.ft.
3076	70.62	33	0.76
3757	86.25	51	1.17
3239	74.36	47	1.08
2907	66.74	99	2.27
2857	65.59	180	4.13
4850	111.34	83	1.91
3756	86.23	34	0.73
4990	114.55	115	2.64
4611	105.85	19	0.44
3510	80.58	113	2.59
4411	101.26	71	1.63
4887	112.19	81	1.86
4840	111.11	203	4.66
2472	56.75	175	4.17
4876	111.94	113	2.59
1420	32.60	106	2.43
4030	92.52	68	1.5
2809	64.49	232	5.33
3811	87.49	175	4.02
4232	97.15	33	0.76
...	...	220	5.05
4145	95.16	121	2.78
3342	76.72	...	...
4235	97.22	...	...
2350	53.95	...	...

APPENDIX C

NOTE ON THE AVAILABILITY OF WATER AT THE HEAD OF KURNOL CUDDAPAH CANAL.

In the stage plan proposed by the Committee, K. P. East, Kaveli and Kanupur canals will be fed from the Tungabhadra by remodelling the K. C. canal. It is to be seen whether sufficient water is available in the river to meet the demands of these canals in full.

2. *Dependable annual yield at Mallapuram dam site.*—According to the agreement reached between the Governments of Madras and Mysore regarding the sharing of waters of Tungabhadra, the waters of Bhadra and Tunga were jointly gauged by the two states at Lakkavali, Mallapuram and Sankesula and as a result of the said gauging and discussions, the net dependable flow at Mallapuram after meeting the requirements of existing irrigation above Mallapuram was agreed to as 340,000 m.c.ft.

According to the same agreement, Mysore share above Mallapuram excluding existing, irrigation was finally fixed at 84 t. m. c. ft. leaving a balance of 256 t.m.c.ft. to be shared by Madras and Hyderabad. This quantity of 84 t.m.c.ft. is slightly in excess of the allotment made in the inter-state Conference held by the Planning Commission on 27th and 28th July, 1951.

Bombay's proposed utilization above Mallapuram is only t.m.c.ft. for Dharam Wardha storage Scheme. Hence the annual dependable yield after allowing for all the existing and proposed utilizations above Mallapuram may be taken as 255 t.m.c.ft.

3. *Capacity of Tungabhadra dam.*—The Tungabhadra dam is designed for a storage capacity of 133 t.m.c.ft. at f.r.l. 1633. The f.r.l. has been fixed on the following considerations :

- (1) Reservoir full on 1st November.
- (2) No impounding to be done from 1st November to 30th June.
- (3) Madras and Hyderabad to have 65 t.m.c.ft. each including evaporation losses.

These quantities of 65 t.m.c.ft. each will provide for the need of all new and pre-Mughal irrigation and also the assistance to old Kurnool Cuddapah Canal and Rajolibanda canal proposed by Hyderabad State.

The contribution to the Krishna for delta irrigation will be in addition to the above quantity of 65 t.m.c.ft. and met by regulated flow from the reservoir. This contribution and its distribution, though not finally fixed, seems to be of the order of 700 cusecs per day (*vide* specifications Tungabhadra Dam Design).

4. *Requirements of Madras Canal from the dam.*—Total annual irrigable area on the low level canal taking off from the Madras side of the dam is 2·94 lakh acres about 95 per cent of which is proposed to irrigate dry crops. The equivalent wet area may therefore be taken as 2·0 lakhs acres. This will require only 40 t.m.c.ft. Development of this irrigation according to the Project Report is likely to take 10 years. Considering, however, the sparsity of population and backward condition of the people, it is not likely to take less than 15 years to develop the area fully. Hence for the first 10 years the requirements of irrigation will be fully met with 27 t.m.c.ft. and the remaining supplies would be available for being utilised elsewhere.

5. *Requirements of K. C. canal.*—The requirements of K.C. canal as per proposal of the Committee are of the order of 58·60 t.m.c.ft. *i.e.*, 0·70 t.m.c.ft. in June, 12·40 t.m.c.ft. in July 14·50 t.m.c.ft. in August, 11·50 t.m.c.ft. in September, 9·8 t.m.c.ft. in October, 7·5 t.m.c.ft. in November and 1·9 t.m.c.ft. in December.

6. As stated above, the annual dependable yield at the dam site is 255 t.m.c.ft. Deducting 133 t.m.c.ft. for storage in the dam, balance that will be passed below the dam will be 122 t.m.c.ft.

The inflow between the dam site and the Sunkasela anicut from which existing K. C. canal takes off is of the order 70 t.m.c.ft. The total flow in this reach is therefore, 120+72 or 192 t.m.c.ft. Practically the whole of this occurs during monsoon months and it can be safely presumed that 20 per cent of it can be diverted into the K. C. canal. The balance requirements can be met from the storage and also partly from the low flow in November, and

December. The following table gives the quantities required from the storage supplies, inflows etc :—

Month	Requirements in		Met from		
	Cusecs maxm.	t.m. c.ft.	Storage	Surplus & inflow 22+70	Low flow
June . .	300	0.70	0.70	..	..
July . .	5100	12.40	2.50	9.90	..
August . .	6000	14.50	2.50	12.00	..
September . .	4875	11.50	2.50	9.00	..
October . .	4050	9.8	2.50	7.30	..
November . .	3200	7.5	6.50	..	1.00
December . .	780	1.9	1.50	..	0.40
TOTAL		58.3	18.7	38.20	1.40

As the reservoir will be kept full on 1st November, withdrawal of 10 t.m.c.ft. shown from storage during the months of July to October will really come from diversion and not from storage. Hence the quantity required in practice from the storage will be only 8.70 t.m.c.ft. As existing K.C. canal has got prior claim on the waters of Tungabhadra, half of the quantity of 8.7 t.m.c.ft. may be considered its legitimate share. This leaves only 4.35 t.m.c.ft. which the reservoir will be required to provide till the Siddeshwaram Dam is built.

APPENDIX D

NOTE ON THE DIVERSION OF GODAVARI WATERS TO KRISHNA BASIN

A study of the map of the Godavari and Krishna basins shows that the only place in the Hyderabad State from which it is possible to divert Godavari waters into Krishna basin is at Khushtapuram below the junction of the Manjira with the Godavari where the Hyderabad State proposes to build a dam. The catchment area of the Godavari at this site is about 35,000 sq. miles and annual dependable yield only 441 t.m.c.ft. This yield is hardly sufficient to meet the requirements of Nizambad and Warrangal districts in the Hyderabad State and existing and proposed utilizations in the Bombay State. Hence though the possibility of diverting the Godavari waters to the land situated below +1000 elevation exists, no water is available at the site for diversion.

Large tributaries of the river Godavari *viz.*, Pranhita Indravati and Sabari which meet the river below this dam site, contribute about 40 per cent., 20 per cent. and 10 per cent. of the flow reaching Dowleshwaram. But unfortunately the Godavari passes on into a ghat section right upto Polavaram or Ramapadasagar dam site. Any dam built in this reach can only be a power project with very little irrigation potential and no possibility of diversion on account of very high elevations. The only other site where there is a possibility of diverting supplies from the Godavari is at Ramapadasagar where a dam or diversion barrage will be necessary for the purpose. The Ramapadasagar project investigated by Madras visualised the construction of a dam with f.r. l. +198 (1st Stage) and storage capacity of 15.9 m.a. ft. The minimum reservoir level is proposed as +145 and the right canal f.s.l. at head +138.0. With a slope of 1 ft. in 4 1/2 miles throughout its length, the right canal is to cross the Krishna by means of an aqueduct with f.s. l. of +107 to irrigate an area of 4.2 lakhs acres in Guntur uplands. The total amount of water proposed to be diverted in the Krishna basin under this project is as given below :—

Krishna Delta 1st crop — Nil	*7.44	t.m.c. ft.
Krishna Delta 2nd crop — 6.4 lakh acres	134.81	t.m.c. ft.
Guntur uplands 1st crop — 4.2 acres	105.85	t.m.c. ft.
	248.10	

*This quantity is required for giving early supplies (June 1-14) for 1st crop irrigation in Krishna delta.

The proposal to take Godavari waters across the Krishna involves construction of an aqueduct which has been roughly estimated to Rs. 4.3 crores. This is likely to be heavily exceeded. The cost of the canal itself is expected to be Rs. 9.91 crores. The scheme is, therefore, very costly and has been dropped. This reduces the contribution of Godavari to Krishna area to 142.25 t.m.c.ft. only.

If Ramapadasagar dam is not built but a storage reservoir is constructed somewhere upstream either on the Godavari itself or some of its major tributaries and only a diversion barrage is built at the proposed Ramapadasagar dam site, this quantity will remain unaffected.

The total irrigable area in the Krishna delta, is 10.5 lakhs acres and 6.40 lakhs represents 62 per cent of it. If this percentage is increased to 80 per cent which is not desirable in the interest of maintenance of the fertility of the soil, the maximum diversion will be about 184.38 t.m.c.ft. The economics of this proposal will, however, need to be worked out.

It may be mentioned in this connection that in the development of Krishna Valley, a certain number of dams will be built on the Krishna where a large amount of power can be generated by irrigation water. To stabilise the power in non-monsoon months, about 3000 to 5000 cusecs will have to be let down. This amount of water by flowing over successive dams will be of great importance in the economics of power production and will after leaving the last dam irrigate the 2nd crop in the delta. If by suitably integrating the power systems the generation of power at Pulichintala is stopped and at Nandikonda restricted for a part of the year, it should be possible to divert about 130 t.m.c. ft. or 2.92 m.a.ft. from Godavari to the Krishna and take over the entire Krishna delta 2nd crop irrigation on to Godavari.

A question may arise whether the entire 1st crop of existing delta can be fed by Godavari waters.

The basin of Godavari does not consist of so much of Western Ghat areas as that of the Krishna. This results in the yield of the Godavari being less than that in the Krishna in bad years. Thus during 1899-1900, the annual runoff on Godavari was as low as 438 t.m.c. ft. *i.e.* 18% of its dependable flow, while in Krishna, it was never less than 777 t.m.c. ft. *i.e.* 45% of its dependable flow. Hence there is a danger in linking up of Krishna delta with Godavari waters.

Moreover the last dam site on the Krishna is at Pulichintala 35 miles above Vijayawada and the catchment area below this dam site to Vijayawada is 6400 sq. miles which contribute about 6.25% of the monsoon flow reaching Vijayawada. In case of a year dependable yield, this flow is of the order of 100 t.m.c. ft. (2.29 m.a. ft.) out of which at least 90% would be available for utilisation for irrigation in delta. The requirement of 1st crop irrigation to the extent of 10.5 lakhs is about 161 t.m.c. ft. (3.69 m.a. ft.). Hence the requirements to be met from Godavari will be only about 70 t.m.c. ft. (1.60 m.a. ft.). But for stabilising power for even 20,000 K.W. at the terminal reservoir in the 1st crop period, about 50 t.m.c. ft. (1.15 m.a. ft.) are required. This reduces the diversion possibility to 20 t.m.c. ft. (0.46 m.a. ft.) only which is negligible.

According to this the requirements for 2nd crop, the total diversion from Godavari is not likely to exceed 130 t.m.c. ft. (2.29 m.a. ft.). In years of normal yield of about 1900 t.m.c. ft. (43.51 m.a. ft.) in the Krishna (available in 50% of the years *vide graph* 6*) this quantity will be reduced to about 110 t.m.c. ft. (1.83 m.a. ft.). With such a small quantity of water for diversion, the economics of the proposal becomes problematic.

In any actual scheme of diversion, it will, however, have to be laid down that Godavari areas having prior claims on the Godavari, diversion will be allowed only when the waters are actually in excess of the requirements of the Godavari basin.

APPENDIX E

NOTE ON THE TOUR OF THE TECHNICAL COMMITTEE

The Committee made an extensive tour to get an idea of local conditions and to see the sites of important works included in the various projects for making use of Krishna and Godavari waters. During the tour they met prominent people and representatives of local organizations interested in the various projects and obtained their views. A summary of the memoranda presented by them is given at the end of this note.

Shri G.R. Garg and Shri Moti Ram, Members of the Committee left Delhi by air on the morning of the 17th February 1952 and reached Madras in the evening. The Chairman, Sri A. N. Khosla who was detained at Delhi owing to important work joined the Members at Madras on the 19th February.

During their stay of a little over two days at Madras the Members paid visits to the Madras Institute of Technology and the Government Hydraulic Research Station at Poondi and had discussions with the Chief Engineers for Irrigation and Electricity on technical matters. They also called on the Hon'ble Chief Minister and the Hon'ble Minister for Public Works at the Secretariat and met other Hon'ble Ministers and Secretaries of Departments at a dinner which was kindly arranged by the Madras Government.

In the course of discussion the Chief Engineer for Irrigation stated that the Krishna-Pennar Project would result in early food production as it is proposed to irrigate a considerable acreage of second crop in areas which were already developed and provide an assured supply to lands which were at present being precariously irrigated from tanks. The Chief Engineer for Electricity said that the demand for power in the near future in the central portion of the State would be met if a power house was constructed on any one dam on the Kistna or Pennar and that Power houses on other dams could be constructed later as load developed.

The Committee left Madras by Bombay Mail on the evening of the 19th February and reached Gooti on the morning of the 20th where they detrained. From Gooti they proceeded by road

and after inspecting Mitakondala cutting area, the trial pits dug there, and the site of the proposed Siddheswaram Dam on the Kistna reached Kurnool late in the evening. While inspecting Siddheswaram they also saw the gorge below the dam site for a few miles.

Leaving Kurnool on the morning of the 21st the Committee reached Hospet in the evening after inspecting aqueducts, tunnels, deep cuttings and other important works on Tungabhadra right bank canal. On the 22nd the Tungabhadra Dam on both the Madras and Hyderabad sides and Tungabhadra left bank canal were inspected and the party left Hospet by train in the afternoon, arriving at Madras on the morning of 23rd February. After a brief halt they left by road and reached Somasila at about 5.0 P.M. On the way a short halt was made at Gudur to meet local residents who had collected in large numbers. The Someshwaram dam site and the site of proposed pick-up weir on the Pennar were inspected the same evening.

The Committee left Somasila early in the morning of the 24th February and after a long journey by road reached Vijayawada at about 3.0 A.M. on the morning of the 25th February. On the way the dry areas of the Guntur and Nellore districts were seen and a visit was also paid from the right bank to the place where the Nandikonda dam has been proposed by the Hyderabad Government. This site can be reached only on foot but the local residents had made a track over very difficult rocky country at short notice to enable a jeep to be taken. Some time was spent at Guntur to meet representatives of associations and the president of the Rotary Club.

After halting for a few hours at Vijayawada a start was made for Hyderabad which was reached late in the evening. On the way the site of the proposed Pulichintala Dam was seen and numerous memoranda from villagers who had collected in large numbers all along the road and at Pulichintala were received. During their stay of about five days in Hyderabad State the Committee saw the Nizamsagar Dam, the Kadam Dam (under construction) the likely sites for dams on Indravati river near Bhupalapatnam in Madhya Pradesh, and the site of the proposed Nandikonda dam on the Krishna. They also held discussions with Hyderabad Engineers. The Chairman had to leave by air for Delhi on the morning of the 28th February on account of urgent work and the rest of the tour was done by the Members only.

Returning to Vijayawada by train in the early morning of 2nd March the Members spent another three days in Madras State during which they saw the Vijayawada anicut, Dowleshwar anicut, the Godavari and Krishna deltas and the site of the proposed Ramapadasagar dam and the Godavari gorge above that site. They also met representatives of numerous local organisations who expressed their views and also gave written memoranda. The Committee left Vijayawada by train on the evening of the 5th March on the conclusion of their tour.

The Committee are grateful to the officers of the Madras and Hyderabad Governments for the courtesy and assistance received from them and for the arrangements made for transport to the places visited.

APPENDICES
APPENDIX F-1

A SUMMARY OF THE IMPORTANT REPRESENTATIONS

1. Shri O. P. Ramaswamy Reddiar formerly Chief Minister, Madras State, on behalf of the residents of South Arcot recommended the Krishna Pennar Project as it would meet the needs of the famine stricken areas in the south and suggested that long canal from Somasila should be provided to meet the irrigation needs of the areas which might be suffering from draught. He deprecated the Ramapadasagar Scheme because—

- (1) It had difficult foundation problem.
- (2) It did not give relief to famine stricken areas.
- (3) The drainage from the irrigated areas could only run waste into the sea.
- (4) It had no big power potential.

He suggested that hydel development on Vainganga, Indravati and upper reaches of Godavari should be taken up and the same water be diverted to Krishna basin through Hyderabad territory for irrigation purposes. As the areas proposed to be irrigated by Pulichintala or Nandikonda Reservoirs could be irrigated by the diverted waters of Godavari, the idea of these projects might be dropped.

2. Janab Sibghathulla Mayor of the Madras strongly favoured the Krishna-Pennar Project as it would help solving the problem of portable water supply to Madras City.

3. Shri R. Suryanarain Rao proposed that the high level Tungabhadra canal should be immediately investigated and taken up for execution. He recommended the Krishna-Pennar Project as it would provide irrigation facilities to the famine stricken areas and solve the water supply problem of Madras City.

4. Shri K. V. Varadachari, M.L.A., recommended the Krishna-Pennar Project as the Kurnool-Cuddapah canal could not provide adequate irrigation facilities to the Rayalaseema districts. He, however, complained that the Krishna Pennar canal was proposed to pass through a corner of Chittoor district and would provide irrigation facilities to a small area thereof.

He, therefore, proposed that the canal might be taken at a higher contour to extend the benefits of irrigation to a larger part of the district.

5. Shri V. Raghavayya, M.L.A., preferred Nandikonda Project to Krishna Pennar Project as it would provide irrigation to a large area of Nellore district than the latter. He mentioned that the final selection of the project should be made with due regard to cheapness, feasibility of irrigation development in the area, the needs of the famine stricken areas and the water supply requirement of Madras City. He recommended a lower dam at Siddeswaram to meet the irrigation requirements of the Rayalaseema districts. In case, however, the Krishna Pennar Scheme was likely to be taken up first for execution, he would welcome the same but requested that the high lying areas of this district which were not commanded by the K. P. canals should be provided with lift irrigation.

6. Shri V. Gopal Krishnayya deprecated the Krishna Pennar Project and recommended the Nandikonda and Pulichintala projects for the developments of irrigation in the uplands of Guntur and Nellore districts. To meet the irrigation requirements of the Rayalaseema area he suggested a lower dam at Siddeswaram.

7. Prof. N. G. Ranga put up a strong plea for the prior claims of the valley residents on the waters of the Krishna and suggested a combined scheme at Nandikonda for Madras and Hyderabad States. He said that all the Andhras were united on this issue and were prepared to raise loans and pay betterment charges to meet the cost of the project. He suggested a modified scheme at Siddeswaram to meet the irrigation requirements of the Rayalaseema area and construction of Pulichintala dam in the final stage to complete the development of the lower Krishna Valley.

8. Sir S. V. Ramamurthy, former adviser to the Governor of Madras and acting Governor of Bombay, suggested that Pulichintala should be taken up as a short term measure to meet the country's present deficit in rice. As a long term scheme for integrated development of Krishna and Godavari Valleys he felt that a start should be made with the Godavari valley. He regretted that the Ramapadasagar scheme was not taken up by the Madras Government in spite of the thorough manner in which the investigations of that project were carried out, and the favourable opinion expressed by world famous authorities on the feasibility of the same. He was, however, favourably disposed

to an enquiry by the Chairman if a storage reservoir higher up on the Godavari or one of its tributaries and a pick up barrage at Pollavaram to meet the irrigation needs in the Godavari valley and diversion of surplus waters to Krishna valley would serve the same purpose. As a general policy he felt that the areas on either side of the river had prior claim on the water resources of the same and that any surplus after meeting its requirements might be diverted to the neighbouring areas. On the question of choice between extending irrigation facilities for first crop in new upland areas and second crop in the deltas, he was inclined to favour the latter with a view to meet the rice shortage in the country though as a long term policy it was likely to lead to difficulties such as water rights for the second crop. He felt that enough water could be found for the first crop in the uplands and the second crop in the deltas. Regarding the potable water supply for the city of Madras his view was that the same could be met either by improving the Buckingham canal or by pumping water from Krishna or Pennar.

9. The president of the Karnatak Maha Sabha met the Committee at Hospet and represented that the highlevel canal should be immediately investigated and taken up.

10. *Nellore District Ryots' Association.*—The representatives of the Association urged that the dam at Somasila should be constructed as this would ensure a steady and regular supply to the Nellore delta system. They also recommended the Nandikonda scheme which was calculated to bring large areas of their district under irrigation.

11. A deputation of Somasila ryots led by Shri P. Venkat Subbaiyya met the Committee and recommended the construction of Somasila reservoir. Shri G. C. Kandayya, M. L. A. on the other hand pressed for implementing the Nandikonda scheme.

12. Shri Krishna Rao on behalf of Andhra Kisan Ryots Association suggested that in the best interest of the Krishna Valley people and the needs of the central Andhra, Nandikonda project should be immediately investigated. He also urged that Krishna-Pennar project should be modified by dropping Someswaram reservoir and lowering the height of Siddeswaram dam to impound water sufficient only to meet the needs of Kurnool and Cuddapah districts. He also pleaded for taking up Pulichintala project to get quick results.

13. Ryots of Markapur and Cumbum Taluks of Kurnool district urged the need to take up the Korti Kanuma, Nandikonda and Sangmeswaram projects.

14. Communists of Kanchikarcherla urged the Government to take up immediately the Pulichintala project to solve the food problem

15. Krishna River Valley Peoples Welfare Association in their memorandum suggested an alternative scheme to Krishna-Pennar Project. This alternative envisaged to provide irrigation facilities to large areas of Cuddapah, Kurnool, Chittoor and some areas of Nellore, Guntur, Krishna and West Godavari districts by providing a smaller Siddeswaram reservoir, Nandikonda and Pulichintala reservoirs.

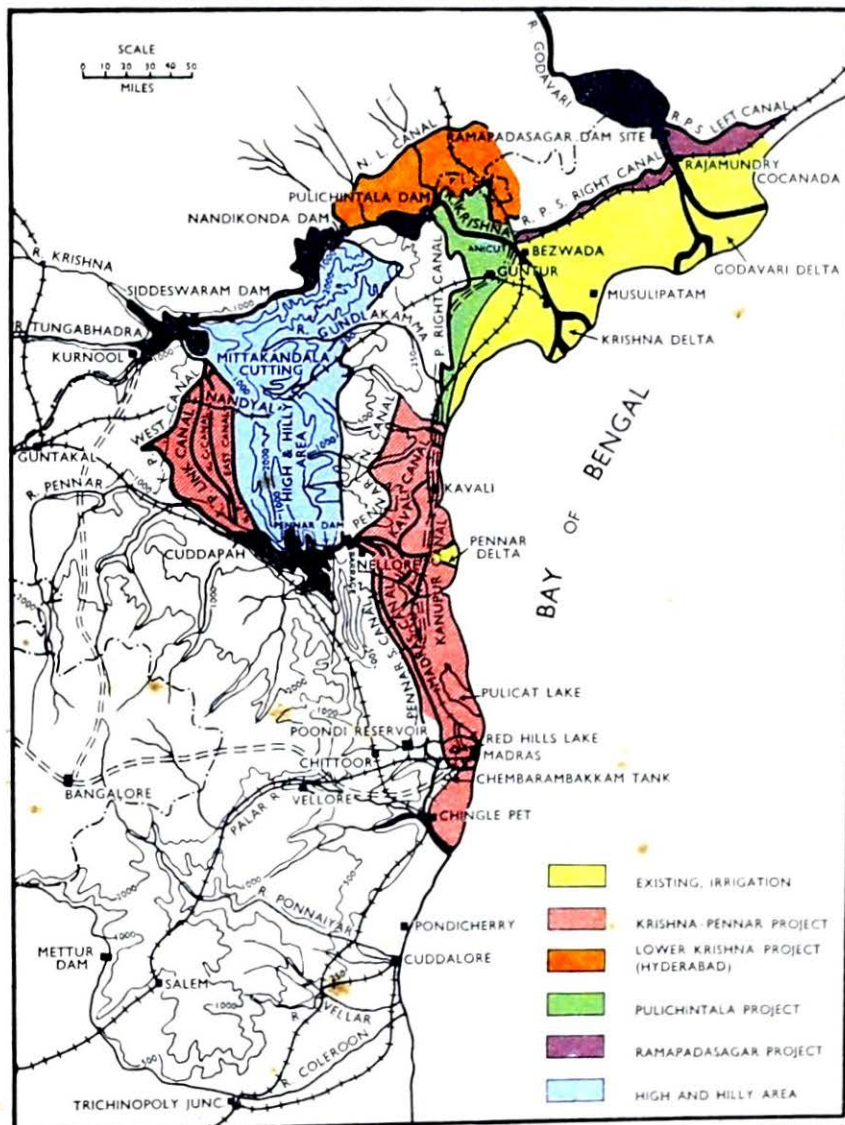
16. The *Ad-hoc* Committee of the People of Dowleswaram presented a detailed memorandum expressing their regret on the Ramapadasagar scheme being shelved by the Madras Government on not very convincing grounds. They deprecated the Krishna-Pennar Project on the grounds that it would—

- (i) deplete the Krishna waters to the detriment of the Krishna delta second crop and the development of the valley areas of Krishna and Guntur districts;
- [(ii) submerge costly lands and villages in reservoir areas;
- (iii) involve unnecessary heavy expenditure in the Mitta Kandala cutting ;
- (iv) generate less electrical power ;
- (v) bring a very small area under the first crop, large area being under the second crop in the first stage of the scheme.

Comparing the Ramapadasagar and Krishna Pennar projects they stated that though both the schemes were equally costly and offered equal irrigation and power benefits, the former scheme was more thoroughly investigated, did not involve diversion of waters from one valley to another and was capable

KRISHNA & GODAVARI VALLEY PROJECTS

AREA COMMANDED BY VARIOUS PROJECTS

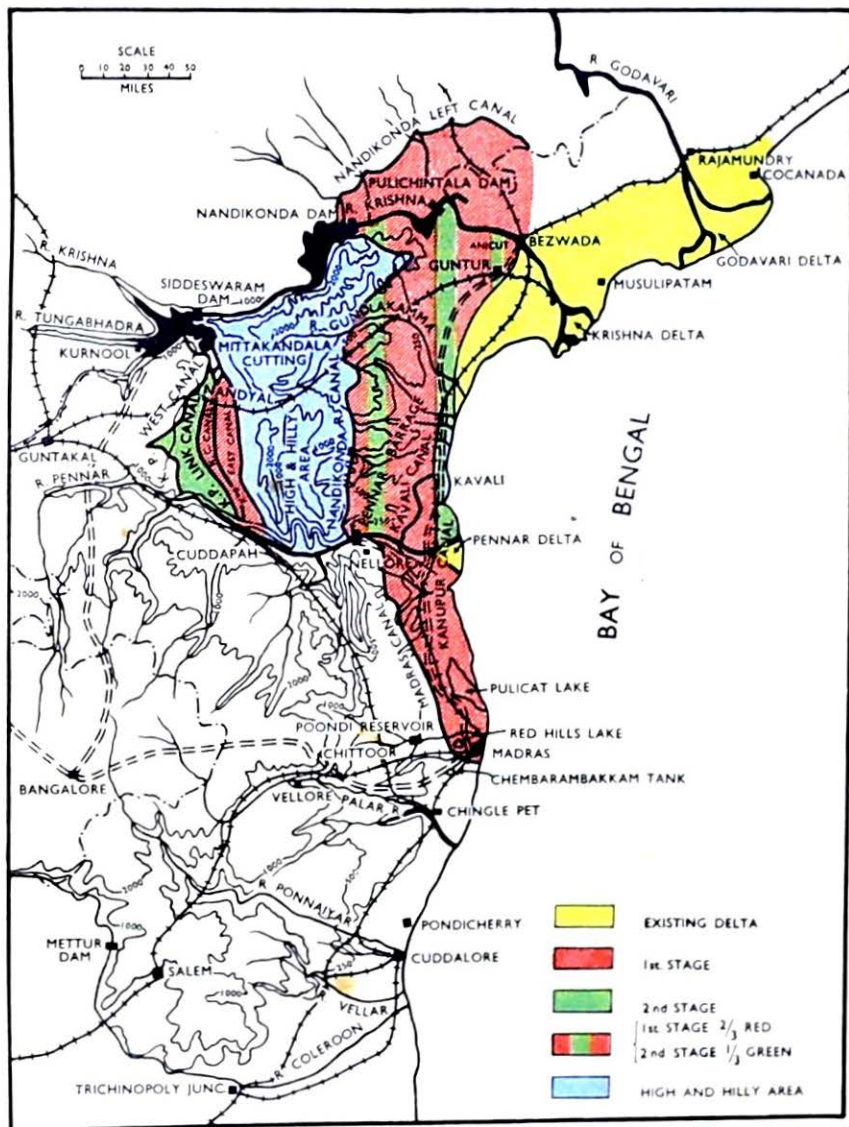


Reg. No. 3930 HE'53-1650. Printed for the PLANNING COMMISSION, GOVERNMENT OF INDIA from the data supplied by them with the permission of the Surveyor General of India.

Printed at the Survey of India Offices (M.L.O.).

KRISHNA & GODAVARI VALLEY PROJECTS

AREA COMMANDED BY COMMITTEE'S PROPOSAL



of speedy execution. They therefore recommended an integrated development of Godavari and Krishna Valley starting with Ramapadasagar as the first project. Further, in their view, the Nandikonda scheme should be taken up as it would provide irrigation facilities to high areas of Nellore, Guntur, Krishna and West Godavari districts answering at the same time anti-social activities rampant in that area. As Nandikonda was a big scheme and likely to take a longer period, they recommended the Pulichintala scheme to overcome rice shortage in the country by growing second crop in the Krishna delta temporarily. They were, however, of the opinion that the capital resources of the country should be equitably distributed on as large areas as possible. As for Madras Water Supply they held the view that it was a local problem which did not merit consideration in the selection of these multipurpose projects. Red Hills lake could meet the water supply requirements of the city if the Government purchased the water rights of the 7500 acres which at present received irrigation from this source.

APPENDIX G

COMMENTS OF THE GOVERNMENT OF MADRAS.

THE KRISHNA-PENNAH PROJECT—COSTS AND BENEFITS

(a) The Krishna-Pennar Project is one which has been investigated in appreciable detail. It contemplates, in conjunction with an enlarged Gandikota Project in the Cuddappah district which would be feasible with supplies of Krishna waters, the irrigation of 20·69 lakhs acres of wet crops and 2·27 lakhs acres of dry crops (equivalent to 21·83 lakhs acres in all of wet crops) in the first stage and 34·37 lakhs acres of wet crops and 3·76 lakhs acres in all of dry crops (equivalent to 36·25 lakhs acres of wet crops) in the final stage. The cost of the first stage works is expected to be Rs. 78 crores, or Rs. 67 crores if betterment fees are deducted. The return will be 3·5%. The cost of the works in the complete plan is expected to be Rs. 130 crores or Rs. 94 crores after allowing for betterment fees, and the return 3·8%.

(b) The areas to be irrigated in lakhs of acres in the first stage and in the complete plan will be as follows :—

Districts	1st Stage			Full Plan		
	1st crop		Second Crop (wet)	1st crop		Second Crop (wet)
	Wet	Irrigated dry		Wet	Irrigated (dry)	
Kurnool . . .	0·50	1·00	...	1·30	2·60	...
Cuddappah . . .	0·63	1·27	...	1·33	1·16	...
Nellore (new) . . .	4·37	...	4·37	12·39	...	4·37
Nellore (old delta) . . .	...	...	1·29	...	...	1·29
Chittoor . . .	0·12	...	0·12	2·54	...	0·12
Chingleput . . .	1·07	...	1·07	4·81	...	1·07
Krishna } Krishna . . .	...	...	4·55	...	...	4·55
Guntur } Delta . . .	...	...	2·60	...	...	2·60
TOTAL . . .	6·69	2·27	14·00	20·37	3·76	14·00

2. VIEWS OF KHOSLA COMMITTEE ON THE KRISHNA-PENNAH PROJECTS AND COMMENTS THEREON

(a) The Khosla committee has conceded that the Krishna-Pennar Project is generally technically sound, but has criticised it on the following grounds :—

- (i) that the available supplies in the river at Siddeswaram will be 15% less than that assumed in the Project Report which relates to availability at Vijayawada ;
- (ii) that the Siddeswaram and the Someswaram reservoirs in the plan will submerge large areas, about 3 lakhs of acres (including cultivated and garden lands in the case of the Someswaram area), and displace about 1,50,000 persons in all;
- (iii) that the cost of the project works (mainly under the cutting needed to convey the water stored up at Siddeswaram to the Kundiu, and the cost of the waterway to carry the water up to the Pennar dam) and working expenses, are likely to be considerably higher and the revenues lower than those assumed by this Government;}
- (iv) that the designed capacities of the canals in the projects are too large and the duties assumed for all the canals low ;
- (v) that the food yield and rate of development of irrigation under this project are over-estimated ;
- (vi) that emphasis is laid on second crop instead of on first crop, which will spread relief over larger and nearer areas ;
- (vii) that the benefits of the project will largely go to areas already served by canals or tanks, while vast tracts lying close to the Krishna and having no alternative means of irrigation supplies will be permanently denied such supplies.

(b) (i) As regards the first criticism, it may be pointed out that Madras has been given 470 t.m.c.ft. or 47% of the net dependable flow available in the river at Bezawada after allowing for utilisation by existing projects and projects under investigation. Hyderabad is to get 28% or 230 t.m. c.ft. It may be that the

availability at Siddeswaram dam of the proposed Krishna-Pennar Project will be 15% less, the 15% representing the contribution of the catchment area between Siddeswaram and Bez wada. This small quantity of water to be taken at Siddeswaram by Madras will be adjusted to the credit of Hyderabad's share for a project below Siddeswaram, from out of the catchment contribution below that place. After all, so long as Hyderabad get their 280 t.m. c.ft. it does not matter where Madras takes its total of 470 t.m.c.ft. Further that the actual dependable river flow at Siddeswaram will be definitely greater than 470 t.m.c.ft. and there will be no difficulty whatever in tapping it at Siddeswaram entirely.

(ii) The answer to the second criticism is that poromboke lands form a large part of the reservoir beds, being nearly 35% in the case of Krishna reservoir and 45% in the case of the Pennar reservoir. Some of the lands which are in the top 20 ft. of the bed can be irrigated in summer when the lakes are low. This may be about $\frac{1}{3}$ or $\frac{1}{4}$ of the area of occupied lands. The owners can be given some areas of these lands for growing an irrigated crop and the returns from these will be as much as, if not better than, those from rain-fed crops in a notoriously dry region. Irrigation facilities for such lands can be given from the Kurnool-Cuddappah Canal or otherwise in the case of the Krishna Reservoir, and from Gandikotta or by pumps and contour channels in the case of the Pennar reservoir lands. A certain area of garden lands, particularly in the Pennar areas, may be affected, but this is inevitable in the larger interests of the State. New gardens can be raised outside the water-spread limits. As regards the displacement of population, suitable provision has been made for rehabilitation. Submersion of land and displacement of population are inevitable in any major reservoir project.

(iii) As for the criticism regarding costs, something similar can be said of any estimate. The cost of the works referred to have been estimated by the Madras Engineers, on a conservative basis, in the light of their considerable experience of the costs of similar works under construction, and without any tendency to under-estimating.

(iv) The Madras proposals in respect of capacities of canals and duties are based on the actual duties realised in the areas irrigated by the Kurnool-Cuddappah Canal and those in the Cauvery-Mettur Project. Similarly for the criticism regarding food yields and rate of development.

(v) As regards the project's emphasis on second crop, it may be pointed out that emphasis on the first crop no doubt spreads irrigation benefits over large areas, but it is expensive in first cost taking time in construction and development. Second crop, or additional crop on first crop area, is a non-guaranteed crop, and a scheme including this feature is cheaper in initial cost, quicker in construction, yields, etc. and takes less water if it is on an area also having tanks previously supplied. The area in the Nellore district have these features and, in the initial stages, the water for the second crop can come from guaranteed flows, but later, by a rotation scheme, out on non-guaranteed flows *i.e.* flows in excess of the safe dependable flows assumed. The quantities so realised can be used on new areas and new canals for first crop in the second stage of development. The immediate use of water for 2nd crop, limiting the new areas and new canals, is a very useful proposal in the present context of shortage of rice.

(vi) The chief criticism of the Committee is that the project will debar permanently the irrigation of an area of 40 lakhs acres of the lower Krishna basin in the upland tracts of the Guntur and Nellore districts. The upland areas are not by any means wholly in the Krishna basin as assumed by the Committee and, moreover, not all that area is likely to be commandable. The eastern slopes of the Nallamalsis and the Darsi, Podili and Udayagiri talukas of the Nellore district may be in need of relief, but the areas adjoining the irrigated areas of Guntur are not badly off—they grow valuable tobacco and other crops. Large areas of the Guntur district are being irrigated by the Krishna, and it is appropriate that in the new project water must first be given to the areas in the Ceded districts in which famine is endemic. A part of the Nellore uplands will, in fact, be served by the Krishna-Pennar Project, and the intention was to find water for the uplands in Guntur and the balance of lands in Nellore, from the Godavari by an inter-connection between the Krishna and the Godavari. This very inter-connection is supported by the Committee in its report.

(c) A noteworthy fact is that the Committee's alternative proposals include the Krishna dam of the Krishna-Pennar Project. The Committee has recommended, as part of its plan, the same dam with the same design and features, but with a full reservoir level of *plus* 885 instead of *plus* 898.

3. BASES OF THE COMMITTEE'S ALTERNATIVE PROPOSALS AND COMMENTS THEREON

(a) The Committee has put forward certain alternative proposals which are said to be based on the following general principles :—

- (i) The scheme should provide for the most economical and optimum use of the waters of the Godavari and Krishna rivers from a broad national point of view ;
- (ii) That the scheme should provide irrigation to first crop in as large an area as possible ;
- (iii) In allocating water for second crop, some preference should be given to delta areas where maximum benefits from the food production point of view can be secured earlier ;
- (iv) As far as possible the water allocated to Madras State should be utilised fully ;
- (v) Provision should be made for generation of adequate power without sacrificing essential irrigation interests ;
- (vi) Areas liable to frequent famine and distress should receive special attention and at an early date ;
- (vii) Relief should be afforded to Madras City where the drinking water supplies are inadequate and there are no alternative sources of augmenting the supplies ; and
- (viii) The project should be capable of being executed in stages.

(b) (i) The first, the fourth to sixth and the eighth principles will be objected to by none. The seventh has been dealt with later in this note.

(ii) The third principle practically conflicts with the second. As a matter of fact the terms of reference to the Committee contain the following expression :—

“and whether having regard to the urgent need for increased food supply, especially of rice.....”.

It is the stabilisation of precarious irrigation under tanks in Nellore and the growing of a second crop on existing wet lands, both envisaged by the Krishna-Pennar Project, which will yield rice quickly.

(iii) Even according to the Committee's sixth principle ; it is the Rayalaseema area liable to scarcity conditions frequently which should receive first attention—not the Guntur district a part of which has excellent irrigation under the Krishna.

4. THE COMMITTEE'S PROPOSALS AND COMMENTS THEREON

(a) (i) Saying that it has borne in mind the principles referred to in para 3 (a) above, the Committee, while not recommending the Krishna-Pennar Project as it stands, has put forward new set of proposals, which include the construction of three reservoirs on the Krishna (at Siddeswaram, Nandikonda and Pulichintala), a reservoir on the Godavari or the Indravati or the Pranhitta, a diversion barrage on the Godavari at the site of the Ramapadasagar dam and another on the Pennar and many canals taking off from the Krishna reservoirs and from the rivers Godavari, Krishna and Pennar. It has modified and incorporated in its place portions of the Krishna-Pennar Project. It has recommended development by stages, the several stages being as follows :—

STAGE I

This comprises the construction of a dam at Nandikonda with an F. R. L. of *plus* 590 (as against *plus* 540 proposed by Hyderabad—what area this will submerge and what population this will displace has to be ascertained by investigation) and its left side and right side canals ; the diversion barrage on the Pennar, the Madras Canal, the Krishna-Pennar East Canal, the Kavali Canal and the Kanupur Canal (as proposed in the Krishna-Pennar Project but with reduced dimensions) ; and the remodelling of the Kurnool-Cuddappah Canal, its discharge being increased to about 6,000 cusecs so as to carry Tungabhadra water to the last mentioned three canals also (*viz.* the Krishna-Pennar east, the Kanupur and the Kavali canals). The Nandikonda dam will be constructed and the reservoir operated jointly by the Governments of Madras and Hyderabad. The right side canal will be a long contour canal with some tunnels on the way, running for 224 miles, and tailing into the Pennar. Out of a gross area of 45.47 lakhs of acres commanded by it, about 25 lakhs of acres are proposed to be irrigated.

STAGE II

This comprises the construction of a dam at Siddeswaram with an F. R. L. of *plus* 885 (against *plus* 898·5 proposed in the Krishna-Pennar Project), the Krishna Pennar Link canal (generally on the lines proposed in the Krishna-Pennar Project but with capacity reduced from 75,000 cusecs to 10,000 cusecs and the Mittakondala cutting replaced if possible by a tunnel), and the Krishna-Pennar West Canal for direct irrigation only and not for feeding the Gandikota reservoir also as proposed by Madras.

STAGE III

This comprises the construction of the Pulichintala dam on the Krishna, a storage reservoir on the Godavari (near Inchampalli on the main river, or on the Indravati near Bhopalatnam or at some place on (the Pranhita) a diversion dam on the Godavari at the site of the Ramapadasagar dam, and a Right Bank Canal and a Left Bank Canal taking off from the barrage referred to above.

(ii) The Committee has not furnished the areas to be irrigated by Krishna waters in the various districts, but it has indicated that the first stage will irrigate 37·11 lakhs acres of dry and wet crops equivalent to irrigation of wet crops on 22 lakhs acres, in this State, the cost of works being Rs. 84 crores, and that 45 lakhs acres of dry and wet crops, equivalent to irrigation of wet crops on 26 lakhs acres, will be irrigated in the first and second stages put together, the cost of works being Rs. 125 crores for both stages put together. In the third stage an additional 3 to 5 lakhs acres of second crop is expected to be irrigated.

(iii) As regards the full utilisation of Madras's share of the waters of the Godavari, the Committee states that it does not appear to be economically feasible. It has thrown out suggestions for the use of the waters in the Godavari and Kistna deltas, and of the surplus, for irrigation south of Madras City, and adds that further studies and investigations are necessary. In short, the Committee has not dealt with the Godavari as extensively as it has dealt with the Kistna.

(b) The Committee's proposals that in Stage I the first 73 miles of the Kurnool-Cuddappah Canal be remodelled to take a discharge of about 6,000 cusecs at the head, and supply Tungabhadra waters to the Kavali, the Kanupur and the Krishna-Pennar East Canals also, does not seem to be practicable. At the outset, it is fairly clear now that the available supplies in the Tungabhadra will be barely sufficient for the existing schemes of Madras and Hyderabad on the river. The calculations of the Committee do not take into account the latest developments concerning the utilisation of the Tungabhadra waters. The execution of the Tungabhadra High Level Canal Scheme in the near future may mean that no portion of the water will be available for use in the Kurnool-Cuddappah Canal.

(c) The Committee, while conceding that areas liable to frequent famine and distress should be given first priority, has provided for irrigation of the Guntur areas not liable to distress so frequently as the Ceded Districts, but has stated that Krishna water cannot be found for the Gandikota reservoir for irrigation of lands in the notoriously backward Cuddappah district. By itself, the Gandikota Project can irrigate only 50,000 acres in the Cuddappah district, but if Krishna water is supplied, it can irrigate 1,50,000 acres. The Gandikota scheme is one of the vital projects in the scheme of protecting the area from the frequent ravages of famine.

(d) The Committee itself admits that the storage dam proposed by it at Pulichintala would be founded on jointed shales and slates which would require careful geological examination and probably extensive foundation treatment would be necessary. It is doubtful whether this proposal would be economic.

(e) Another important defect in the Committee's proposals is that it omits the provision for a reservoir on the Pennar. The average flow of this river is 102 t.m.c. ft., but the dependable flow is very low, as the flows vary between very wide limits, from 10 t.m.c. ft. in one year to about 250 t.m.c. ft. in another. Besides, discharges in big floods last for only a few days, and these cannot be put to use unless there is a reservoir at the gorge in the Eastern Ghats, through which the river forces its way to the plains.

(f) The Nandikonda dam and the Krishna Right Canal also have difficult or objectionable features. The chief of these are (1) the useful capacity of the reservoir is relatively very small compared to its total capacity, (2) the quantity of masonry is nearly

5 times that of the other alternatives, (3) the canal head is 245 ft. above the bed level of the river and takes off with a tunnel 2 to 3 miles long at its head, (4) the canal is very large canal in rocky country with bare rock or only a crust of about 6" of earth in many places, (5) the length of the canal on contour is about 350 miles but it has been assumed that it can be shortened to 224 miles, (6), the duties assumed for the Canal appear to be too high and canal capacities may need increase, and (7) there are certain proposals to be supplied by one method for sometime and by another later on.

The Committee also admits that the cost of the Lower Krishna Left Canal under the Nandikonda Scheme "is somewhat high on account of difficult country involving construction of tunnels and other expensive works. Details have not been scrutinised". Again in estimating the cost of branch canals under the Lower Krishna Right Canal at Rs. 40 per acre, it has stated "The rate is slightly lower than that adopted in the Krishna-Pennar Project, but it is justified because a large proportion of the irrigation will be dry and the channel dimensions will be comparatively smaller a detailed survey will have to be done before a correct estimate can be prepared".

(g) Again, in criticising the Krishna-Pennar Project, the Committee has stated "unreasonable to take Krishna water for the benefit of areas across the Pennar, which are already served by a large number of tanks and do not normally suffer much distress". Yet, in recommending the irrigation of practically the same or similar areas across the Pennar with water to be dropped into the same Pennar by a canal proposed by it, the Committee says "there is a large number of small and large tanks in the area commanded by the lower half of the canal (Lower Krishna Right Canal) and these will have a favourable influence on the rapid development of irrigation. The total ayacut of the tanks is about 2 lakhs acres but the supply is at present precarious. Conditions will be stabilised when assured supplies pass down into the tanks."

(h) The Committee also proposes to link the Krishna and the Pennar but by a long route *via* Guntur etc. The link proposed under the Krishna-Pennar Project is the shortest.

(i) The estimate for the Pulichintala Dam put by the Committee at Rs. 7.50 crores does not seem to be acceptable. The cost was estimated in 1910 at Rs. 8.34 crores and at present

rates it is more likely to be Rs. 25 crores. Even if a dam of a different design is to be built, the cost is likely to be much more than Rs. 7.50 crores.

(j) It is not clear why the Nandikonda Project, which has yet to be investigated in detail on the Madras side, should be taken up in the first stage, relegating the Siddeswaram Dam on the Krishna, a project investigated in detail and adopted by the Committee itself, to the second stage.

(k) The Committee's proposals contemplate the irrigation of dry crops on large extents of land, the equivalent irrigation of wet crops being less than under the Krishna-Pennar Project. The crying need is for rice and not millets.

(l) The Committee considers that Godavari waters could be diverted to the Krishna, or Krishna areas taken over by the Godavari for supply, in which case areas *south* of Madras could be provided with water. It has added that further investigation will be necessary in this regard. It is not clear why the Committee has not dealt with the possibility of supplying the Guntur area with Godavari water in putting forward an integrated scheme.

5. INTEGRATED PLAN FOR UTILISATION OF KRISHNA AND GODAVARI WATERS—SEVERAL POSSIBILITIES.

Actually, it should be possible to evolve any number of integrated schemes for the utilisation of the waters of the Krishna and Godavari for the irrigation of lands in Kurnool, Cuddappah, Chittoor, Guntur, Nellore and Krishna districts. One possible scheme for the Krishna is described below :—

(i) WITHOUT A PENNAR RESERVOIR

This will consist of :—

- (a) The Siddeswaram Reservoir,
- (b) The Mittakondala Cut,
- (c) The Krishna Pennar East Canal,
- (d) The Krishna Pennar West Canal,
- (e) The Kaveli Canal,
- (f) The Kanupur Canal,
- (g) The Barrage on-Pennar.
- (h) The Madras Canal.

and cost Rs. 51 crores in all and will irrigate 10 lakhs acres for first crop and 2 lakhs acres for second crop.

(2) WITH A PENNAR RESERVOIR

Same as (1) above but with the addition of the reservoir at Someswaram.

This will cost Rs. 71 crores and will irrigate 10 lakhs of acres for first crop and 5.5 lakhs acres for second crop.

(3) AN INTEGRATION OF THE ABOVE TWO PLANS WITH A NANDIKONDA RESERVOIR.

This plan may have : (i) a Pulichintala dam and a canal from it to irrigate the Pulichintala Ayacut as in the Committee's plan (subject to the investigation of the comparative costs of supplying the area from Nandikonda and Pulichintala)

(ii) A Pennar North Canal as in the Krishna-Pennar Project (subject again to investigation of comparative costs of supplying the area by this method and by the Committee's method) ;

(iii) a Nandikonda Right Side Canal to serve areas not commanded by the Pulichintala Canal and the Pennar North Canal, but without accommodation for supplies required for the Madras Canal and

(iv) the other works as in (1) and (2) above.

Under these proposals, the Nandikonda dam need be of just that height as is required for the Hyderabad scheme, and so far as the South Canal from Nandikonda is concerned, it (the Nandikonda dam) will act only as a diversion dam, the storage required for the canal being held at Siddeswaram. The Siddeswaram reservoir will then have to be of the original size provided for in the Krishna-Pennar Project, and it might be desirable to make the Mittikondala cutting big enough to carry 32,000 cusecs even at the first stage. All parts of this last plan except those relating to Nandikonda have been fully investigated as a part of the Krishna-Pennar Project and are ready for execution. The cost of this plan would be Rs. 75.79 crores plus X plus Y plus Z, where X is the Madras share of the cost of Nandikonda Dam, Y that of the Nandikonda Right Canal and Z Nandikonda fuller development. Separate figures for Y and Z have to be worked

out because the scheme will have to be worked out in two stages, Y falling in Stage I and Z in Stage II. There will also be a Stage III. The detail of the stages will be as follows :—

STAGE I	Cost in crores of Rs.
Siddeswaram Reservoir as per original	19.06
Krishna-Pennar Project Plan	19.06
Mittikondala cut and improvements to Krishna-Pennar Project link for 32,000 cusecs	11—10
Krishna-Pennar East Canal	5.17
Kavali Canal	2.52
Kanupur Canal	1.81
Pick-up Barrage	1.13
Madras Canal	12.00
Nandikonda Scheme as per Hyderabad Plan	X crores
Nandikonda Right Side Canal to be investigated and estimated for as per Committee's proposals but without allowance for supply to Madras and to be executed in Stage I as in the Committee's proposals	Y crores
TOTAL	52.79 plus X plus Y crores
STAGE II—	
Krishna-Pennar West Canal	4.28
Nandikonda fuller development	Z crores
Pennar Dam for fuller Development	19.72 crores
	76.79 crores .
	plus X plus Y
	plus Z crores.
STAGE III	
Godavari-cum-Krishna development, consisting of a Dam at a place to be decided, on the Godavari.	
A diversion dam at Ramapadasagar	
Canal to the left.	
Canal to the right emptying at as high a point on the Krishna as possible.	
Pulichintala Plan as envisaged by the Committee.	
Pennar South Canal for any water that may be available for development.	

6. CONCLUSION

(a) The question of how the available Krishna waters might be utilised is predominantly one for technical men, who alone can judge the feasibility and cost of any scheme or schemes in this connection.

As regards policy, the Government of Madras are of opinion, subject to the above (a), that any scheme for utilising the available Krishna waters should be framed so as to involve minimum cost and be within the financial means available, and should be one which will give the maximum extent of addition to irrigation and food production. The Madras Government are further of the opinion that first priority should be given to providing additional irrigation facilities to commandable drought areas, and in particular to the districts of Kurnool, Cuddappah and Chittoor, and those parts of Guntur and Nellore districts which suffer from drought along with Rayalaseema.

If, as a result of schemes on the Godavari and the linking up of the Godavari and the Krishna, extra water becomes available, the question of supply for irrigation in the best interests of the country as a whole, by extending the canals, might be taken up in the light of the then prevailing conditions.

(b) It is the opinion of the Madras Government's engineers that if any plan for the utilisation of Madras's share of the Krishna waters is to be taken up in the near future, the best course would be to construct the Siddeswaram Dam, or a modified version of it, and attendant canals, etc. in the first stage, and simultaneously investigate the Nandikonda and Pulichintala schemes. This technical opinion might be examined in the light of the statement of the Madras Government's policy in (a) above.

(c) The Planning Commission has included a project on the Krishna in the Five Year Plan, without mentioning anything about what expenditure is proposed during the period. It is not also clear whether the cost is to be met from Central loans entirely or from Central loans in part, the rest being found by the States concerned. The amount which this State Government could borrow is necessarily limited, and it has not enough resources even to meet the cost of important sanctioned schemes under execution. The plan for the utilisation of Madras's share of the Krishna waters would be a major one, about the biggest ever for Madras, costing well over Rs. 120 crores, whatever might be the constituent schemes.

APPENDICES

APPENDIX H I

COMMENTS OF THE GOVERNMENT OF HYDERABAD

(Extracts from a letter from the Chief Minister of Hyderabad dated the 21st November, 1952.)

It is to be pointed out that the Government of Hyderabad do not agree with the view expressed in the Press Note, dated 1st November 1952, that the Report is an interim one sent by the Khosla Committee. As a matter of fact, it is a final report so far as the main recommendations of the Committee are concerned. The further investigation and survey suggested by them is intended to work out details of the schemes they have recommended. It is also felt that the Report of the Committee need not have been kept strictly confidential.

This Government does not also agree with the statement in the Press Note that the Khosla Committee had not answered the terms of reference owing to insufficient material at their disposal. In fact, this Government feel that the Khosla Committee have fully investigated the various schemes that were submitted by the Madras and Hyderabad Governments, and expressed their definite opinion on the merits and demerits of each one of them. They have made an exhaustive analysis of all of them and given their conclusions in an unmistakable language. A perusal of Chapter V of the Report which deals with the Committee's proposals and the grounds on which they base them, show that they have dealt with all aspects of the issues referred to them in detail and made their definite recommendations. There is nothing in the Report to show that there was lack of material or insufficient material before the Committee nor is there anything to indicate that their Report should be considered as an interim Report subject to modification after further surveys and investigations. On the other hand, it will be seen that on page 85 of the Report under the heading "Committee's proposals" they made specific recommendations suggesting that their proposals should be carried out in three stages so far as Krishna Valley projects are concerned. On page 87 of the Report, the Committee have given definite answers to the terms of reference stating the questions and the answers seriatim.

On these grounds and others based on an exhaustive examination of the Report, the Government of Hyderabad regret to say that they do not agree with the statements made in the letter and the Press note referred to above. They consider that it is necessary in the interests of all concerned, that the Planning Commission should clarify these points after a fuller consideration of the Report in the light of the above observations.

The Hyderabad Government take the view that further surveys and investigations should be carried out strictly in accordance with the recommendations made by the Khosla Committee and should be restricted to purposes for which the Technical Committee have suggested these surveys and investigations. A perusal of para. 9 of the letter addressed to the Secretary, Planning Commission, by the Khosla Committee printed at the commencement of the Report, will clearly show that the surveys and investigations contemplated by the Khosla Committee, are those that are indicated in para. 8 of their letter. Para. 8 deals with the possibility of diverting Godavary water into the Krishna with a view to release the unused balances becoming available for Madras. A reference to this subject has been made in para. 9 and it has been suggested that immediate steps should be taken to implement the first stage of the Committee's plan and the necessary surveys and investigations mentioned in para. 8. It has also been mentioned that these investigations should be carried out under the guidance and control of the Technical Committee. In para. 7, they have also indicated that the figures mentioned by them were based on rough estimates and may have to be suitably altered as a result of detailed investigations and survey which must be carried out. So far as the further survey and investigation on the lines suggested by the Commission is concerned, this Government has no objection for their being carried out, and are sending their officers as required for the Conference to be held on the 8th of December, 1952.

It will then be seen that the Hyderabad Government are in general agreement with the best and most economical method of utilisation of Krishna waters suggested by the Khosla Committee and they take the view that it is only the details that have to be worked out in the light of the recommendations made. This Government is anxious that the best and most economical and extensive use of Krishna waters should be made without depriving the Krishna valley of its due share of waters both for irrigation and power. They are also anxious that the scheme should be such as to make it possible to release unused

waters of Krishna for utilization in Madras. Both these objects should be achieved in a manner that there is no undue disadvantage or damage to any part of the country whether in Hyderabad State or in Madras State. From this point of view, the Hyderabad Government desire that some better alternative than Siddeswaram dam should be found to satisfy the requirements of Madras because they feel that the construction of a dam at Siddeswaram would result in the submergence of a large number of villages and considerable area of land under cultivation. The Hyderabad Government desire that the alternative suggestions offered by the officers of this Government may be examined by the Technical Committee under whose directions the further surveys and investigations are going to be conducted before that part of the scheme is finally approved.

APPENDIX II

MINUTES OF A CONFERENCE HELD IN THE PLANNING COMMISSION ON MONDAY, THE 8TH DECEMBER, 1952, TO CONSIDER RECOMMENDATIONS OF THE TECHNICAL (KHOSLA) COMMITTEE ON THE UTILISATION OF THE KRISHNA AND THE GODAVARI WATERS.

PRESENT :

PLANNING COMMISSION

- Shri G. L. Nanda . . . Deputy Chairman.
Shri V. T. Krishnamachari . Member.
Shrimati G. Durgabai . . Member.
Shri A. Zaman . . . Deputy Secretary.
Shri P. C. Suri . . . Private Secretary to the
Deputy Chairman.
Shri S. Rammohan . . . Technical Officer (Power).
Shri C. S. Parthasarathy . Technical Officer (Irrigation).

TECHNICAL (KHOSLA) COMMITTEE

- Shri G. R. Garg . . . Member.
Shri Moti Ram . . . Member.

GOVERNMENT OF MADRAS

- Shri T. M. S. Mani . . . Secretary, Public Works
Department.
Shri N. Padmanabha Ayyar . Chief Engineer.

GOVERNMENT OF HYDERABAD

- Shri Zahir Ahmed . . . Development Commissioner.
Shri P. Papiiah . . . Chief Engineer.
Shri M. Jaffar Ali . . . Superintending Engineer.

The Planning Commission appointed a Technical Committee under the chairmanship of Shri A. N. Khosla to formulate an integrated programme for the most economic utilisation

of the share of the Madras State of the waters of the Kistna and the Godavari and to suggest a specific project or projects which would fit into the programme and satisfy the tests laid down by the Planning Commission in paragraph 10 of chapter 7 of the Draft Outline for inclusion in the Five Year Plan.

2. The Technical Committee have drawn up an integrated programme but have suggested that further investigations should be made before their proposals are finalised. Investigations will also have to be made before recommending particular schemes for inclusion in the Five Year Plan. Both sets of investigations can be carried out together.

3. The conference accordingly decided on the following programme of investigations :—

(i) Remodelling of the Kurnool-Cuddapah canal including, if necessary, remodelling of Sunkesula ancicut for this purpose. The Madras Government will complete the necessary investigations within a period of four months.

(ii) *The Nandikonda dam—*

(a) The Government of Hyderabad will furnish existing data in full to the Madras Government and to the Planning Commission immediately. It is understood that these estimates have been brought up-to-date.

(b) Detailed investigations on the canal system on the Madras side will be made by the Madras Government within a period of ten months.

(c) Investigations made by the Hyderabad Government on the canal from the Nandikonda dam on the Hyderabad side will be brought up-to-date within a period of three months.

(iii) *The Pennar dam—*

The Madras Government may renew the proposals and, after further investigation, place them before the Planning Commission within a period of three months.

(iv) *The Pulichintala dam—*

The Madras Government will carry out further investigations and bring the estimates up-to-date. They will also examine the question whether a dam or a barrage should be provided. The entire investigation should be completed within a period of nine months.

- (v) The Madras and the Hyderabad Governments will submit a joint note in regard to the cost of the Nandikonda dam upto +475 for the purpose of a second crop irrigation in the Krishna delta.

4. The results of the investigations decided on above should be communicated to the Planning Commission as and when they become available within the periods agreed to. The investigations should include the preparation of fairly accurate estimates of costs.

5. The investigations referred to in paragraph 3 above will be carried out under the general guidance of the Technical Committee, viz., the Khosla Committee. The Technical Committee will continue to function until in consultation with the Governments of Madras and Hyderabad an integrated plan has been finally drawn up and specific recommendation has been made for the inclusion of a project or projects in the Five Year Plan.

6. Members of the Technical Committee, who were present at the conference, made it clear that they had no time to study the memoranda submitted by the Governments of Madras and Hyderabad on the report of the Committee.

COVER DESIGNED & PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PHOTO-LITHO