GOVERNMENT OF INDIA

KRISHNA WATER DISPUTES TRIBUNAL

THE REPORT
OF
THE KRISHNA WATER DISPUTES TRIBUNAL
WITH THE DECISION

VOLUME II

NEW DELHI
1973

ERRATA

(Volume II of the report of the Krishna Water Disputes Tribunal)

S. No.	Page No.	Column	Line No.	For	Read
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GOVERNMENT OF INDIA

KRISHNA WATER DISPUTES TRIBUNAL

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THE REPORT

OF

THE KRISHNA WATER DISPUTES TRIBUNAL WITH THE DECISION

IN THE MATTER OF WATER DISPUTES REGARDING THE INTER-STATE RIVER KRISHNA & THE RIVER VALLEY THEREOF BETWEEN

1. **The state of Maharashtra**
2. **The state of Karnataka**
3. **The state of Andhra Pradesh**
4. **The state of Madhya Pradesh**
5. **The state of Orissa**

} **Parties to the dispute until 19th April, 1971**

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CHAPTER XIII

DIVERSION OF THE KRISHNA WATERS OUTSIDE THE KRISHNA BASIN

393 Part I—*Legality of diversion of river water to another watershed.*

Proposals and contentions of the parties.—Mysore has no existing project nor does it contemplate any future project for diversion of the Krishna waters outside the basin. Maharashtra diverts and proposes to divert large quantities of water outside the Krishna basin for generation of hydropower and, wherever possible, for irrigation from the tail-race waters. Andhra Pradesh diverts and proposes to divert large quantities of water outside the Krishna basin for purposes of irrigating lands in other basins.

Mysore contends that diversion outside the basin is illegal and that only in-basin needs should be considered in determining a State's equitable share. Maharashtra asserts that transfer of water to another watershed for purposes of both power generation and irrigation is lawful and that, while in-basin needs only should be considered in determining a State's equitable share, a State should be permitted to divert its
394 share of the water outside the basin. Andhra Pradesh contends that out-of-basin needs are a relevant factor and that diversion outside the basin for irrigation needs only should be permitted. On the subject of diversion of the Krishna waters outside the Krishna basin generally, the following issue was raised :—

> Issue II(4) "Should diversion or further diversion of the waters outside the Krishna drainage basin be protected and/or permitted ? If so, to what extent and with what safeguards?"

Necessity of diversion to another watershed. —The diversion of river water to different watershed-for purposes of irrigation, generation of hydropower, municipal water supply and other beneficial uses may be made sometimes, and no objection can be raised to this practice merely on the ground that the diversion is from an inter-State river. The diversion to another basin may be useful for the benefit of the region as a whole ([1]). One river basin may have a surplus of excellent land capable of being irrigated but **395** a shortage of irrigation water, while another basin may have a surplus of water but a shortage of arable land; such a situation may be rectified by moving surplus water to areas where it is needed and can be used beneficially.

Large scale and technically complex diversions of water have become common with the advance of modern technology. There are many instances of such diversions in U.S.A., South America, Australia, France, Switzerland, Russia, China and other countries ([2]). In India also, the waters of the Ravi, the Beas, the Jhelum, the Sutlej, the Chenab, the Krishna, the Mula Mutha, the Indrayani, the Periyar, the Chelakudi, the Subarnarekha and other rivers have **396** beendiverted toother watersheds. Currently, the feasibility of the Ganga Cauvery link is being seriously debated.

An inter-State river basin is an indispensable unit for meteorological, hydrological and engineering studies and is an important unit for organising and carrying out economic and social development including the improvement of land and water use practices. Only a river basin study can give intimate knowledge of the quantity, quality and distribution of water resources and the optimum location of dam sites and engineering works. At the same time a comprehensive river basin development plan must always take account of competing projects, demands and service areas within wider boundaries than merely those of the basin. Natural and social factors may indicate a wider area for optimum growth ([3]).

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(1) Second Five Year Plan, p. 349.

([2]) L.A. Teclaff—The River Basin in History & Law (1967), pp. 184-192, 202; R.C. Martin and others, River Basin Administration and the Delaware, pp. 19-20, 230; E. Kuiper, Water Resources Development, Planning Engineering and Economics (1965), p. 351; R. J. Chorley, Water Earth & Man, pp. 507-508; A. H. Garretson and others, The Law of International Drainage Basins, pp. 324, 492-495; The International Law Association, Report of the Fifty-Second Conference Helsinki 1967, p. 461. In China, an irrigation canal diverting the Ching river and discharging it into the Lo river was completed in 246 B.C., see History of Mankind by Luigi Pareti Vol. II, Part II, p. 383 (English translation by Guy E.F. Chilver and Sylvia Chilver).

(3) J.D. Chapman, The International River Basin (1963), p. 2; R.E. Clark, Water and Water Rights (1967) Vol. II, pp. 427- 429

397 Hydropower produced from the basin waters may be and is often needed and transmitted for the benefit of other areas. For optimum utilisation of water resources, it may be necessary to divert surplus waters for irrigating lands in scarcity areas outside the basin.

Legality of the diversion.—On several occasions, the U.S.A. Supreme Court has allowed diversions of waters of Inter-State rivers outside the watershed.

In New Jersey v. New York 283 U.S. 336(1931) at p. 343 the Court observed :

> "The removal of water to a different watershed obviously must be allowed at times unless States are to be deprived of the most beneficial use on formal grounds. In fact it has been allowed repeatedly and has been practised by the States concerned. Missouri v. Illinois, 200 U.S. 496, 526. Wyoming v. Colorado, 259, U.S. 419, 466. Connecticut v. Massachusetts, 282, U.S. 660, 671."

In Lake Lanoux Arbitration (France v. Spain),
398 International Law Reports (1957) Lauterpacht, p. 101 at p. 125, an International Arbitral Tribunal observed :

> "The Tribunal does not overlook the reality, from the point of view of physical geography, of each river basin, which constitutes, as the Spanish Memorial (at p. 53) maintains 'a unit'. But this observation does not authorise the absolute consequences that the Spanish argument would draw from it. The unity of a basin is sanctioned at the juridical level only to the extent that it corresponds to human realities. The water which by nature constitutes a fungible item may be the object of a restitution which does not change its qualities in regard to human needs. A diversion with restitution, such as that envisaged by the French project, does not change a state of affairs organised for the working of the requirements of social life. The state of modern technology leads to more and more frequent justifications of the fact that waters used for the production of electric energy should not be returned to their natural
399 course. Water is taken higher and higher Up and it is carried ever farther, and in so doing it is sometimes diverted to another river basin, in the same state or in another country within the same federation, or even in a third State. Within federations, the judicial decisions have recognised the validity of this last practice (Wyoming v. Colorado..... (259 U.S. 419) and the instances cited by Dr. F. J. Berber, Die Rechtsquellen des internationalen Wasserniitzungsrechts, p. 180, and by M. Sauser-Hall, 'L' Utilisation industrielle des fleuves internationaux', (in) Recueil des Cours de l'Academic de Droit international de la Haye, 1953, Vol. 83, p. 544; for Switzer land, (see) Recueil des Arrets du Tribunal Federal, Vol. 78, Part I, pp, 14 et seq."

Mysore relied on a statement of Dr. Gamal M. Badr (Algeria) at the fifty second conference of the International Law Association at Helsinki that diversions of waters beyond the geographical limits of the drainage basin was illegal. He proposed that the draft Article IV of the Helsinki Rules should be amended 400
to read "Each basin State is entitled to a reasonable and equitable share in the beneficial uses within the part of the basin lying in its territory, of the waters of the international river basin". But it is to be observed that Mr. J. L. Macallum (Canada) and Dr. Zarbrugg (Switzerland) and other participants did not agree with Dr. Badr and the conference approved of Article IV which reads "Each basin State is entitled, within its territory, to a reasonable and equitable share in the beneficial uses of the waters of an International drainage basin([4])".

For all these reasons, we hold that diversion of water of an inter-State river outside the river basin is legal. In the present case, all the areas outside the Krishna basin to which the Krishna waters are diverted or proposed to be diverted are situated within the territories of riparian States. We express no opinion on the question whether the Krishna waters can law- 401
fully be diverted to areas situated in the territories of a non-riparian State.

Relevance of need for diversion of water outside the basin.—The need for diversion of water to another watershed may be a relevant factor in equitable apportionment. Transmountain diversions were considered by the parties to the Upper Colorado River Basin Compact, 1948 in arriving at a fair share of the riparian States in the waters of the inter-State Colorado River system([5]). A State is one integral unit and its interests encompass the well being

(4) The International Law Association Report of the Fifty Second Conference Helsinki 1966, pp. 448-449, 460-461, 476, 486.

(5) A.H Garretson and others, The Law of International Drainage Basins (1967), pp. 494-495.

of all its inhabitants within its territory including areas outside the river basin. Under Section 3 of the Inter-State Water Disputes Act, 1956, the crucial question is whether the interest of the State or of any of its inhabitants in the waters of the inter-State river and river valley is prejudicially affected by the action of another State. Thus, the relevant consideration is the interest of the State as a whole and all its inhabitants and not merely the interest of the basin areas of the State. 402

However the fact that the water diverted to another watershed is wholly lost to the river basin and no part of it appears as return flow or adds to the ground water recharge in the basin is also a relevant factor in equitable apportionment ([6]).

Permissible limits of diversion to another watershed.—Though out-of-basin diversions and needs may be relevant in determining a State's equitable share, the weight to be given to them depends upon the circumstances of each case. Each river basin has its own peculiar problems and there is no set of rigid-norms that can be applied to all river systems under all circumstances.

If there is an agreement permitting the removal of the water to a different watershed, the agreement furnishes the law and no further question arises. Otherwise complex questions of distribution may arise([7]).

Diversion of water from one river basin to another is viewed with distrust and resisted by the basin population([8]) and in some places statutory restrictions are imposed on such transfer ([9]). Some publicists hold that barring exceptional circumstances large scale transfers of water do not maximise economic benefits ([10]) —and some assert that all future needs of areas of origin must be provided for before surplus water can be exported([11]). Comprehensive river basin plans have been formulated on the basis that generous allowance should be made for all present and prospective uses within the parent drainage basin before water would be exported to an adjacent drainage area([12]). 403 404 405

On the other hand, there are publicists who maintain that water resources of the river should be used to optimum advantage over the entire area served or likely to be served by the water including areas outside the river basin([13]).

With respect to diversion of the Godavari waters to the Krishna basin, the Khosla Committee ([14]) observed that "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". The question of diversion of the Godavari waters out of the Godavari basin will be discussed by us separately. 406

(6) Report of the Special Master, Michael J. Doherty, pp. 131-152 in the case of Nebraska v. Wyoming 325 U.S. 589, 665.

(7) The Nation's Water Resources, U.S. Water Resources Council 1968, p. 6-13-10.

(8) Transactions of the American Society of Civil Engineers Vol. 104(1939), p. 1822 Paper No. 2055—Final Report of the Com mittee of the Irrigation Division on Inter-State Water Rights (The people dependent on the waters of a stream view with distrust any attempts to divert a portion of its waters to another watershed or basin).

Francis A, Engelbert, Federation and Water Resources Development, Law and Contemporary Problems Vol. 22(1957), p. 325 at p. 336.

(9) In U.S.A., many local statutes restrict the diversion of water from one river basin to another, See Ven Te Chow, Handbook of Applied Hydrology (1964), p. 27-14, The Water Resources Planning Act of 1965 enjoins that no entity established or acting under the Act may "study, plan, or recommend the transfer- of waters between areas under the jurisdiction of more than one river basin commission."

(10) C.W. Howe, K.W. Easter, Inter Basin Transfers of Water, Economic Issues and Impacts (1970), p. 168 (Except for certain sets of circumstances in so called "rescue operations", the national economic benefits from the use of the water provided would, be less than the cost of the transfers); Joseph L. Sex, Water Law Planning & Policy (1968), pp. 20-22 (Engineering feasibility must not be confused with social policy and economic gain).

(11) L.A. Teclaff, The River Basin and Beyond-changing concepts in U.S. Water Resources Planning, International Association for water law, Annales Juris Aquarum (1968), p. 114; L.A. Teclaff, The River Basin in History and Law pp. 191, 192. L.A. Teclaff even asserts that the future needs or uses of the areas of origin take precedence over existing or prior uses of the receiving-areas, UN Inter regional Seminar on Current Issues of Water Resources Administration, New Delhi, 1973 ESA/RT/Meeting V/8 Reading 3.

N.D. Gulhati, Development of inter-State rivers, Law and Practice in India, p. 93 (The lands of a river basin have prior claim on the waters of a river system and any part of these waters can be used for irrigation outside the basin only if that part is surplus after meeting the full requirements of the lands within the basin. Any irrigation use outside the basin, ignoring the claims of the basin itself, must sooner or later lead to undesirable complications).

(12) Missouri River Basin Project, Lower Platte River Basin, A plan of development for the Lower Platte Basin, September, 1951, pp. 173-174 (U.S. Dept. of the Interior, Bureau of Reclamation Region 7).

(13) R.C. Martin and others, River Basin Administration and the Delaware, pp. 19-20, 23-24.

(14) Report of the Technical Committee on the optimum utilisation of the Krishna and the Godavari Waters (1952), p. 103.

The preponderance of opinion seems to indicate that diversion of water to another watershed may be permitted, but normally, in the absence of any agreement, the prudent course may be to limit the diversion to the surplus waters left after liberally allowing for the pressing needs of basin areas. In general, basin areas are more dependent on the water than other areas. Maximum economic benefit can rarely be achieved by ignoring the pressing needs of the areas of origin and permitting development elsewhere.

However, where water has already been allowed to be transferred and used in another watershed, the settled economy of the region should not be lightly disturbed. Normally, existing works based on such a transfer should receive the same protection that may be given to existing works based on diversions inside the basin. If a populous city outside a river basin receives its water supply from the river, it is unjust and unrealistic to hold that the water should be restored to the basin and the city deprived of its drinking water.

407 For a long period of time, large quantities of water have been diverted outside the Krishna basin and used for beneficial purposes. Admittedly, however, the available supplies of the Krishna river system are not sufficient to satisfy the demands of all the existing and proposed projects of the States.

Conclusion.—Subject to consideration of the question whether in case of conflict between uses for irrigation and power production the claims for power production by westward diversion of water should be allowed to prevail at the expense of irrigation, three propositions may be safely laid down with regard to the Krishna river basin:

(1) Diversion of water of the inter-State river Krishna outside the river basin is legal.

(2) In equitable allocation, future uses requiring diversion of water outside the basin are relevant, but more weight may be given to uses requiring diversion of water inside the basin.

(3) All existing uses based on diversion of water outside the basin should receive the same protection that may be given to existing uses based on diversion of water inside the basin. **408**

Part II—*Diversion of water of the Krishna river for irrigation outside the river basin.* **409**

Water is and will. be diverted outside the Krishna basin for the purpose of irrigation from the following projects([15]) :—

(1) Krishna Delta Canals,

(2) Kurnool Cuddapah Canal,

(3) Nagarjunasagar project (Right Bank Canal),

(4) Tungabhadra Project (Right Bank High Level Canal) Stages I and II (Andhra Pradesh's share), and

(5) Guntur Channel.

The Krishna Delta Canal system was constructed in 1855 for irrigation of the Delta areas. The characteristic of the delta formed at the month of a river by the deposit of river-borne silt is that its general surface slope is away from the river margins and most of its drainage reaches the sea through minor streams. A large part of the delta area is thus technically outside the river basin. But the entire delta area is dependent on the river for irrigation; its soil is usually very fertile, and being soft, facilitates the cheap construction of canals([16]). About 95% of the area irrigated in the Krishna delta by the Krishna **410** Delta canals is in the Gundlakamma and other minor valleys outside the Krishna basin. The Guntur Channel will supply water for irrigation to the high lands adjoining the Krishna Delta.

The Kurnool Cuddapah Canal was constructed in 1866 to alleviate distress in the famine-stricken areas of the Pennar basin. About 90% of the area irrigated by the Kurnool Cuddapah Canal lies in the Pennar valley ([17]). At the point of diversion of the Krishna waters, a low ridge separates the Pennar valley from the Krishna basin.

The Tungabhadra Project High Level and Low Level Canals are intended partly for the benefit of Bellary, Anantpur, Cuddapah and Kurnool districts ([18]). A part of the area irrigated from the Tungabhadra High Level Canal lies in the Pennar valley. Water is diverted outside the Krishna basin from the Nagarjunasagar Project Right Bank Canal also.

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(15) MRDK XII, Sheet No. XXIII.

(16) See W.M. Ellis, College of Engineering Manual 1963, pp. 62-65.

(17) Report of the Krishna Godavari Commission, p. 162.

(18) The Andhra State Act, 1953 section 66(5); Report of the Tungabhadra Project 1942 Low level Canal Scheme, APPK XVIIIpp. 3-5.

All the out-of-basin areas irrigated by the Krishna waters lie in the territories of Andhra Pradesh. It is conceded by all parties that all these projects should be protected. Only the extent of their protection is
411 disputed and this will be dealt with under Issue II(3).

Maharashtra and Mysore argue that restrictions should be imposed on Andhra Pradesh regarding the quantity of water which may be diverted by Andhra Pradesh for irrigation outside the Krishna river basin. It is to be observed that all diversions by Andhra Pradesh outside the basin are for purposes of irrigation only and not for purposes of power production. The delta area, though technically outside the basin, is heavily dependent on the Krishna waters for its irrigation needs. Diversion of the Krishna waters for irrigation of scarcity areas in the Pennar valley has been practised for a long time. Irrigation from the Nagarjunasagar Project and the Tungabhadra Right Bank High Level Canal of Andhra Pradesh is not yet fully developed and it is not known how much water will be diverted from these projects for irrigation outside the basin. On a consideration of all relevant materials, we do not propose to impose any specific restrictions on Andhra Pradesh regarding diversion of water outside the basin for purposes of irrigation.

412 Part III—*Maharashtra's westward diversion schemes and conflict between uses for irrigation and power.*

Existing westward diversion projects.—For over half a century, waters of the Krishna river system are being diverted westwards for purposes of generation of hydropower. In the Tata Hydel Power Supply, Andhra Valley Power Supply and Tata Power Schemes, the headwaters of the Bhima are impounded in storages, conducted through tunnels or open ducts to steel penstocks and dropped to power houses at the foot of the Western Ghats. The three schemes collectively known as the Tata Hydel Works are operated by the Tata group of limited companies.

The gigantic Koyna Hydel Project diverts the waters of the river Koyna westwards for purposes of power generation. The Koyna is an important tributary of the river Krishna. The project has an underground power house at Pophali. The seasonal rainfall is impounded in the huge Koyna reservoir so that a dependable water supply is available throughout the year. The water is taken from the reservoir through an underground head-race tunnel, surge shaft, pressure shafts and penstocks and dropped from a considerable height to the turbines in the power house at the foot of the Western Ghats.

The Koyna station has 4 generators of 75 MW 413
each and 4 generators of 60 MW each. The load factor of the station utilising 67.5 T.M.C. of water annually is 54% with one generator as a stand-by and 46.5% with all generators working. Normally, except during periods of repairs, maintenance etc., all generators work for 24 hours in the monsoon season and during day time in the non-monsoon season ([19]).

The Koyna dam suffered damage from earthquakes in December 1967 and soon thereafter the lowering of the crest gates was stopped. The strengthening of the dam was completed in May 1972.

All the westward diversion projects lie in the territories of Maharashtra . The protected annual westward diversion for the projects including incidental evaporation losses is as follows: —

- Name of project	Westward diversion in T.M.C.	Evaporation-losses in T.M.C.	Total in T.M.C.
1	2	3	4
Tata Hydel Projects .	42.6	2.4	45
Koyna Hydro-electric Project	67.5	7.3	74.8
TOTAL	110.1	9.7	119.8

All the parties have conceded that the annual utilisation, of 119.8 T.M.C. for these projects should be protected.

Particulars of the power generated at the Tata Hydel Works and the Koyna Hydel Project Stages I, II &III are given in the following table ([20]).

(19) MR Note No. 16.
(20) MR Note No. 15.

414

Sl. No.	Name of Project	Head for power generation in feet	Number and size of units installed kW.	Firm capacity at 100% L.F kW.	Capacity available and L.F. for which station is designed kW. (taking one unit standby)	Total energy generated in MkWh.
1	2	3	4	5	6	7
1.	Tata Hydel Works		5x12,000=60000 1x10,000=10,000 70,000	26,300	58,000 kW @45.3%L.F. |	*1225 (Average at 50.7% load factor).
	(i) Tata Hydel Power Supply Scheme	1725		34,050	60,000 kW @ 56. 8% L.F.	
	(ii) Andhra Valley Power Supply Scheme .	1721	6 x 12,000=72,000	90,100	1,10,000 kW @82%L.F.	
	(iii) Tata Power Scheme (Mulshi Dam)	1638	6 x 22,000=1,32,000			
2.	(i) Koyna Hydro electric Project Stages I & II .	1600	4 x 60,000=2,40,000 4 x 75,000=3,00,000 5,40,000	2,51,600	5,40,000 kW @46. 5% L.F. 4,65,000 kW @ 54% L.F.	2200 with 67.5 T.M.C. diversion.
	(ii) Koyna Hydro-electric Project Stage III	400	4 x 80,000=3,20,000	64,000	3,20,000 @20%to30%L.F.	590 with 67.5 T.M.C. diversion.

* The average of the combined energy generation of the 3 power schemes for the period 1966-67 to 1971-72.

415 The annual diversion of water for hydro power generation from Tata lakes from year to year during 1952-53 to 1967-68 was ([21]) as follows:—

SI. No.	Year	Tata Hydel Power Supply	Andhra Valley Power Supply	Mulshi Dam	Total
1.	1952-53	5.97	8.35	24.37	38.69
2.	1953-54	6.92	8.00	25.22	40.14
3.	1954-55	5.87	8.60	27.36	41.83
4.	1955-56	6 89	9.01	27.09	42.99
5.	1956-57	8.74	10 31	28.19	47.24
6.	1957-58	5.94	9.72	25.34	41.00
7.	1958-59	7.79	10 81	25.92	44.52
8.	1959-60	9.64	12.56	26.43	48.63_
9.	1960-61	7.07	9.01	26.53	42.61
10.	1961-62	10.39	13.55	30.53	54.47
11.	1962-63	7.98	8.90	29.19	46.07
12.	1963-64	7.74	10.42	27.99	46.15
13.	1964-65	6.48	7.94	27.95	42.37
14.	1965-66	5.85	8.59	26.31	40.75
15.	1966-67	4.25	6.36	22.66	33.27
16.	1967-68	5.27	7.31	26.24	38.82

Koyna Project '

The proposal of the Bombay Government for westward diversion of the Koyna waters for purposes of power production met with considerable opposition 416 from the lower riparian States and was one of the main reasons for calling the conference of the States interested in the Krishna waters in July 1951.

Opening the discussion at the inter-State conference On the 27th July, 1951, Shri V. T. Krishnamachari stated:

> "In considering the issues placed before the meeting, two points of view should be reconciled. The first was the need from an all-India point of view for increasing available food supplies within the shortest possible tune and on the most economic basis. The Irrigation Commission reporting over 50 years ago emphasised the need regarding irrigation development as a national all-India question. This was even more important now than it was in the past. India's food problem can be solved only on such a basis. The shortage of power in the Bombay City and surrounding areas should also be regarded as an urgent problem. On the other hand, regional development was important, especially the development of backward regions, and could not be ignored."

The memorandum of agreement drawn up as a result of the deliberations at the conference provided that the diversion of supplies across the Western Ghats for the Koyna Project would be limited to 67.5 T.M.C. 417 of water. Formal sanctions to Stages I & II of the Koyna Hydel Project were given by the Planning Commission subject to the condition that the westward diversion of water would be limited to 67.5 T.M.C. of water annually. Maharashtra proposes _to divert from the Koyna Project an additional 32.5 T.M.C. of water westwards for power generation and 16 T.M.C. of water eastwards for purposes of irrigation.

Particulars of the Koyna Hydel extension scheme and the allied Koyna-Krishna *Lift* Irrigation scheme are as follows :—

Name of Project	Source of supply	Westward diversion in T.M.C.	Eastern irrigation in T.M.C.	Total utilisation in T.M.C.
Koyna Hydel Scheme with reservation of 16 T.M.C. for lift scheme	Koyna	32.5	16	48.5
Koyna Krishna Lift Irrigation Scheme	Koyna		5.6	5.6 in addition to 16 T.M.C. available from Koyna storage.

With an annual diversion of 100 T.MC. of Koyna water, the Koyna Hydel Station Stages I and II will produce 3,260 MKWh of electricity and will operate at 80 per cent L.F. with one generator of 75 MW as stand-by and at 69 per cent L. F. with all generators working. With this diversion, Koyna Hydel Project Stage III will produce 418 785 MKWh of energy at 20 to 30 per cent L. F.

(21) KGCR Ann. IV pp. 109-144; MRDK V pp. 34-40, 44-50, 54-60; MR Note No. 44.

New Multiple purpose westward diversion schemes: Maharashtra proposes new multi-purpose schemes for westward diversion of 108.1 T.M.C. and eastward diversion 0f 23.5 T.M.C. of water. Particulars of the new schemes are as follows:—

Name of Project	Source of supply	Westward diversion including evaporation in T.M.C.	Eastward diversion in T.M.C.	Total utilisation including evaporation in T.M.C.
1	2	3	4	5
Hiranyakeshi Multi-purpose	Hiranyakeshi	27.2	5	32.2
Vedganga Multi-purpose	Vedganga	22.7	5	27.7
Kasari Multi-purpose	Kasari	34.4	Nil	34.4
Kumbhi Multi-purpose	Kumbhi	10.5	7	17.5
Kadvi Multi-purpose	Kadvi	9,1	6.5	15.6
Phonda Multy purpose	Bhogavati	4.2	Nil	4.2
TOTAL		108.1	23.5	131.6

Particulars of the power potential and other details of the new westward diversion schemes are given in
419 ([22]) the following table :—

SI No	Name of Project	Head for power generation in feet	Number & size of units installed kW	Firm capaacity at 100% L.F. KW	Capacity available & L.F. for which station is designed kW	Cost of generation paise per kWh.	Total energy generated in MkWh
1	2	3	4	5	6	7	8
1.	Hiranyakeshi and Vedganga	1688 (& 190 for ridge power house).	8x80,000=6,40,000 1 x 13,500 6,53,500	1,76,250	6,40,000 at 25% L.F. 13,500 at 76% L.F.	4.95	1517
2.	Kasari . . .	1283 and 197	6x55,000=3,30,000 1x6,000=6,000 3,36,000	82,000 6,000 88,000	3,30,000 at 26.2% L.F - 6 000 at 100% L.F	5.45	730
3.	Kumbhi	1380	2x95,000=1,90,000	38,OOO	1,90,000 at 20 %L.F.	6.25	262
4.	Kadvi .	1510	2x66,500=1,33,000	33,225	1,33,000 at 25 % L.F.	6.25	228
5.	Phonda .	1415	1x75,000=75,000	14,730	75,000 at 20 % L.F.	6.25	99
		TOTAL	13,87,500	3,50,205			2836

420 Thus Maharashtra seeks to utilise 260.4 T.M.C. of water for westward diversion including evaporation losses as follows:—

Project	Westward diversion including evaporation losses in T.M.C.
Tata Hydel Project/ Koyna Hydel Project (authorised) . /Koyna Hydel Projects (extension) /New Multi-Purpose Projects .	45 74.8 32.5 108.1
TOTAL	260.4

On December 15, 1970, the Government of Maharashtra passed the following resolution :—

"The Government of Maharashtra has carefully considered the question of the westward diversion of the waters of the river Krishna and is hereby pleased to authorise the Advocate General of Maharashtra, Shri H. M. Seervai, appearing before the Honourable Tribunal hearing the Krishna water dispute to make a statement on behalf of the State of Maharashtra that for all practical

([22]) MR Note No. 9.

purposes, it is not possible to divert more than 260 T.M.C. of water to the West and
421 he is further authorised to inform the Honourable Tribunal that the Honourable Tribunal may by its final order restrain the State Of Maharashtra from diverting more than 260 T.M.C. of water to the west."

Even in 1951, when irrigation was not yet fully developed, westward diversion of water was resisted by the lower riparian States and only a limited quantity of water was allowed to be diverted westwards for production of electric energy. Since 1951, irrigation in the Krishna basin is being intensively developed. The question is whether further westward diversion of the Krishna waters should be permitted.

The States of Mysore and Andhra Pradesh strongly object to the westward diversion of additional water for purposes of power production.

Irrigation and other uses in the Ratnagiri District :

Maharashtra asserts that westward diversion of the Krishna waters is necessary not only for power production, but also for irrigation, water supply and industrial uses in Ratnagiri.

The major portion of the tail-race waters of the existing westward diversion from Koyna Hydel Project([23]) and Tata Hydel Works ([24]) is not utilised 422
for purposes of irrigation or other beneficial uses in the Ratnagiri district.

Maharashtra proposes to utilise the tail-race waters of new westward diversion schemes for irrigation, water supply and other uses in Ratnagiri.

Particulars of westward irrigation under the new westward diversion schemes will appear from the 423
following table:-

	Name of Project	Westward diversion/ gross utilisation for westward irrigation (T.M.C.)	Irrigated area (in thousand acres)	Talukas to be irrigated	District
	1	2	3	4	5
1	Kadvi	9.1/9.1	18.2	Lanja Mahal	Ratnagiri
				Sangamsshwar	,,
2.	Kasari	34.4/25.85	55.81	Lanja Mahal	,,
				Rajapur	.,
3.	Kumbhi.	10.5/10.5	23.0	Kankavli	,,
				Gagan Bavda Mahal	Kolhapur
4.	Phonda	4.2/4.2	9.0	Kankavli	Ratnagiri
5.	Hiranyakeshi	49.9/34.26	80.5	Kudal Mahal	,,
6.	Vedganga			Sawantwadi	
				Vengurla	,,
				Malvan	••
		108.1/83.91	186.51		

All the areas in Ratangiri and Kolhapur districts proposed to be irrigated from westward diversion schemes have heavy and assured rainfall during the monsoon months. The normal annual and June to November monthly rainfall in millimetres and the number of rainy days in these areas are shown in the 424
following table([25]).

([23]) in its statement of case (MRK I p. 47) Maharashtra said that, except for the Koyna Project, most of the water required for the proposed westward diversion schemes will be used for irrigation in Konkan areas. However, the note on Koyna Hydel Scheme (MRPK XXVIII, pp. 5-9) states that about 10 T.M.C. of the tail-race water released from Koyna Project will be used for irrigation and water supply in the Konkan region. Most of the proposed irrigation schemes are still under investigation.

([24]) The Note on Tata Hydel Works (MRPK XXVIII, pp. 55-56) states that a part of the tail-race waters from the Khopoli and Bhivpuri power houses are used for industries, lift irrigation schemes and for irrigation of about 4,000 acres under the Raja Nala Scheme and that the tail-race waters from Bhira Power House will be used for irrigating about 33,000 acres under the Kal Project.

([25]) Memoirs of the India Meteorological Department 1962 Vol. XXXI, Part III. (Monthly and Annual Normals of Rainfall and of Rainy days), MYDK XIX pp. 7-9, 16.

RAINFALL IN MILLIMETRES AND NUMBER OF RAINY DAYS

Station	June	July	August	September	October	November	Annual
Vengurla	836.2	910.6	457.7	263.4	96.0	34.3	2671.0
	21.3	26.5	23.1	14.8	5.8	2.0	96.6
Malvan	682.2	700.5	355.6	241.3	82.8	33.0	2154.7
	19.4	23.7	19.9	13.2	4.4	1.8	85.1
Rajapur	806.2	1173.2	664.7	367.3	122.7	32.7	3213.2
	20.6	28.6	26.1	16.2	6.2	1.9	102.0
Lanja	604.0	1409.2	833.4	660.7	112.5	59.2	3759.3
	20.4	29.8	24.6	21.2	6.6	3.2	110.9
Kankavli	557.0	1407.9	832.1	553.5	112.0	64.5	3616.4
	18.7	29.8	26.8	21.2	7.6	2.2	112.7
Sawantwadi	981.5	1370.1	759.2	344.2	177.0	51.1	3758.2
	22.4	28.9	26.4	17.2	8.5	2.6	109.6
Kudal	875.0	1102.4	581.9	289.6	129.8	40.1	3082.0
	21.6	28.1	24.8	15.8	6.9	2.2	102.3
Ganganbavada	1196.9	2237.0	1595.6	799.3	246.4	53.6	6212.3
	24.0	30.6	29.9	23.9	10.9	3.0	128.6

(Figures in the second line against the stations denote number of rainy days).

425 On account of heavy rainfall in this region, irrigation is not necessary during the kharif season([26]).

As the west flowing rivers are virtually dry during non-monsoon months, irrigation is useful during the rabi season for growing a second crop of paddy or pulses. ([27]) However, on account of the difficult terrain, irrigation possibilities are very limited([28]).

At present, the enormous water potential of the west flowing streams is being wasted to the sea. Suitable projects on the west flowing streams can be constructed for storing and using this water for purposes of irrigation and other uses in Ratnagiri. The Central Water & Power Commission made the following alternative proposals for irrigation from
426 west flowing rivers ([29]).

Sl. No	Name of project based on westward diversion of waters from the Krishna	Alternative sites on west flowing streams proposed by the C.W. & P.C.
1	2	3
1.	Kasari .	Pastewadi, Puwarwadi
2.	Kumbhi	Sutarwadi, Sangulwadi
3.	Phonda	Ghonsari
4.	Vedganga	Shivdav
5.	Ajra (Hiranyakeshi)	Talamba

The projects on the alternative sites on the west flowing rivers particularly at Shivdav and Puwarwadi are feasible([30]).

The cost per m.c.ft. of live storage in dam at the alternative sites is compartively higher, but it is not prohibitive ([31]).

(26) The report of the Maharashtra State Irrigation Commission at p. 203 observed that in the coastal strip comprising the districts of Ratnagiri, Thana and Kolaba, 'No irrigation water was required during the Kharif season on account of heavy rainfall'.

The First Five Year Plan at p. 338 observed : "In areas of high rainfall, like the west coast and north-eastern India, irrigation is either not necessary or is needed only to a very limited extent."

(27) Report of Maharashtra State Irrigation Commission, p. 203.

(28) Report of Maharashtra State Irrigation Commission, p. 36. With regard to future development of the basin of the west flowing rivers, the report of the Irrigation Commission 1972 Vol. HI Part I at p. 278 observed "Maharashtra has stated that because of the ruggedness of much of the terrain and steep gradient there is not much scope for future development of projects in the basin."

(29) MRK II p. 272.

(30) Notes on Shivdav Irrigation Project and Puwarwadi Irrigation Project MRPK XXVIII pp. 104-135; Report of the Maharashtra Experts Coin nittee *on* possible replacement of irrigation in th3 Ratnagiri district under the proposed multipurpose projects by the water potential of west flowing streams, pp. 1-38.

(31) MYDK II pp. 241-243.

427 Clearly Ratnagiri district is not a scarcity area.([32])

All the areas proposed to be irrigated from the tail race waters of the westward diversion schemes are non-scarcity areas. Their water needs can be fully satisfied from the local rainfall and the west flowing streams. It is not necessary to divert the waters of the Krishna for satisfying those needs. The priority list of projects submitted by Maharashtra gives the first priority to additional westward diversion from the Koyna Project. No part of the tail-race water of this additional westward diversion will be used for irrigation and other uses in Ratnagiri dis-
428 trict. Clearly, Maharashtra's need for westward diversion from Koyna and other projects is for purposes of power production only and not for purposes of irrigation. The real question, therefore, is whether further westward diversion of the Krishna waters for purposes of power generation should be permitted

Claim of Maharashtra regarding westward diversion of water for power generation :

According to Maharashtra, the Government of India recognised that, having regard to the special claim of Maharashtra with regard to production of cheap power, westward diverson of water cannot be ruled out altogether. For this purpose, Maharashtra relies on the statement of the Minister of Irrigation and Power in the Lok Sabha on the 23rd March, 1963. In paragraph 19 of his statement ([33]), the Minister said :

> "As regards the question of diversion across the Western Ghats for power generation, while it goes without saying that the irrigation needs of scarcity areas should receive the first priority, one cannot overlook other consideration. Each area and each group of people have to be developed on the basis of their geography and such natural advantages as may be available to them.
> 429 Areas which cannot have agriculture as the main base, have to be developed In other ways. It has been stated that certain parts of Maharashtra cannot be developed except through industry based on cheap power. The land resources there are limited and even such lands may not get irrigation. Some way has to be found to develop the economy of such areas, and the only best way may be to supply them with cheap power, provided, of course that the economy of the people lower down in the river basin is not seriously jeopardised, now or in the future. A suitable balance may have to be struck between the requirements of the people of the region on an equitable basis."

Referring to this statement, the Government of Mysore in its letter dated 14th June, 1963 ([34]) addressed to the Ministry of Irrigation and Power said that "westward diversion of Krishna should once for all be ruled out giving preference to the irrigation needs of the basin." But the Ministry of Irrigation and Power in its reply dated 26th August, 1963([35]) observed: "Westward Diversion: the suggestion of Mysore Government that Western diversion should be ruled out once for all, has, been carefully considered, Paragraph 19 of the Minister's statement sums up the posi- 430 tion of this Government correctly in this regard."

However, on December 31, 1963([36]), Shri Jawaharlal Nehru, Prime Minister wrote to Sri V. P. Naik, Chief Minister, Maharashtra—

> "The question of diverting the river to the other side of the Western Ghat remains. You want this water for power production and not for irrigation. It should be possible to provide you with power for this area from various places, without your having to divert the river, which will mean lack of irrigation facilities in other parts of the country."

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(32) With regard to Ratnagiri district, the report of the Fact-finding Committee for survey of scarcity areas in Bombay State 1960 Vol. II Part I at p. 236 observed :—"During the last 10 years, land revenue suspension was given only in a few villages in Sawantwadi taluka during the year 1956-57. Except for this, no part of the district has been affected in the past. As will be seen from the rainfall figures, this district has heavy and assured rainfall and there is no part in which rainfall was less than 42.86", during the last 27 years. The district cannot, therefore, be considered as affected by scarcity.

The Report of the Indian Irrigation Commission 1901-1903 Part I at page 3 para 13 observed : "On the other hand in. Eastern Bengal and Assam, and in the narrow strip between the Western Ghats and the Arabian sea, the rainfall, which exceeds 70 inches, has always been so abundant that the chance of its serious failure may be regarded as remote."

(33) MYDK I p. 156 at pp. 169-170.

(34) MYDK I p. 175 at p. 177.

(35) MYDK I p. 188 at p. 190.

(36) MRK II p. 61.

Other instances of diversion outside the basin for power generation :

In support of its claim for westward diversion of Krishna waters outside the Krishna basin for purposes of power generation, Maharashtra cites the instances of (1) Lake Lanoux diversion (2) the Plata basin diversion and (3) the Kistna Pennar Project.

Lake Lanoux lies on the southern slopes of the Pyrenees in French territory. Its waters emerge by the Fon-Vive Stream, a tributary of the river Carol
431 which after flowing through French territory enters Spanish territory near puigcerda before joining the river Segre, a tributary of the Ebro. The French Government proposed to carry out works involving the diversion of the waters of Lake Lanoux towards the river Ariege for production of electric energy, the diverted waters ultimately losing themselves in the Atlantic Ocean and not, as previously, in the Mediterranean. The proposal envisaged that, in order to compensate for the diversion, an equal quantity of the waters of the Ariege would be restored to the Carol above Puigcerda within French territory by means of an underground tunnel. The Spanish Government complained that the proposal for diversion of the waters of Lake Lanoux was in contravention of the Franco-Spanish Treaty of Bayonne of May 26, 1866 and the Additional Act of the same date. It was not alleged that the returned waters had a chemical composition or temperature or some other characteristic which could injure Spanish interests. An International Arbitral Tribunal([37]) held that the carrying out of works involving the diversion of the waters of Lake Lanoux with restitution as envisaged in the French Project, without prior agreement between the two Governments was not contrary to the Treaty and the Additional Act of 1866.

432 It is to be observed that there is no analogy between Maharashtra's westward diversion schemes and the French proposal for diversion of waters of Lake Lanoux. The westward diversion schemes do not propose restitution of water nor do their legality depend upon the interpretation of a treaty.

In the Plata basin, the waters of a Parana affluent are diverted out of the basin to enable production of electric energy at the power plant near Sao Paulo city in Brazil after falling over 2000 feet inside a mountain. But the Plata basin is not, on the whole, a water scarce region. Navigation has been the primary use of the river system and, although irrigation is practised in the basin, the general sufficiency of rainfall and the relative abundance of water has not led to any major works for the purpose([38]). There can be no objection to diversion of surplus water to another watershed for producing electric energy, if the water would otherwise be wasted. But such a diversion is objectionable if there is shortage of water and the river supply is not sufficient to meet the full requirements of irrigation in the lower reaches of river. Citing the case of the Paraiba do Sul near Rio de Janerio, it has been observed that a 433 large water diversion to feed a hydro-electric station outside the basin has led to a serious loss of water in its lower channel ([39]).

The Kistna Pennar Project proposed to carry the Krishna waters 300 miles away outside the Krishna basin and the construction of two dams with full power development facilities. The Project Report ([40]) stated that large blocks of electric power developed at the dams would give an impetus to industry and the environs of Madras would become great industrial cities with assured supplies of industrial power. However, a major controversy arose in the Andhra region in regard to the proposal to carry the Krishna waters to distant areas near Madras ([41]). The Khosla Committee found that the Project had many objectionable features([42]). In the letter of transmittal of their report the Committee pointed out that one of the adverse features of the project was that "the benefits will largely go to areas already served by canals or tanks while vast tracts lying close 434 to the Krishna and having no alternative means of irrigation supplies will be permanently denied such supplies." Eventually, the Kistna Pennar Project was replaced by the Nagarjunasagar Project. The history of the Kistna Pennar Project does not support Maharashtra's argument regarding westward diversion of water for power generation.

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(38) Lake Lanoux Arbitration (France v. Spain), International Law Reports (1957) Lauterpacht, pp. 101-142. See also American Journal of International Law Vol.53(1959), pp. 37-39, 62, 156-157; F.J. Berber, Rivers in International Law (1959), PP. 162-167.

(38) A.H. Garretson, R.D. Hayton, C.J. Olmstead, The Law of International Drainage Basins (1967), pp. 324, 325, 333, 402.

(39) Richard J. Chorley, Water, Earth and Man pp. 507-508.

(40) Kistna Pennar Project Report (1951-Scheme) Vol. I (APPK Vol. II p. ix).

(41) N.D. Gulhati, Development of Inter-State Rivers (1972), pp. 86, 190-191.

(42) Report of the Technical Committee on the optimum utilisation of the Krishna and the Godavari waters 1953, pp. 3, 44.

Conflicting claims of power development and Irrigation of basin areas :

There can be no doubt that generation of electric energy is an important water use, but the water diverted westwards will not be available for downstream irrigation.

The sanctioned utilisations of the existing irrigation projects and westward diversion schemes for generation of hydro-electric energy can be met from the available supply in the basin. But the States have proposed numerous new projects and extensions of existing projects both for irrigation and westward diversion of water. The available river supplies in the Krishna basin are insufficient to satisfy the demands of all the existing uses and the projected additional uses as well. The river Krishna commands extensive irrigation potential along the natural course of the river. The demands for the pressing needs of irrigation alone are so large that they cannot be wholly satisfied from the river supplies. **435** Until irrigation from the new projects is fully developed, it may be possible to allow westward diversion of some additional water for purposes of power production. But upon full development of such irrigation, it will be impossible to satisfy the demands of the irrigation projects as well as the additional demands for the westward diversion schemes. There is a clear conflict of interest between claims of downstream irrigation and power development by westward diversion of water. The question is whether, in allocating the waters of the river Krishna, the claims of power production by westward diversion of water should be allowed at the expense of irrigation.

In this connection we must consider Issue No. II(5).
Issue No. II(5) — Should any preference or priority be given to irrigation over production of power?

Preferential uses and equitable allocation :

Water has manifold uses for the community. It may be used for drinking, domestic and sanitary purposes, irrigation, generation of electric power. industry, navigation, and other purposes. If two uses are mutually exclusive and conflicting or if the available water is not sufficient to meet the requirements of both, it may be necessary to decide how far one use should give way to another in the larger interests of the community. The problem of es- **436** tablishing the order of priority arises in national planning, ([43]) legislation as well as equitable apportionment.

The study on legal aspects of the hydro-electric development of rivers and lakes of common interest prepared by Pierre Sevette([44]) observed:

> "The question arises whether these various uses can be classified according to their economic importance and an order of priority established * * * When a conflict arises in international law, as of course in other branches of law, between opposing interests (even though they are legitimate when taken singly), it is necessary to assess these interests, classifying them in order of importance and deciding which of them should come first."

H. A. Smith observed.([45]) "The chief practical function of law consists in regulating the conflicts of different interests. In order to do this it must make some attempt to appraise and rank them in order of value, laying down that in a given situation one interest is to be preferred over another."

There is no inherent preference of one use over **437** another([46]) but one use may be preferred to another because of its greater value and importance to the community as a whole. ([47])

The preference of one use to another differs from basin to basin and from one part of a basin to another, and it may even vary within the same basin or sub-basin as conditions change and the relative importance of the use develops with time.([48]) Economic, social, engineering and resource studies supply the basis for determining the priorities appropriate to the needs

(43) Five Year Plan, p. 348.

(44) Legal Aspects of the Hydro-electric Development of Rivers and Lakes of Common Interest, U.N. Doc. E/ECE/136/EP/98 Rev. 1, pp. 26-27.

(45) H.A. Smith, The Economic Uses of International Rivers, 1931, p. 139.

(46) Helsinki Rules, Article VI.

(47) Legal Aspects of the Hydro electric development of rivers and lakes of common interest, U.N. Doc. E/ECE/136 E/ECE/EP/98 Rev. 1 (1952), pp. 26-37. H.A. Smith, The Economic Uses of International Rivers (1931), p. 141.

(48) R.E. Clark, Water and Water Rights (1967) Vol. II, p. 425, Legal Aspects of the Hydro Electric Development of Rivers and Lakes of Common Interest, UN. Doc. E/ECE/136, E/ECE/HP/98 Rev. 1 (1952), pp. 26-37; R.C. Martin and others, River Basin Administration and the Delaware (1960), p. 275. 2 M of I&P/73—3

438 and possibilities of each basin and in appropriate cases to portions of the same basin. ([49]) Each river has its unique problem which must be examined and determined separately. ([50]) For this reason, there is no general rule of universal application establishing an order of priority for different uses either in international law or in our national law.

There is no Central Act in India laying down an order of priority for different uses. But we cannot accept Maharashtra's argument that, in the absence of legislation, one use cannot be preferred to another while allocating river water. In the absence of enacted law, the order of priority of different uses must be determined by applying the principles of equitable apportionment.

R. E. Clark ovserved([51]) 'Lipper points out that the two most significant factors in
439 apportionment are preferential uses and existing uses * * * Preferred uses and existing uses are two of the many variables that must be considered" Clyde Eagleton observed ([52]) "In a number of cases and treaties something is said concerning certain uses of the water to be regarded as more important than other uses, and consequently to be given priority of rights. The establishment of such priorities in each situation belongs, I think, to equitable apportionment."

Instead of laying down a rigid order of priority, a pragmatic and flexible solution is more appropriate. The question whether one use should prevail over another should be decided on a consideration of all relevant factors in each particular case.([53])

The economic relativity of different uses may become very important in Court decisions as the amount of available water diminishes with increasing utilisation of water resources. ([54])

A Tribunal appointed under the Inter-State Water Disputes Act, 1956 is charged with the duty of de- 440
ciding disputes with regard to the use, control and distribution of waters of an inter-State river. If two uses are mutually exclusive and conflicting, the Tribunal may have to decide which of the two uses will prevail in the equitable utilisation of the river water. *Need for water :* All life depends on water. Apart from the air we breathe, water is the most fundamental necessity of life. Use of water for drinking, household purposes and watering of cattle is regarded as the primary use to which all other uses are subordinated. ([55]) The U.S.A. Supreme Court([56]) said that "drinking and other domestic purposes are the highest uses of water". If the need for water for drinking and domestic purposes is genuine, it must prevail over all other needs. ([57])

There is no fixed order of priority for other uses. Irrigation may become the major use of the world's
441 rivers, but it does not follow that it should occupy a preferred position in every river basin([58]) over hydro eletctric power. ([59]) The relative importance of the two uses in the river system should be examined to ascertain which of them should prevail over the other.

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(49) J. D. Chapman, The International River Basin (1963), p. 16 Historical, geographical and political considerations should also be borne in mind, Legal Aspects of the Hydro-Electric Development of Rivers and Lakes of Common Interest, UN. Doc. E/ECE/136, E/ECE/EP/98 Rev. 1 (1952), p. 36; R.E. Clark, Water and Water Rights (1967) Vol. II, p. 425; U.N. Memorandum of 1950 cited in F. J. Berber, Rivers in International Law (1959), p. 159.

(50) A. H. Garretson and others. The Law of International Drainage Basins (1967), pp. 61,787.

(51) R.E. Clark, Water and Water Rights (1967) Vol. II, pp. 424, 425.

(52) Clyde Eagleton, The use of waters of International Rivers, 33 Canadian Bar Review Vol. 33 (1955), pp. 1018, 1025.

(53) A. H. Garretson and others, The Law of International Drainage Basin (1967), pp. 47, 62, 64.

(54)Economic and Public Policy in Water Resources Development, Edited by S.C. Smith and E.N. Castle, p. 287.

(55) Use of water for drinking, household purposes and watering of cattle is regarded as ordinary or primary, and other uses are regarded as secondary or extraordinary. See Mcartney v. Londonerry and Lough Swilly Railway Company Limited, 1904, A.C. 301, 306-307; Secretary of State for India v. Subbarayadu LR 59 IA 56, 64; Belbhadar Pershad Singh v. Sheikh Barkat Ali, 11 CWN 85,88,93-98; Indian Easements Act, 1872, s. 7 Illustration (j); T. Guthrie Brown, Hydro Electric Engineering Prac tice (1958) Vol. III, p. 152.

(56) Connecticut v. Massachusetts 282 U.S. 660, 673. See also Report of the Indus (Rau) Commission, Vol. 1, p. 11.

(57)A. H\Garretson and others, The Law of International Drainage Basins (1967), pp. 61, 788.

(58) A. H. Garretson and others, The Law of International Drainage Basins (1967), p. 61.

(59) Irrigation enjoyed the first preference in the Nile basin, see Legal Aspects of the Hydro Electric Development of Rivers and Lakes of Common Interest in U.N. Doc. E/ECE/136, E/ECE/EP/98, Rev. I<1952), p. 36, in the Indus basin, see Rolet Chih Shih Chen, The Non-Navigational Uses of International Waters (1965), pp. 150-155, in the Colorado River Compact 1922 Art. IV(b) and in the Rio Grande. Colorado and Tijuana Treaty 1944 Art. 3.

Hydro-electric power had precedence in Columbia River Basin Co-operative Development Treaty 1961, A.H. Garret-son and others, The Law of International Drainage Basins (1967), pp. 61, 88. The two uses were bracketed together in the Boundary Waters Treaty 1909 Art. VIII and the Report of the Indus (Rau) Commission Vol. I, p. 11.

Importance of power :

Production and distribution of electric energy and its conversion into motion, heat or light for a multitude of uses are vital not only for industrial development, but also for rural development, cottage and small scale industries, pumping of river and underground water, lift and well irrigation and numerous other operations in agriculture. Electric power has brought about revolutionary changes in modern society, improvement in man's material
442 welfare and the advance of civilization. Modern life depends so largely on the use of electricity that consumption per capita in a country is an index of its material development and standard of living. ([60])

Sources of power.—The chief sources of power are coal, water, atomic fuel, oil and natural gas. The generation of hydro-electric energy, is an important water use because it makes energy available at a lower cost than other alternative sources of generation.

Importance of irrigation and priority of irrigation use:

Irrigation of land for agriculture represents one of the oldest and most important uses of water next only to providing water for drinking and domestic purposes. ([61])

O. W. Israelson and V. E. Hansen observed. ([62])

> "The importance of irrigation in the world today is well stated by N. D. Gulhati of India : 'Irrigation in many countries is an old art—as old as civilization—but for the whole world it is a modern science—the science of survival.' The pressure of survival and the need for additional food supplies are necessitating a rapid expansion of irrigation throughout the world. Even though irrigation
> 443 is of prime importance in the more arid regions of the earth it is becoming increasingly important in humid regions."

For irrigation use, there is no substitute for water, but power may be generated from coal, oil, nuclear energy and other sources. In general, whenever production of hydro-electric power interferes with irrigation and the two uses cannot be reconciled, increasing priority may have to be given to irrigation. Rapid growth in population calls for increased food production which in turn calls for intensified irrigation. ([63])

In countries with a hot and arid climate, water is absolutely indispensable for cultivation of the soil, and the use of water for irrigation is regarded as an ordinary or primary use for satisfying a natural want. In the arid and semi-arid parts of the country, irrigation makes the difference between waste land and highly productive crop land.([64]) J. Guthrie Brown observed ([65]) "Finally it may be said that in arid areas the use of water for irrigation will, where soil conditions are suitable, take precedence over its use for power production".

In India, with the rapid growth of population, the 444 demand for additional food supplies and raw materials is increasing. For survival, the nation must have more food and more raw materials. The supplies and prices of agricultural commodities, particularly of food, play a crucial role in attaining economic and social stability. Indian economy is predominantly agrarian, as 75% of the country's population depends on agriculture for livelihood. Nearly 60% of total household consumption and 85% of the commodity consumption of households are composed of agricultural products or manufactures based principally on agricultural raw materials. ([66]) A strong agricultural base is essential for industrial development. Agro-based industries like textiles, starch products, sugar and oil pressing can be fed only by agriculture. For good, the basic requirement of life, the nation cannot afford to depend on imports. Development of agriculture calls for irrigation on a large scale. The use of water resources for irrigation to the fullest extent possible is an essential condition for diversifying agriculture and increasing crop yields. Thus, irrigation plays a key role in the planned development of

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(60) First Five Year Plan, p. 345.

(61) U.N. ECAFE, Multiple purposes River Basin Development Part I, Manual of River Basin Planning 1955, p. 3.

(62) O. W. Israelson and V. E. Hansen—Irrigation Principles and Practices (1962), p. 3.

(63) E. Kuiper, Water Resources Development, Planning Engineering and Economic (1965), pp. 13, 15.

(64) The Nations Water Resources. U.S. Water Resources Council, p. 4-4-1.

(65) J. Guthrie Brown, Hydro-Electric Engineering Practice (1958) Reprinted (1963), p. 155. See also Otis W. Freeman. H. F.
Raup, Essentials of Geography 2nd Edn., pp. 390-391.

(66) Fourth Five Year Plan, pp. 12, 13, 28, 35, 38.

445 the country. ([67]) Without irrigation, large arid tracts of the country would be permanently waste, ([68]) while many other tracts having low and uncertain rainfall could be cultivated only in favourable seasons. In view of the pressing necessity for irrigation, India has more irrigated land than any other country in the world. ([69])

For determining the priority of irrigation and power projects *inter se* for inclusion in our national plans, the following broad principles are observed ([70]):—

(1) Projects which will add to the food production in the country must receive priority over projects re lating to other uses of river waters.

(2) Projects which are more remunerative in direct financial returns, in terms of cost of irrigation per acre or per unit of power generated and in total bene fit to the community, and those which would yield quick results should be given preference.

(3) Region-wise requirements of food and power must receive due consideration, and also the need of backward areas.

There is a large volume of opinion in India that use of water for irrigation should have preference
446 over its use for power generation. ([71]) Irrigation is of prime importance in India because of the agrarian nature of the population and the pressure of expending population on the land.

Since irrigation is a type of water use, which may be given increasing priority in the future, it is important to appraise all economic, social and other factors which will determine the relative priority that irrigation should have in relation to other water uses.([72]) Regional needs and the best means of developing the region on the basis of its geography and the natural advantages available to it must receive due consideration.

Multiple purpose projects :

The conflict of interest between hydro-electric and irrigation uses should be reconciled as far as possible 447 by integrated development of the river basin.

The concept of integrated river basin development implies orderly marshalling of water resources of river basins for multiple purposes to promote human welfare. The fact that the waters of the river flow from a higher to a lower level gives rise to numerous possibilities of using the flow more than once at several points in the course of the river for purposes of generation of hydro-eleetric power and irrigation of land. The principle now adopted by most countries is that hydro-electric power should be produced, where feasible, as part of a comprehensive development of a river basin so that the water released from the power plant may be used for irrigation and other beneficial purposes downstream. ([73])

Where the tail-race water after generation of electricity is returned to the river, the hydro-electric use is non-consumptive, except for losses in the water conductor system and storages, and there is no substantial conflict of interest between the hydro-electric use and downstream irrigation and other uses.

Shortage of power in Maharashtra : 448

There is shortage of power in Maharashtra. The demand for 1973-74 as assessed in the Seventh Annual Electric Power Survey of India 1972([74]) is 2098 MW. According to Maharashtra, the installed capacity by 1973-74 would be 2306 MW, and allowing 30% for stand-by, spinning reserve etc., the effective capacity by 1973-74 would be 2306 xO.7-1614 MW. Thus by the end of Fourth Plan there would be shortage of capacity to the extent of 484 MW([75]).

According to Maharashtra, by the end of the Fifth Five Year Plan i.e. by 1978-79, the power demand

(67) Water Resources Series No. 38 U.N. ECAFE, p. 132.

(68) Development of Irrigation in India 1965, Publication No. 78, Central Board of Irrigation and Power, p. 5.

(69) See Otis W. Freeman, H. F. Raup, Essentials of Geography 2nd Ed., p. 390.

(70) First Five Year Plan, pp. 365-366. For similar principles for inclusion of irrigation and power projects in the Second Five Year Plan, See Multipurpose River Basin Development, Part 2B, Flood Control Series No. 11, St/EC\FE/Ser.. F/11, p. 63.

(71) Report of the Study Team on Agricultural Administration (1967) Vol. I, p. 141, Administrative Reforms Commission (Irri gation should have first priority over water in preference to any other use).

The Census of India 1961, Monograph No. 6 by M. Datta, Electricity Supply in India, p. 5 (A further limitation on hydro-power schemes is set by irrigation which overrides all other considerations).

V. S. Rao & M. K. Sambamurthy—Planning for hydro-power development in India, C.W. & P.C.'s contribution,— Central Water & Power Commission Silver Jubilee Souvenir 1970, p. 109 (In India, irrigation requirements generally claim the first priority on the available water supplies).

(72) E. Kuiper, Water Resources Development, Planning Engineering and Economics (1965), pp. 13-14.

(73) U.N. ECAFE, Multiple Purpose River Basin Development, Part I, Manual of River Basin Planning (1955) St/ECAFE/ Ser. F. 7, p. 4.

(74) Seventh Annual Electric Power Survey of India 1972, p, 21.

(75) MR Note No 13, pp. 12, 22.

in Maharashtra will be 3650 MW and allowing for 30% stand-by and spinning reserve an installed capacity of about 5214 MW will be required to meet the demand by 1978-79. L. B. Dudhane, Chairman, Maharashtra State Electricity Board stated ([76]) that an installed capacity of about 4730 MW will be required in Maharashtra by 1978-79.

Steps are being taken to meet this shortage from thermal and hydro schemes without diverting more
449 water west wards. ([77])

Sri Dudhane observed([78]) "in Maharashtra the Bombay-Poona area has been showing a rapid increase in the power demand. At the same time the Hydro Power sources in the Western Ghats are exhausted. Therefore the State as a whole has to depend on Thermal Power for all its future Power demands".

Power resources of Maharashtra :

Along the Western Ghats within the State of Maharashtra, there are excellent sites for power generation with advantages of ample water supply from heavy rainfall and high heads obtainable by westward diversion of water. Though the rainfall is seasonal, there are excellent storage sites for impounding water. The twin advantages of high head and ample water supply are exceptionally favourable for pro-
450 duction of electric power at unusually cheap rates, considering that the power produced in a hydro-electric plant is directly proportional to the quantity of water flowing through the plant and the head or distance through which the water falls.

The known coal reserve in Chanda-Ballarshah area in Maharashtra is about 3600 million tonnes, and this can sustain the generation programme of 6600 MW of power for 250 years. ([79]) Coal of non-coking type with high ash content may be used for thermal power plants([80]) and this is available in abundance in the country. ([81])

The Central Government has established the Tarapur Atomic station in Maharashtra. The station has an installed capacity of 420 MW, comprising of two units of 210 MW each, supplying power on a commercial basis since October, 1969, to the combined Maharashtra and Gujarat systems. This capacity constitutes about 20% of the combined Maharashtra and Gujarat systems' installed capacity. The station has supplied a large part of the total power require- 451
ments of Maharashtra and Gujarat and the effect of this has been apparent in that no power cut had to be imposed in Maharashtra even when Koyna lake was depleted. ([82]) Maharashtra's share of the nuclear power is 190 MW. In 1971-72, Maharashtra was unable to get its full share of the power due to a breakdown in the Tarapur station.

Need of hydro-electric power for meeting peak demands and working of Koyna station :

A typical daily load curve of Maharashtra at the end of the Fourth Five Year Plan shows that 30% of the load at the top of the curve and 1/8.5 of the total energy represents the peak demand.

Maharashtra's peak demands are supplied by the Koyna and Tata hydel stations and a few thermal stations. During argument, Maharashtra's Counsel stated :—"In Western Maharashtra, peak fluctuations in loads are being taken mostly by Koyna and Tata Hydro stations and also to a small extent by the old Thermal Plant of the Central Railway at Chola *** In the Vidarbha system, peak toads are at present being met by Puma Hyrdo station (22.5 MW) and the old sets of the Ballarshah and Khapackheda Thermal stations in the same way as the Chola Plant. Sometimes small assistance for peaking is also taken by this system from the western Maharashtra System." 452
The old sets of Khaparkheda, Chola and Ballarshah will be retired soon and replaced by other thermal power stations.

Instead of generating peaking energy at the Koyna station, Maharashtra now seeks to work the station as a base load station at 69/80%. load factor with an annual westward diversion of 100 T.M.C. of water. But Stage II of the Koyna Project was cleared by the Planning Commission in April, 1961 subject to the

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(76) An article by L.B. Dudhane in the Times of India, New Delhi Edition, March 30, 1973, pp. 27-28 (Ex. MYK-300).

(77) An article by L.B. Dudhane, in the Times of India, New Delhi Edition, March 30, 1973, pp. 27-28; Summary Record of the Working Group Meeting in the Planning Commission, Maharashtra on 5th January, 1973 to consider the Annual Plan 1973-74 proposals regarding power sector of Maharashtra (Ex. MRK-335).

(78) L.B. Dudhane, Selection of Extra High Voltage for the National Grid in India (December 1970), MRDK IX, pp. 56, 63.

(79) L.B. Dudhane, Article in the Times of India, New Delhi Edition, March 30, 1973, pp. 27-28; See also MR Note No. 9.

(80) First Five Year Plan, p. 366.

(81) L.B. Dudhane, Selection of Extra High Voltage for the National Grid in India, MRDK IX, pp. 56, 59.

(82) Report of Power Economy Committee 1971, pp. 59, 60.

condition that westward diversion of water would be limited to 67.5 T.M.C. of water per annum. ([83]) On the 25th November, 1961,([84]) the Maharashtra Government requested the Planning Commission to sanction the thickening of the dam relevant to a storage of 98 T.M.C. of water and raising the height of the dam for full reservoir level (2,158.5) on condition that there would be no change in the scope of the project in regard to the maximum westward diversion of water. On the 3rd January, 1962,([85]) the Planning Commission granted the sanction asked for. Nevertheless, after raising the height of the dam and installing crest gates, the Maharashtra Government, in breach of its assurances and without the sanction of the Planning Commission, has been diverting westwards
453 more than 67.5 T.M.C. annually. Since 1966-67, the yearly westward diversions in T.M.C. were([86]) :—

1966-67	85.8
1967-68	88.3
1968-69	85.9
1969-70	89.2
1970-71	97.6

The working of the Koyna station as a base load station with annual westward diversion of 100 T.M.C. of water which will be wasted to the sea after power generation cannot be permitted in the Krishna basin where there is shortage of water and such a large westward diversion will hamper the development of irrigation potential in the lower reaches of the river.

As power requirements increase, hydro electric plants are shifted to generate peaking power and new thermal and nuclear plants are constructed to generate the base load.([87]) Hydro electric power has found its most efficient utilisation for peaking rather than for base load. In a hydro electric plant, generation rates can be varied quickly and inexpensively in response to fluctuating energy demands by simply regulating the flow of water through the plant. It is much more expensive to maintain steam plants in a state of readi-
454 ness and keep the boiler furnaces burning at low heat. Costs of generation from thermal and nuclear power stations are at their lowest when the power stations are operated at high load factors. According to Maharashtra's estimate, the cost of power at Koradi thermal station is 6.28 paise/kWh at 70% L.F. while the cost of peaking power at the same station at 25% L.F. is 13.52 paise/kWh. Nuclear and thermal power are best utilised for base load, allowing hydro power stations like the Koyna hydel station to supply the peak energy and thereby permitting the most economical and optimum use of power. Therefore, the Koyna Project. Stage II Report ([88]) stated that "an overall economy would accrue to the country, if hydro power stations are operated (in the ultimate stage) at lower load factors and the thermal stations at higher load factors."

The load factor at a hydro-electric station may be reduced by installing more plants, but Maharashtra says that it is not technically feasible to install more plants at the Koyna station. However, the load factor at the Koyna station may be reduced by using less than 67.5 T.M.C. of water, while the remaining water may be used at another hydro-electric station for generating energy at a low load factor. To give an example, if Maharashtra utilises 37 T.M.C. instead of 67.5 T.M.C. of water at the Koyna Station and the 455
balance 30.5 T.M.C. at another hydro-electric station in the Upper Krishna (K-l) sub-basin, both stations will produce energy at very low load factors. The total energy generated at the two stations will be somewhat less and more expensive, but as peaking energy at a low load factor, it will be more valuable. Whether in the long run the adoption of this method will result in net financial gain or loss cannot be determined off-hand and the point requires close investigation.

Pumped storage schemes.—Pumped storage is an alternative method for meeting the demand for peaking power. In this system, the surplus energy available in thermal and nuclear plants during off-peak periods is used to pump water from a lower to a higher level and the water pumped to the higher level is used again to generate power during the period of peak demand. Pumped storage developments require a supply of inexpensive off-peak energy from thermal and nuclear plants for pumping. The optimum use

(83) MRDK VI pp. 105-106.

(84) MRDK I pp. 161-163.

(85) APK II p. 118.

(86) MR Note No. 16.

(87) L. Douglas James & Robert R. Lee, Economics of Water Resourcss Planning, p. 327 para 13-3; Energy International, January 1967, p. 21, APDK X p. 97; Energy International, March 1967, p. 10, APDK X p. 98.

(88) The Koyna Hydro-electric Project Stage II Report, July 1960, Vol. I, p. 13 para 10.01.

of pumped storage projects is for the provision of peaking power and reserve capacity. ([89]) L. 'Douglas James and Robert R. Lee observe([90]) "Where hydro sites are too few to provide even peaking capacity, 456 pumped storage is used. A pumped-storage plant uses power generated during low demand periods to pump water to a high reservoir for later release through the turbines to generate peaking power. Such plants are most economical where two low cost reservoir sites are available at high head differential.*** Pumped storage plants have a fuel cost equal to the value of the off-peak thermal power used for pumping". Pumped storage plants have been commissioned in many foreign countries. ([91]) A pumped storage scheme at Nagarjunasagar in Andhra Pradesh with an installed capacity of 2x50 MW has been sanctioned by the Planning Commission in 1972.

At Koyna and other places along the Western Ghats, excellent reservoir sites at high head differentials are available. But Maharashtra contends that thermal stations are working at high load factors, that now or in the near future no spare off-peak capacity will be available for use in pumped storage schemes and that the economic feasibility of such schemes in Maharashtra is not established. The economics of such storages raise complex problems and require 457 careful study. ([92]) However, we find that the Draft Fifth Five Year Plan([93]) envisages a pumped storage scheme (300 MW) in Maharashtra. L. B. Dudhane, Chairman, Maharashtra State Electricity Board has stated([94]) that there is a proposal in Maharashtra for pumped storage schemes (100 MW). The summary record of the Working Group meeting held in the Maharashtra Planning Commission on 5th January, 1973 to consider the Annual Plan 1973-74 proposal regarding power sector of Maharashtra shows that the Maharashtra Government has recommended for advance action pumped storage scheme requiring outlay of Rs. 72 lakhs in 1973-74. Having regard to all these proposals, it is hoped that the economic feasibility of pumped storage schemes for providing peaking power in Maharashtra will be established soon.

Other hydro-electric schemes to provide peaking power : 458

Particulars([95]) of hydro-electric projects in Maharashtra State" other than Koyna Stages I, II and III and Tata Hydel Works are as follows :

Sl. No.	Name of Project	Installed capacity in MW	Load factor percentage	Energy generated in MkWh
1	2	3	4	5
Projects already completed				
1.	Purna	22.5	27.4	53.97
2.	Radhanagari	4.8	40	16.8
Projects under construction				
3.	Bhatgar	16	38.8	54.53
4.	Vir .	9	55.7	44.149
5.	Vaitarna Stage I	60	27	141
6.	Bhira Tailrace .	80	10	66.5
7.	Tillari	60	25	125.20
8.	Paithan (Pumped storage)	12	20	20.60
9.	Pench Hydel (Total) (1/3 for Maharashtra share)	160 (53)	17.8	83,2
Projects proposed				
10.	Kas ...	11.4	20	19.73
11.	Panshet .	10	25.3	22.17
12.	Pawna	10	20	17.78
13.	Warasgaon	10	37.8	33.00
14.	Bhandardara			
	Power House I	10	67.6	59.31
	Power House II .	35	20.0	58.21
15.	Vaitarna Stage II	6	63	31.8

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Maharashtra's argument concerning Srisailam Project:

Maharashtra argues that if 33 T.M.C. of water is allowed for the Srisailam Hydra Electric Project there is no reason why an additional westward diversion of 32.5 T.M.C. of water at the Koyna Station for purposes of power generation should not be permitted. We are unable to accept this argument. Unlike the Koyna Project, the water released for the

(89) The Nation's Water Resources, U.S. Water Resources Council, Washington D.C. 1968, pp. 4-3-1, 4-3-2.

(90) L. Douglas James & Robert R. Lee, Economics of Water Resources Engineering 1971, pp. 326-328 para 13-3.

(91) Energy International April 1970, p. 17 (APDK X p. 38).

(92) J. Guthrie Brown, Hydro-Electric Engineering Practice (1958), Vol. III, pp. 134-151.

(93) Draft Fifth Five Year Plan (1974/75-78/79), Power Development Programme, All India, Government of India, Ministry of Irrigation and Power, April 1972, p. 10.

(94) L.B. Dudhane, Article in the Times of India, New Delhi Ed., March 30, 1973, pp. 27-28 (Ex. MYK-300).

(95) MR Note No. 16.

Srisailam power plant is used for irrigation downstream. The storage reservoir at Srisailam involves an annual lake loss of 39 T.M.C., but regulated releases from the reservoir are necessary for downstream irrigation. The storage provides valuable carry-over storage and conserves irrigation water which would otherwise be wasted to the sea. Thus, there is no real conflict of interest between hydro-electric use of water at Srisailam and irrigation use.

460 *Cost of power production from westward diversion and other sources* ([96]) : The cost of energy generated at Koyna Hydel Project Stages I and II and delivered at Bombay is 2.66 paise/kWh with 67.5 T.M.C annual diversion. The cost is low because Koyna Project Stages I & II were executed mostly during the pre-devaluation period.

With 100 T.M.C. annual diversion, the cost of energy at Koyna will be 1.78 paise/kWh. The fixed charges remaining the same, the cost per unit of hydel power decreases with larger power production. ([97])

The cost of energy generated at Koyna Hydel Project Stage III and delivered at Bombay is 7.4 paise/kWh with 67.5 T.M.C. annual diversion. The cost will be 5.6 paise/kWh with 100 T.M.C. annual diversion.

The cost of generation at the proposed Hiranyakeshi-Vedganga and other hydel stations will vary from 4.95 to 6.25 paise/kWh. The transmission cost to Bombay will be 0.75 paise/kWh.([98])

The cost of power generated at Koradi thermal station at 70% load factor is 6.28 paise/kWh. The estimated cost of peaking power at the station at 25% load factor is 13.52 paise/kWh. The cost of transmission of the power to Bombay is 1.26 paise/kWh.

461 The average unit energy sale price for Tarapur nuclear power is 5.61 paise/kWh([99]). It is said that, in actual practice, the price works out to be 6 paise/kWh.

Maharashtra says that if an additional diversion of 32.5 T.M.C. of water at the Koyna-projcct Stages I and II is not permitted, it will lose 1060 MkWh of power available free of cost apart from the loss of 195 MkWh of power at Koyna Project Stage III and by substituting thermal power costing 7.5 paise/kWh at Bombay, it will suffer an annual financial loss of Rupees 7.20 crores.([100]) It is difficult to see how Maharashtra can complain of this financial loss, considering that it obtained the sanction of the Planning Commission and grants from the Union Government for construction of the Koyna station upon condition that the westward diversion of water at the station would be limited to 67.5 T.M.C. annually. Maharashtra also says that if the new westward diversion schemes are not permitted, it will have to replace cheap hydro energy by thermal power costing 14.5 paise/kW and will thereby suffer an annual loss of Rs. 25.87 crores. The argument regarding financial 462 loss is based on the assumption that 140.6 T.M.C. of water can be allotted to Maharashtra for westward diversion from K-l and K-3 sub-basins in addition to the water allowed for its protected projects. As a matter of fact, much less water can be allotted to Maharashtra for its needs in K-l and K-3 sub-basins having regard to the available supply and the needs of the other States in the Krishna basin.

Moreover, Maharashtra's estimate of cost of hydro-electric energy assumes that water has no value and is available free of cost. But if the water supply is not ample enough to satisfy all demands upon it and one use of water restricts other uses, water cannot.be regarded as a free good. The paper "Water Demand forecasting and Related Administrative Implications" prepared by the United Nations Secretariat pertinently observes([101]) :—

> "When the natural supply is 'ample' relative to the draft upon it the economic problem is limited to the acquisition and placement of the hydraulic facilities. Under such conditions 463 water *per se* is considered a free good,
>
> since no use of water is curtailed by the satisfaction of other uses.***
>
> If, however, one use of water restricts one or more other uses, water is no longer 'free' even though the uses that are restricted are

(96) MR Note No. 8, MR Note No. 9, MR Note No. 15.
(97) Report of the Power Economy Committee 1971, p. 39.
(98) The transmission costs from distant stations like Hiranyakeshi-Vedganga may be more than 0.75 paise/kWh.
(99) Report of the Power Economy Committee, 1971, p. 62.
(100) MR Note No. 9, p. 2.
(101) United Nations Secretariat, Water Demand Forecasting and Related Administrative Imolications. United Nations Secretariat, Inter-regional Seminar on current issues of water resources administration, ESA/RT Meeting v/3, New Delhi Jan./Feb. 1973. The paper is based on material extracted from the draft report currently under preparation by United Nations Secretariat "Water Requirements Forecasting".

neither priced nor rationed in some other way. As soon as a restriction in the use and enjoyment of water is experienced a double economic problem arises: (1) how important are the uses that are restricted in comparison with the uses that are satisfied (2) what costs must be undertaken to augment supply so that usage is less restricted, and how do the costs compare with the benefits. It is seen that both of these questions are most vexing as they bear upon the uses of water that traditionally are unmarketed or unpriced and, therefore, 'free' in a naive sense of the word."

Irrigation and power uses in the Krishna basin :

In the Krishna basin, water is a scarce commodity. The westward diversion of water for power generation seriously restricts the use of water for downstream irrigation. Consequently, the water utilised by the westward diversion schemes cannot be regarded as a free good. For the present, it is not possible
464 to augment the supplies of surface water in the Krishna basin. It is, therefore, necessary to ascertain how important are irrigation uses that are restricted in comparison with hydro-electric uses that are satisfied and which of the two uses should prevail and to what extent.

In theory, benefit cost analysis provides an optimum solution of the choice of alternatives. But Maharashtra does not show that the benefit cost ratio of the westward diversion projects would be higher than that of the eastward irrigation schemes. Moreover, one of the basic weaknesses of the traditional benefit cost analysis is its inability to assess important intangible benefits in terms of money and monetary benefits. ([102]) The intangible socio-economic benefits from irrigation in arid and semi-arid regions far outweigh the benefits derived from hydropower. The basic objective of promoting human welfare by water resources development in those regions is best achieved by irrigation.

C.V. Davis observed ([103]) "Results of irrigation enterprises cannot be evaluated solely on the basis of areas irrigated and value of crops grown. Proper consideration must be given to the community development which accompany the construction of irrigation works and the growth of prosperous agricul- 465
tural areas. Many of the thriving cities and towns in western United States with their millions of dollars residential, commercial and industrial valuations, have attained their present status largely as a result of the successful development of irrigation enterprise".

For irrigation use water is a priceless treasure, since without water there can be no irrigation and without irrigation successful crop production is not possible in the arid and semi-arid regions of the Krishna basin. These regions depend for survival on agriculture which provides the basis of living for more than 75 per cent of their people. The economic efficiency of this agrarian society clearly depends on proper diet standards which alone can ensure happy living, healthy children and economic efficiency.

Henry Olivier observed ([104]):—

"Diet deficiency has pronounced impact on national economy as regards output per man hour, expectancy of life, health requirements, import of foodstuffs, hence foreign currency problems and, therefore, political alignments.***

Most developing countries depend on agriculture 466

which constitutes approximately 60 per cent of their gross national product and provides the basis of living for about 80 per cent or more of their people. As the country develops the agricultural sector provides initially 'the raw materials for industrial growth, the means for mobilizing capital and the facilities for earning foreign exchange.

However, it is questionable, for reasons already mentioned, whether the measurement of benefits only in monetary units provides a fair representation of the value of water on both a short and a long-term basis. The economic efficiency of the community clearly depends on diet standards and hence there is, for each environment, a critical nutrient level, below which the prime motive of the agrarian society must be preservation, and only above which it can be fully profit motivated. This consideration is of prime importance in forward planning".

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(102) See R.E. Clark, Water and Water Rights (1967), Vol. II, p. 141.

(103) C.V. Davis, Handbook of Applied Hydraulics, 2nd Ed., p. 812.

(104) Henry Olivier, Irrigation and Water Resources Engineering (1972), pp. 90, 92-93. See also O.W. Israelson and V.E. Hanson Irrigation Principles and Practices, 3rd Ed., p. 8.

The Approach of Maharashtra State to the Fifth Five Year Plan ([105]) demonstrates the paramount
467 importance of irrigation in the scarcity areas within the State and the direct, indirect and intangible socio-economic costs of scarcity which can be avoided only by providing irrigation. This paper reveals that in extensive drought-prone areas in Poona, Sholapur, Satara, Sangli, Ahmednagar, Osmanabad and other districts of Maharashtra, sub-normality of monsoon has become more a rule rather than an exception. The last seven years since 1965-66 show a disturbing trend in respect of consecutive years of scarcity, area affected and the severity of scarcity. The 1971-72 scarcity conditions involved an expenditure of more than Rs. 42 crores on scarcity relief alone. The number of workers employed on scarcity works reached 15 lakhs at one stage. Apart from expenditure on famine relief, the scarcity of 1971-72 alone meant the loss of 18.6 lakhs tons of foodgrains, suspension and remission of land revenue, suspension and non-recovery of dues of cooperative, banking and Government institutions, and impoverishment and indebtedness of the farmer. The remedy is to undertake irrigation works to the full extent possible as an insurance against scarcity. Even with all possible stress on irrigation, a considerable area would remain devoid of irrigation benefits. The State attaches very high importance to the extension of power for agri-
468 culture and small industries. Power is a vital sector and the power situation also is not happy. However, the hydel potential of the State is limited, and Maharashtra has to depend increasingly on thermal and atomic power. Planning for Maharashtra has no meaning, unless there is a steep acceleration of irrigation and agricultural production. Direct attack on poverty will be ineffective, unless accompanied by increase in such production. Self sufficiency in food and agricultural commodities must be the principal obicctive of the Fifth Plan.

The westward diversion of water restricts not only irrigation use, but also downstream power production. If the water is not diverted westwards, it may be utilised for firm power production at a series of drops as it flows eastwards and particularly at the foot of dams in ghats, and at Almatti, Narayanpur and Srisailam where the average fall in feet utilisable for generation of power is 85, 75, 300 and 320 feet respectively. ([106]) The remaining water after allowing for lake and transit losses may be used for down-stream irrigation.

Waste of tail race waters of westward diversion projects:

The tail race water of westward diversion in excess of 67.5 T.M.C. from Koyna Hydel Project will not be used for any beneficial purpose in Ratnagiri. 469

Instead of using the tail race water of the new westward diversion schemes for irrigation in Ratnagiri, the waters of the west flowing streams can be harnessed and used for such irrigation. At present, the enormous water potential of the west flowing streams is being wasted to the sea. By harnessing this water potential, needless waste of water may be prevented and optimum development of the water resources of the nation can be achieved.

Hydor-electric sites in the Western Ghats :

There are excellent sites for power production in the Western Ghats. As early as 1919, J.W. Meares observed ([107]):—

> "Bombay—There are probably endless sites in the Western Ghats, of which the best have already been examined by Messrs. Tata's engineers. The rainfall is heavy, especially at the scarp of the Ghats, where it locally reaches 200 and even 250 inches; but nearly all concentrated between June and September. Storage is therefore an essential of practically every project in this area; 470
>
> the levels are prima facie favourable; the fall is generally of the order of 1,000 to 1,800 feet, obtained for the most part by piercing the watershed; the demand for power is large; and the tail water could sometimes be used further on for irrigation".

The special peculiarity of the hydro-electric potential in Western Ghat region is that the water used for power generation is entirely lost to the basin and cannot be used for irrigation on the eastern side.

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(105) Approach of Maharashtra State to the Fifth Five Year Plan, Broad policies as finalized by Planning Sub-committee of the Cabinet in its meetings on 21st and 22nd September 1972, pp. 1, 2, 7, 18-23 (Ex. MRK 344).

(106) Letter of Sri V.P. Naik, Chief Minister, Maharashtra to Pandit Jawaharlal Nehru dated 7-5-1964, MRK II pp. 254, 265.

(107) Hydro-Electric Survey of India, Preliminary Report on the Water Power Resources of India (1919) ascertained by **G.T.** Barlow and compiled by J.W. Meares, p. 41. Maharashtra relied on the passage at p. 41, but at pp. 30-31, the Report pointed out that one of the dangers to be guarded against in giving a concession to a public utility company was "Existing water rights and future irrigation demands must be safeguarded, or, in other words, no concession should be given until the irrigation possibilities have been fully considered."

Thc rivers rising in the Western Ghats near the Arabian Sea flow in an easterly direction and eventually fall into the Bay of Bengal On the eastern side, the country gently slopes and the culturable area lies offering vast possibilities of irrigation while the hills have steep slopes towards the west of the Western Ghats and, for obtaining high heads for power generation, water has to be diverted towards the west By cutting off the highly productive head waters of the Krishna and diverting them to the west coast, considerable power may be generated but at the cost of depriving the low rainfall areas on the eastern side of the water solely needed tor irrigation ([108])

471 Considerations of eastward irrigation are of prime importance in the case of east flowing rivers, and the adverse effect on such irrigation is a ground for rejecting westward diversion schemes for the generation of power ([109])

In assessing the theoretical limit of hydro-electric potential of Indian rivers, the sites in the Western Ghats may be included, but the report of the Energy Survey of India Committee 1965 pointed out ([110]) that there are serious limitations to such a theoretical approach One of such limitations is —

> "Further, in some cases there are restrictions imposed by irrigation and other priority uses which again depend on topography, climate etc and impose m turn restrictions on available waters and storages These cannot be taken into account with any reasonable degree of accuracy in overall theoretical estimate and derivations therefrom".

472 The Committee held([111]) ' The most important east flowing rivers in southern India from the point of power development are the Godavari, the Krishna and the Cauvery. These rivers, excepting some of the tributaries of the Godavari, take their rise in the Western Ghats and traverse almost the full width of the Deccan plateau to fall into the Bay of Bengal They command considerable irrigation potential and plans for power development have to be integrated with development of irrigation For instance, there are a number of possibilites of storing the waters of tributaries of the Godavari and the Krishna in the upper reaches in Western Ghats and diverting them westwards where they can be utilised for power generation at heads, of 450 to 600 m At present, plans to use the waters of these rivers for irrigation along their natural courses are under consideration and westward diversion beyond what is used at the Tata Hydro and Koyna Stations can be considered only after these studies are completed. The power potentials of these rivers are restricted to that corresponding to using of the waters, reserved for irrigation developments in the lower reaches of the river"

The project reports exhibited in the present case **473** show that the river Krishna commands extensive irrigation potential along the natural course of the river. From the point of view of location, topography, fertility and drainage, there is abundant land suitable for agriculture but in view of the scanty and uncertain rainfall irrigation is essential for successful crop production In these and and semiand regions, irrigation water gives value to land and in the correct combination of water and land, lies the foundation of all agriculture and the population carrying capacity of the country Depletion of the waters of the Krishna by excessive westward diversion is injurious to the full development of the vast irrigation potential in the lower reaches of the river.

75-8 per cent of the population in the Krishna basin lives in rural areas and 68 per cent of the working force is engaged as cultivators or agricultural labourers The agrarian population is entirely dependent on the Krishna waters for irrigation. Having regard to the economic and social needs of the population, their dependence on the Krishna waters for irrigation and the hydrology, climate and physical characteristics of the basin, irrigation use is of prune importance and of the greatest value to the basin community as a whole In view of the overall scar- **474** city of the Krishna waters, preference should be given to irrigation use over power production by westward diversion of water.

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(108) J Outline Brown, Hydro Electric Engineering Practice 1958, Vol. III, p 170

(109) A scheme for generation of power by westward diversion of waters of the river Pravara from Bhandardara storage was rejected by Maharashtra on inter aha the following grounds —

> "This proposal yields larger quantum of power but will not be economically as attractive as the proposals of the present report * * * Another important consideration against this proposal is that it will adversely affect the present irrigation from Bhandardata dam This is the only source of water to the area which lies in low rainfall zones." See The Bhandardara Hydro Electric Project Report 1968, MRPG XXI p 3, para 3 5

(110) Report of the Energy Survey of India Committee 1965, p 185

(111) Report of the Energy Survey of India Committee 1965, p 190

The Irrigation Commission pertinently observed: ([112])

"Multipurpose river valley projects offer the best use of surface water resources; but apart from situations where both power generation and irrigation may be possible, there may be other cases in which a choice has to be made between the use of water either for irrigation or power generation. The Western Ghats offer sites with high heads for the generation of cheap hydro-electric power by diverting westwards the waters of east flowing streams. In Maharashtra, part of the waters of the Koyna, a tributary of the Krishna, has already been partly diverted westwards to generate hydro-electric power at the Koyna power-station, which has an installed capacity of 560 MW. In such cases, where a choice is involved, the priority has to be determined not only by economic considerations, but by recognition of the fact that irrigation is possible only by the use of water, whereas power can be generated from alternative sources such as coal, gas, oil and atomic
475 fuels. In view of the overall scarcity of water resources, we recommend that wherever a choice has to be made between irrigation and power generation, preference should be given to irrigation. The east flowing rivers rising in the Western Ghats traverse areas which have low rainfall and suffer from water scarcity. The needs of these areas should receive priority."

We hold that irrigation use of the waters of river Krishna should prevail over hydro-electric use requiring diversion of the water across the Western Ghats and that westward diversion of water beyond what is allowed for the Koyna Hydro-electric Project and the Tata Hydel Works should not be permitted in the Krishna basin. We have protected the annual westward diversion of 67.5 T.M.C. by the Koyna Hydel Project and 42.6 T.M.C. of water by the Tata Hydel Works. This water represents more than 5 per cent of the 75 percent dependable flow of the Krishna river.

The Koyna Hydel Project diverts westwards outside the Krishna river basin water from the river supplies in the Upper Krishna (K-1) sub-basin. The State of Maharashtra should not be permitted to divert outside the Krishna river basin from the river supplies in the Upper Krishna (K-1) basin more than 67.5 T.M.C. of water in any water year for the Koyna Hydel Project or any other project.

The Projects collectively known as the Tata Hydel 476
Works divert water outside the Krishna river basin water from the river supplies in the Upper Bhima (K-5) sub-basin. The quantity of water diverted westwards for these Projects fluctuated from year to year, the maximum annual diversion being 54.47 T.M.C. during the years 1952-53 to 1967-68, while the protected annual westward diversion is 42.6 T.M.C. The State of Maharashtra should not be permitted to divert outside the Krishna river basin from the river supplies in the Upper Bhima (K-5) sub-basin for the aforesaid Projects or any other project more than 54.5 T.M.C. of water in any one water year and more than 212 T.M.C. in any period of five consecutive water years commencing on the 1st June, 1974.

Transitional Provisions :

Maharashtra has argued that an abrupt reduction of westward diversion of water at Koyna station will paralyse the power situation in the State and that the limitation of the diversion to 67.5 T.M.C. of water annually should not take effect for some time.

On a full consideration of the matter, we are inclined to hold that Maharashtra should be permitted to divert westwards for the Koyna Hydel Project 97 T.M.C. of water annually during the period of 10 years commencing on the 1st June, 1974 and 87 T.M.C. of water annually during the next period of 5 years and 78 T.M.C. of water during the next succeeding period of 5 years. As it will take several 477
years to develop the irrigation potential of all the States, the larger westward diversion for this limited period will not injure the irrigation interests in the lower reaches of the river. Counsel for Mysore and Andhra Pradesh conceded that irrigation interests in the lower reaches of the river will not be injured by the larger diversions for the first 15 years. On the expiry of 20 years, the annual westward diversion of water from Koyna Hydel Project will be limited to 67.5 T.M.C. of water.

Restriction should be imposed on westward diversion of water :

Maharashtra argues that once an allotment of the Krishna waters is made, Maharashtra may divert a

([112]) Report of the Irrigation Commission 1972, Vol. I, p. 90.

portion of its share of the water (not exceeding 260 T.M.C. annually) westwards and that so long as its total appropriation does not exceed the aggregate quantity allotted to it, westward diversion of water cannot cause any injury to the other States and should not be restrained by the Tribunal. We are unable to accept this argument.

The case of the other States is that irrigation use should enjoy preference over hydro-electric use requiring westward diversion of the Krishna waters and that more westward diversion of water for purposes of power production should not be permitted. The
478 dispute must be settled and the reciprocal rights and obligations of the States must be determined by applying the rule of equitable apportionment of the benefits of the river. The process of equitable allocation involves determination of the relative values of conflicting uses, the extent to which irrigation and other uses should prevail over hydro-electric uses requiring westward diversion of water and the quantity of water that may be diverted westwards consistently with the available supply and the needs of the other States. On a consideration of all relevant factors, we have found that Maharashtra should be allowed to divert westwards a limited quantity of water only and that excess westward diversion would be injurious to full development of the irrigation potential in the lower reaches of the river. The equitable allocation fixes the limits of westward diversion of water. Any westward diversion by Maharashtra in excess of those limits involves an injury to the other States and must be restrained.

We cannot permit westward diversion of water allotted to Maharashtra for its irrigation and other uses within the Krishna basin and particularly for the irrigation needs of its scarcity areas. If Maharashtra did not need the water for its irrigation needs within the basin, we would have allotted the water to the other States for developing their irrigation potential.

479 The special features of the Krishna basin necessitate the imposition of restrictions with regard to westward diversion of water and other restrictions with regard to the use of the water allotted to the States. Subject to these restrictions, each State is free to use the water allotted to it in any way it likes. But the restrictions imposed by the Tribunal must be obeyed.

We may now examine the materials and authorities upon which reliance was placed by Maharashtra.

Maharashtra relied on the literature concerning equitable allocation of the waters of the river Jordan. In 1954 and 1955, W.D. Criddle, adviser for the United States of America, formulated a plan for the development of the waters of the Jordan river system. A basic assumption of the plan was that, in so far as possible, each country was entitled to beneficially use water on all irrigable lands within the basin, and that once the division was made between the countries, water so allocated could be used on lands within the basin or out of the basin as the country might choose. Israel wished to use much of her allotted water outside the basin. ([113]) In October 1955, there was a revised unified plan under which the reasonable needs of all in-basin users in the riparian 480
States was to be provided before out-of-basin uses could be considered. The United States authorities contended that the waters accruing to Israel represented its share after equitable Arab claims had been deducted, and that Israel's share could be used legitimately either in or out of the basin. The technical representatives of the riparian Stales unanimously endorsed the revised Plan. But eventually the plan was vetoed and nothing definite emerged. ([114]) The negotiations regarding the allocation of the Jordan waters do not establish any precedent for settling inter-State water controversies.

The decisions of the U.S.A. Supreme Court relied upon by Maharashtra turned upon the construction of a decree in Wyoming v. Colorado 259 U. S. 419 as modified in 260 U.S.1. That decree affirmed "the right of the State of Colorado or of any one recognised by her as duly entitled thereto" to divert and take annually 15,500 acre feet of water for the Laramie Poudre Tunnel appropriation, 18,000 acre feet of water for the Skyline Ditch appropriation 4250 acre feet of water for the Meadowland appropriation and 2000 acre feet of water for the Wilson Supply Ditch, that is, 39,750 acre feet of water in all. In Wyoming v. Colorado 298 U.S. 573 and 481
309 U.S. 572, the Court held that it was not the purpose of the decree to withdraw water claims dealt with therein from the operation of the local laws under which water rights acquired by appropriation were transferable and the use of water could be changed from the irrigation of one tract to another, if the change did not injure other appropriations.

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(113) H.F. Blaney and W.D. Criddle, Determining Water Requiremsnts for settling water disputes, Natural Resources Journal Vol. 4 No. 1, pp. 29, 39, 40; The Methods of Estimating Evapotranspiration, Irrigation and Drainage Speciality Conference, Las Vegas, Nov. 2-4, 1966, published by American Society of Civil Engineers, p. 27.

(114) Samir N. Salioa, The Jordon River Water Disputes, pp. 106, 107 (Martinus Nijhoff/The Hague).

Accordingly, the Court ruled that diversions by Colorado in excess of 18,000 acre feet of water for the Skyline Ditch appropriation and in excess of 4250 acre feet of water for the Meadowland appropriation did not constitute an infraction of the decree so long as the diversions for all the Colorado appropriations did not exceed its total allotment. The decree, on its proper interpretation, imposed a limitation on the amount of water divertible by Colorado, but it did not place any restriction on the place of diversion or the purpose for which diversion could be made

But where, for purposes of equitable allocation, it is necessary to impose specific restrictions on the place or purpose of diversion, the Court may by its decree direct that not more than a specified quantity of water can be diverted to another watershed or can be withdrawn from particular reaches of the river and that the diverted water shall be used for certain specific purposes and areas only. If such a decree is
482 passed, it must be carried out and the specific restrictions imposed by it must be obeyed. Instances of such specific restrictions may be cited.

Para A to D of article IV of the decree passed In Arizona v. California 376 U.S. 340 permitted the State of New Mexico to divert water from certain streams and to use the water for irrigation of certain areas on those streams. Para (F) of article IV of the decree enjoined that no diversion from a stream authorised in para (A) to (D) "may be transferred to any of the other streams nor may any use for irrigation purposes within any area on one of the streams be transferred for use for irrigation purposes to any other area on that stream". Obviously, the State of New Mexico could not claim immunity from the specific restrictions imposed by article IV(F of the decree by invoking the authority of the decisions in 298 U.S. 573 and 309 U.S. 572.

Clause I of the decree in Nebraska v. Wyoming 325 U.S. 589, 665 restrained the State of Colorado from diverting water from the North Platte River for irrigation of more than 1,35,000 acres of land in Jackson County, Colorado and from exporting out of the basin of the North Platte River and its tributaries in Jackson County, Colorado to any other stream basin more than 60,000 acre feet of water in any period of ten consecutive years. In view of
483 these specific restrictions, Colorado could not lawfully export a larger quantity of water to another watershed on the plea that the larger export would not cause any injury to the other States so long as its total appropriation did not exceed the aggregate quantity of water allotted to it.

On a consideration of all relevant factors we propose to pass the following order :—

(1) The State of Maharashtra shall not out of the water allocated to it divert or permit the diversion of more than 67.5 T.M.C. of water outside the Krishna river basin in any water year from the river supplies in the Upper Krishna (K-l) sub-basin for the Koyna Hydel Project or any other project.

Provided that the State of Maharashtra will be at liberty to divert outside the Krishna river basin for the Koyna Hydel Project water to the extent of 97 T.M.C. annually during the period of 10 years commencing on the 1st June, 1974 and water to the extent of 87 T.M.C. annually during the next period of 5 years commencing on the 1st June, 1984 and water to the extent of 78 T.M.C. annually during the next succeeding period of 5 years commencing on the 1st June, 1989.

(2) The State of Maharashtra shall not out of the water allocated to it divert or permit diversion outside the Krishna river basin from the river supplies in the Upper Bhima 484

(3) (K-5) sub-basin for the Projects collectively known as the Tata Hydel Works or any other project of more than 54.5 T.M.C. annually in any one water year and more than 212 T.M.C. in any period of five consecutive water years commencing on the 1st June, 1974.

(4) Except to the extent mentioned above the State of Maharashtra shall not divert or permit diversion of any water out of the Krishna river basin.

Eastward irrigation :

Maharashtra's demand for Koyna Krishna Lift Irrigation Scheme as also its demand for eastward irrigation under the proposed multiple purpose westward diversion schemes will be dealt with separately.

CHAPTER XIV

485 *APPORTIONMENT OF THE WATERS OF THE RIVER KRISHNA*

PART—I

In this chapter we proceed to embark upon the difficult and delicate task of the division of waters of the river Krishna between the States of Maharashtra, Mysore and Andhra Pradesh. This is also the subject matter of Issue No. II and the sub-issues under it. These are set out below :—

II. What directions, if any, should be given for the equitable apportionment of the beneficial use of the waters of the Krishna river and the river valley.

SUB-ISSUES

(1) On what basis should the available waters be determined ?

(2) How and on what basis should the equit able apportionment be made ?

(3) What projects and works in operation or under construction, if any, should be pro tected and/or permitted ? If so, to what extent ?

(4) Should diversion or further diversion of waters outside the Krishna drainage basin be protected and/or permitted ? If so, to what extent and with what safeguards ? How is the drainage basin to be defined ?

(5) Should any preference or priority be given to irrigation over production of power ?

(6) Has any State any alternative means of satisfying its needs ? If so, with what effect ?

486 (7) Is the legitimate interest of any State affec ted or likely to be affected prejudicially by the aggregate utilisation and requirements of any other State ?

(8) What machinery, if any, should be set up to make available and regulate the alloca tions of waters, if any. to the States con cerned or otherwise to implement the deci sion of the* Tribunal.

While devising the scheme for equitable apportionment of the waters of the river Krishna, we shall also be deciding Issue No. IV(B)(a) which runs as follows :—

"Should any directions be given for the release of water from the Tungabhadra Dam :—

(i) for the benefit of the Kurnool Cuddapah Canal;

(ii) for the benefit of the Rajolibunda Diversion Scheme; and

(iii) by way of contribution to the Krishna river ?"

We have determined the 75 per cent dependable yield of the river Krishna upto Vijayawada as 2060 T.M.C. as mentioned in Chapter IX. We have further determined in Chapter X the quantities of water which shall be available for distribution between the parties on account of return flows. We have also held that in the equitable apportionment of the waters of the river Krishna, utilisations in each State to the extent mentioned in the concluding part of Chapter XII should be preferred to contemplated uses. We have also held in the concluding part of Chapter XIII that irrigation use in the Krishna basin 487 should prevail over hydro-electric use requiring diversion of the Krishna water across the Western Ghats and westward diversion of water beyond what is allowed for the Koyna Hydel Project and the Tata Hydel Works should not be permitted except to the extent it has been allowed as a transitional measure in respect of the Koyna Hydel Project.

We have also held that all the three States will be free to make use of underground water within their respective State territories and that the rights, if any, under the law for the time being in force of private individuals, bodies or authorities relating to the use of underground water, are not altered and that the use of underground water resources shall not be reckoned as alternative means of satisfying the need of any State and will not be taken into account for the purpose of equitable apportionment of the waters of the river Krishna. This relieves us from

discussing whether the use of underground water resources should be taken as alternative means of satisfying the need of any State or not because it is not to be taken into account for the purpose of equitable apportionment of the waters of the river Krishna.

488 It will be proper to set out at this stage the case of the parties on the subject-matter of division of the waters of the river Krishna between the three States. In paragraph 7.59 at pages 194 to 195 of MRK-I, the State of Maharashtra has stated that taking the dependable flow at 75 per cent dependability to be 2200 T.M.C., the equitable distribution of water of the Krishna System between the three States should be worked out as in Statement MK.V1I-2 at page 207 of MRK-I. In this statement the State of Maharashtra has worked out the percentage of the following factors in respect of each of the three States :

(1) drainage contribution to the basin,

(2) scarcity area in the basin,

(3) culturable area in the basin and percentage share based on weighted culturable area, and

(4) population in the basin.

Taking the average of all these percentages, it is stated that the apportionment of the flow of the river Krishna at the 75 per cent dependability between the three States should be as follows :—

Maharashtra	908 T .M.C
Mysore	865 T.M.C
Andhra Pradesh	427 T.M. C

In paragraph 7.59.3 at page 196 of MRK-I the State of Maharashtra has also claimed share in the additional flow exceeding 75 per cent dependable supplies in the same proportion as stated above. It

489 has further claimed that each State should be entitled, at its own discretion, to build storages of larger capacities for utilising the additional supplies upto say 50 per cent dependable flows or any other prescribed lower per cent dependable flows than 75 per cent. In paragraph 7.59.4 at pages 196-197, the State of Maharashtra has stated that during shortages the percentage in the shares of the three States should be the same as the percentage in the contributions by the States to the basin flow.

The State of Maharashtra had got prepared a Master Plan by a committee appointed by the Government of Maharashtra by Resolution No. ISW. 1067-KG, dated the 18th October, 1967, which envisages the use of 900 T.M.C. water of the river Krishna out of the 75 per cent dependable supplies for irrigation, power and domestic and industrial requirements (MRK-II pages 49 to 60). The demand of the State of Maharashtra as given in Annexure II at page 50 of MRK-II may by summarised as follows : — 490

ANNEXURE II - ABSTRACT

Abstract of water requirements of Maharashtra State in the Krishna basin in accordance with the Master Plan.

		Gross utilisation in T.M.C.			
Serial No.	Type of Projects	Projecs existing and cleared.	Projects pending with CW&PC and Planning Commission	Other Planned Projects	Total of Cols. 3 to 5
1	2	3	4	5	6
1.	Irrigation Projects within the Krishna	335	83	150	568
2.	Westerly diversion projects .	120	117	24	261
	TOTAL	455	200	174	829

NOTE:—The utilisations indicated above do not include the future probable requirements of Industrial and Domestic water supply which are expected to be of the order of 70 to 80 T.M.C. as also the utilisation of 32.5 T.M.C. from regenerated flow.

Details of the water requirements for each project in the various sub-basins are given in Statement Nos. 1, 2 and 3 to that Annexure at pages 51 to 60 of MRK-II. The details given in the aforesaid statements show that not only the dependable flow but the water available on account of regeneration is also planned for use in the case of several projects. The State of Maharashtra has further stated that for future 491 projects, that is, projects which would mature after 15 to 20 years further diversions would be necessary from the less dependable flows.

The State of Mysore has stated that there are vast possibilities of irrigation in the Krishna basin and that of the three States it has the largest :—

(a) Drainage area ;

(b) Culturable area ;

(c) Net sown area ; and

(d) Population

in the Krishna basin. The State of Mysore has shown the Statewise distribution of these factors in the Table given in paragraph 107 at page 50 of MYK-I This statement is set out as follows

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State	Drainage Area		Culturable-Area		Net Sown Area		Population	
	Sq. Miles	Percentage Col. 2x100 / Total of Col. 2	Lakh Acres	Percentage Col. 4x100 / Total of Col, 4	Lakh Acres	Percentage Col. 6x100 / Total of Col. 6	Lakhs	Percentage Col. 8x100 / Total of Col. 8
1	2	3	4	5	6	7	8	
Mysore .	43,734	43.7	229.4	45.3	177.3	46.2	117.6	37.6
Andhra Pradesh	29,441	29.5	134.9	26.7	87.7	22.8	98.1	31.4
Maharashtra .	26,805	26.8	141.4	28.0	119.2	31.0	96.7	21.0
TOTAL	99,980		505.7		384.2		312.4	

493 It has been further stated that it has five rich Doabs in the State of Mysore at the confluence of the river Krishna with its major tributaries and that it has maximum arid tracts as compared with other States and these tracts are in need of water. The total requirements of the State of Mysore for irrigation in the Krishna basin as given in Statement Nos. 5, 6 and 7 of Annexure III of MYK-I are for 1430 T.M.C. at 75 per cent dependability. It is stated by the State of Mysore that this assessment of requirement is rather on the conservative side and it does not include needs for domestic and industrial uses (paragraph 114 at pages 52-53 of MYK-I). The consolidated picture of the requirements of the State of Mysore, as claimed by it, is given in Statement 7 of Annexure III at page 102 which is quoted below.

ANNEXURE III

Statement 7

Statement showing water requirements of Projects by Valleys in Krishna Basin Mysore State.

Sl. No.	Name of Valley	Requirements of Projects completed or under construction in T.M.C.	Requirements of proposed projects in T.M.C.	Total requirements of projects in each valley in T.M.C.
1	2	3	4	5
1.	Krishna Main Stem	451.84	87.34	539.18
2.	Ghataprabha Valley	101.73	43.40	145.13
3.	Malapiabha Valley .	51.10	25.48	76.58
4.	Bhima Valley .	13.03	120.47	133.50
5.	Tungabhadra Valley	354.33	181.28	535.61
	TOTAL	972.03	457.97	1430.00

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Figures in Column 3 and Column 4 have been taken from Statement 5 and Statement 6 respectively.

The State of Mysore has also prayed that its share may be increased or reduced when the water available is more or less than the total yield determined at 75 per cent dependability in the same proportion that 1430 T.M.C. bears to the total yield determined at 75 per cent dependability (see Relief B in paragraph 139 at page 65 MYK-I).

The State of Andhra Pradesh has stated that its economy is dependant on its agriculture, that it has the maximum commandable area in the Krishna basin, that it has most fertile soil types eminently fit for irrigation, that it is able to produce food in the shortest period, that it has facilities for construction of economic projects, that it has a fitful unseasonal rainfall resulting in large portions of the State being affected by droughts and famines, that it has a low per capita income, that it has a very high ratio of rural population to urban population and that it is vulnerable to heavy flood and frequent cyclones. It is submitted that all these features taken individually and collectively clearly establish the claim of the State of Andhra Pradesh for a large share of the Krishna waters for irrigation purposes (see pages 110 and 111 of APK-I). The State of Andhra Pradesh further stated that its claim in the waters of the river Krishna should be divided in three categories. The first category relates to the existing utilisation upto 1951, the second category relates to the committed utilisations between 1951 and 1960 and the third category relates to the projects for which water is claimed from the balance quantity of water available out of the dependable flow in the river after meeting the needs of first and second categories. The State of Andhra Pradesh has contended that the total water required for all the committed utilisations upto the year 1960 be set apart for the State of Andhra Pradesh to be utilised on daily basis for projects committed upto 1951 and for projects committed between

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1951-to 1960 on weekly basis. It has submitted that after allowing in full the water for existing utilisation upto the year 1960 the residual flow available be so
496 divided that the State of Andhra Pradesh gets 60 per cent of the residual flows (see pages 49 to 55 of APK-1). In Appendix XVII of APK-I at pages 123 to 125 the State of Andhra Pradesh has given a statement showing the total utilisations for its schemes. This statement is divided in three lists A & B, C and D. The abstract of these lists at the bottom at page 125 of APK-I giving the total utilisations for all projects as 2008 T.M.C., is as follows: —

A	& B Utilisations for schemes committed upto 1960	956	T.M.C. ft.
C	Utilisations for schemes committed after 1960	84	
D	Utilisations for schemes under contemPlation	968	„
	or say	2008 2000	T.M.C.ft. T.M.C.ft.

The following reliefs as mentioned at pages 134 to 136 of APK-I have been claimed with respect to the utilisations mentioned in Lists A & B, C and D and for a share in the excess flows over and above the dependable yields :—

"2. For a direction that all existing irrigation in Andhra Pradesh prior to 1951 requiring a total quantity of 366 Thousand Million Cubic Feet of Krishna water should get full and timely supply on daily basis as a first priority.

3. For a direction that all the committed utilisations in Andhra Pradesh for projects constructed or under construction between
497 1951 and 1960 requiring a total quantity of 590 Thousand Million Cubic Feet of Krishna water should get full and timely supply on a weekly basis.

4. For a direction that out of the balance dependable yield available after deducting the existing and committed utilisations upto 1960 in all States, Andhra Pradesh be allotted a share of 60 per cent on weekly basis, on the basis of equitable principles which have already been enunciated in the statement of case.

5. For a direction that in the excess flows over and above the dependable yield, Andhra Pradesh also be given an equitable share on the basis of the ability of Andhra Pradesh to put water for immediate and beneficial use.

6. For a direction that in years of low supply below the dependable yield committed utilisations upto 1951 be fully met and the balance be regulated on a pro-rata basis first for the committed utilisations upto 1960 with second priority to new schemes.

* * * * *

15. For a direction that a suitable and efficient machinery be established to ensure proper regulation and distribution of legitimate shares of each State."

A bare perusal of the demands of all the three States shows that each State has tried to place its demands as high as possible. It need not be emphasised that it is not possible to meet the aforesaid demands of the three States from the water available in the Krishna basin. We have already mentioned that utilisations upto 1693.36 T.M.C. have been protected. This leaves a limited scope for satisfying the 498
needs of the three States. The States of Maharashtra and Mysore have strenuously urged before us that utilisations of the State of Andhra Pradesh have been protected to the extent of 749.16 T.M.C. Which is much in excess of its equitable share and that in the remaining water that may be available for distribution nothing should be allocated to the State of Andhra Pradesh and the entire remaining water should be equitably divided between the States of Maharashtra and Mysore. On behalf of the State of Andhra Pradesh it is submitted that there is no valid reason that the State of Andhra Pradesh should not get anything from the remaining water when its need for utilisation of more water is as great as any of the other two States. Elaborate arguments have been addressed by the parties before us on all aspects of the matter of which we shall take notice presently.

At this stage we may point out that in any scheme for the division of water of the river Krishna it should be made possible that all the utilisable water available in the Krishna basin may be utilised. So far as the utilisation of underground water is concerned, there is now no controversy and we are here concerned with the utilisation of the surface water by the three States. The surface water is likely to be augmented every year from the return flow which may be available from the water diverted and used for beneficial 499
uses. Most of this is to come from water used for irrigation. If in any scheme for division of the water this increase in the flow of the river Krishna due to return flow is taken into account automatically every year without entering into a meticulous and detailed examination of the various factors which affect the return flow, it would shut the

door to all controversies between the parties regarding the exact or even approximate quantity of water which may be available as return flow. At the same time under such a scheme, the parties would be able to get water which may be available due to return flow for utilisation every year. In drawing up any scheme for the division of waters of the river Krishna this aspect of the matter may be examined.

Another important aspect of the matter is that in view of the vast gap between the supply and demand of water in the Krishna River System, time has come when it should be made possible that the surplus water which may be flowing in 75 years over and above the flow at 75 per cent dependability may be impounded and utilised if it is so feasible. The question is of conservation of water which would be flowing in excess of the dependable flow. The distinction
500 between annual storage and overyear storage must be made clear at this stage. Annual storage refers to storage from the period of surplus to the next period of shortage in the same irrigation year. Overyear storage is storage from high-years for use in low-years. The demands of the three States for beneficial use particularly for irrigation are already so high that no water should be allowed to go waste for 75 years without seriously exploring all possibilities for its utilisation. We have already referred to the case of parties as set out in their pleadings. They themselves are alive to this problem and are keen on utilisation of such water. Each State has claimed equitable share in the dependable flow and also in the water in excess over the dependable flow. /

Chapter VI on 'Policies and Considerations in Irrigation' in the Report of the Irrigation Commission (1972) Volume I, deals with this subject at page 125. It will be useful to quote the views of the Commission on this point :

"6.53. The rainfall in various catchment areas varies from year to year and so does the volume of water in rivers. Irrigation projects have to be so designed that their full requirements are met in most years. At present, the practice is to design the projects to utilise river flows of 75 per cent dependability. It means that in 75 years there is some surplus in the river, and in 25 years some shortage, ranging from marginal to substantial. It is obvious that the higher the dependability, the less the quantity of water available for utilisation. *Availability can, however, be improved by providing an extra capacity in the reservoir*

155 for carrying over supplies from surplus years 501
to lean years. By adopting this device, a project can be designed on river flows of lower dependability to provide a larger volume of water to irrigators, with the same degree of assurance. But the provision of carryover capacity in a reservoir entails additional cost, and it becomes a matter of evaluating the additional supply against the additional cost. The more precious the water in an area, as in drought areas, the greater is the justification for providing a carryover. We have dealt with the policies regarding irrigation in drought affected areas in Chapter VIII.

6.54. We consider that the farmer should be assured of getting the designed supply in 75 per cent of the years, and the existing practice of planning irrigation schemes on the basis of 75 per cent dependability should continue. Where a carryover is provided, the 75 per cent dependability can be figured out taking into account the carryover water.

6.55. As variations in the year to year supply are inherent in all major irrigation schemes, we suggest that, well before the rabi season, the farmer should be informed of the quantity of water likely to be available from a reservoir, so that he may adjust his crop ping suitably. The information in respect of run-of-the-river schemes would be less definite, but even a broad indication would be helpful."

(We have *italicized* some portions in the above passages).

The *italicized* portions emphasise the importance of conservation of water in carryover storages for use in the lean years in areas where the demand for the water outpaces the supplies and show that the water carried over in carryover reservoirs would increase the dependability for the purpose of irrigation. In our opinion in the 502 Krishna basin, the genuine demands for irrigation are outstripping the supplies and a serious attempt should be made to use the entire water available in the basin by constructing carryover storages wherever possible.

We may also point out that the history of development of irrigation in the Nile Valley is also the history of conservation of water for use by construction of overyear storages.

"The decade following the completion of the Aswan Dam was a period of intensive investigation and planning under the technical direction of Sir William Garstin, the Undersecretary of Public Works in Egypt. In 1904 a four point program was recommended to provide more water for Egypt and for the Sudan during the low period. The plan included in addition to the Aswan Dam and the Sennar Dam on the Blue Nile, of which more later, a series of works in the Sudd region on the White Nile to reduce the great losses of water in that swampy region. In addition, overyear storage in Lake Victoria and Lake Albert was recommended and overyear storage in Lake Tana at the origin of the Blue Nile was proposed. Additional proposals for storage on the Atbara were set out. At the close of this period of planning and survey there occurred in 1913-14 the lowest year on the Nile yet recorded. This tended to give even greater urgency to the overyear storage proposals."([1])

The agreement between the United Arab Republic and the Republic of Sudan dated the 8th November, 1959 specifically mentions that water is to be stored in Aswan Dam for use in the next year. In Art. II of the Treaty, reference is made to Nile control works and the sharing of their benefits between the two Republics. It is mentioned therein that:

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2. "In order to make use of the full natural river supply and stop the flow of any excess to the sea the two Republics agree to the construction by the U.A.R. of the Sudd el Aali Reservoir at Aswan as the first of a series of overyear storage schemes on the Nile.

3. The net benefit from the Sudd el Aali Reservoir shall be calculated on the basis of the mean natural river supply at Aswan in the past years of this century and which amounts to 84 milliards of cubic metres per year. The established rights of the two Republics referred to in Article I as well as the mean value of the overyears storage yearly losses in the Sudd el Aali Reservoir shall be deducted from the above mentioned mean natural river in order to obtain the net yearly benefit to be shared by the two Republics-"

We may, however, point out that it is not our intention to say that average of the flows of all the years for which data is available should be taken to be the proper available supplies for distribution between the parties. This will mean utilising the waters of the Krishna river at 50 per cent dependability. The river Krishna is, of course, much more dependable river than many rivers in India, yet without further study it will be too much to say that the water should be impounded in the Krishna basin to such an extent that we may make 50 per cent dependability a basis for division of the water. In this connection it will be worthwhile to notice the following observations in Wyoming vs. Colorado ([2]):— **504**

"Colorado's evidence, which for convenience we take up first, is directed to showing the average yearly flow of all years in a considerable period, as if that constituted a proper measure of the available supply. We think it is not a proper measure—and this because of the great variation in the flow. To be available in a practical sense the supply must be fairly continuous and dependable. No doubt the natural flow can be materially conserved and equalized by means of storage reservoirs, but this has its limitations, both financial and physical. The construction of reservoirs of real capacity is attended with great expense, and unless an adequate return reasonably can be foreseen the expenditure is not justified and will not be made. The years of high water and those of low do not alternate. Often several of the same kind follow in succession. The evaporation of stored water in Colorado and Wyoming is from five to six feet per year. So, while it generally is practical to store water in one part of the year for use in another, or in one year for use in the next, it often, if not generally, is impracticable to store it for longer periods."

The subject of overyear storages with regard to the reservoirs has been discussed (1) in the Physical Department paper No. 35. "The hydrology of the

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(1) AH. Garretson and others "The Law of International Drainags Basins", page 265.

(2) Wyoming vs. Colorado 259 U.S. 419 (1922) cited in "Documents on the use and control of the waters of inter State and International Streams", compiled and edited by T. Richard Witmer, second edition, p. 674.

Lake Plateau and Bahr El Jebel", The Nile Basin Vol. V pp. 81-87 with reference to Lake Albert Reservoir Project and (2) in Physical Department
505 paper No. 51, "The Future Conservation of the Nile," The Nile Basin Vol. VII pp. 55-58 with reference to The Lake Albert Reservoir and Century Storage. These studies are instructive as showing the importance of over year storages and theoretical and practical problems encountered while constructing overyear storages.

Studies for determining the advantage that will accrue by carryover storages have been made in the Krishna basin by the expert witnesses of the parties, namely, Mr. K. K. Framji (MRW-1), Mr. Jaffer Ali (APW-6) and Mr. Angadi (MYW-1). Though their conclusions may be different with regard to exact quantity of water which may be available for utilisation yet they are generally agreed that it is possible to utilise surplus water flowing above 75 per cent dependability in 75 years by constructing overyear storages in which excess water in a particular year may be stored for use in the succeeding years.

Mr. Framji taking the dependable flow at 2176 T.M.C. and combined carryover capacity of the Nagarjunasagar and the Srisailam Reservoirs as 180 T.M.C., stated in answer to Question No. 196 that:—

506 "The general result of the study is that there is an increase of the dependable flow in the Krishna from 2176 T.M.C. to 2300 T.M.C. from the combined use of the carryover capacities in the Nagarjunasagar and Srisailam projects of 180 T.M.C. and that this enables a utilisation upstream of Srisailam of 1680 T.M.C. for the upstream projects."

He submitted Statement No. 1 in the form of a table which is at pages 489 to 491 of his evidence and stated in respect of this statement that:—

"I would draw attention to the general conclusion which can be drawn from this table, namely that 2300 T.M.C. utilisation is available in 38 years out of 51, that is at 75 per cent dependability. 2176 T.M.C. utilisation will be available in 41 years out of 51 years, that is at 80 per cent dependability ; and out of 10 years of failure, the yields are improved in 7 years by the carryover."

Mr. Jaffer Ali (APW-6) admitted that the effect of the carryover storages is to increase the dependable flow. In this connection his answers to Questions Nos. 39 to 42 at pages 117 and 118 are relevant. At page 117 he has plainly admitted that the effect of the carryover storage is to increase the dependable flow of the river. But the extent of the effect will depend on the extent of the carryover and on the pattern of the yields received during the years. He also stated that the effect of the increase can be felt throughout the river. Mr. Angadi (MYW-1) stated as follows in answer to Question No. 8 at page 25 of his evidence.

"I have noticed that in a period of 51 years from 1900-01 to 1950-51, there will be very
507 large surplus which is going waste, if we plan utilisation of the Krishna River System con sidered as a whole for 2176 T.M.C., at 75 per cent dependability. Therefore, I got made, under my personal supervision, a number of trial studies relating to carryover capacity, total benefits and the percentage dependability of that benefit. As a result of these studies, I came to the conclusion that by the best combination of these three variables, namely, the carryover capacity, the total utilisations as a result of it and its dependability, and by providing 283 T.M.C. of carryover capacity it will be possible to increase annual utilisations to 2406 T.M.C., that is to say, by providing 103 T.M.C. more of carryover capacity than what I have found exists in the Srisailam and Nagarjunasagar reservoirs, namely, 180 T.M.C."

He further explained that with the carryover storage at 283 T.M.C., 72.5 per cent dependable flow of 2406 T.M.C. would be obtained. He stated at page 60 of his statement that 75 per cent dependable flow which would be obtained with carryover storage of 283 T.M.C. will be of 2291 T.M.C. It may be mentioned that this witness had taken the dependable flow as 2176 T.M.C. as Mr. Framji had done. The witness in answer to Question No. 12 at page 28 of his evidence stated that there was already a carryover capacity of 180 T.M.C. ft. in the Srisailam and the Nagarjunasagar Reservoirs and in answer to Question No. 13 at the same page stated that the points at which such carryover storages could be constructed are the Almatti Dam site of the Upper Krishna Project and the Malti Reservoir of the Upper Tunga
508 Project and the Mahagundi Dam of the Upper Bhadra Project at Lakkavalli.

The substance of the matter is that by having carryover storages, additional water becomes available for utilisation in the river Krishna. The additional water

which will be available can be measured to some extent in terms of augmentation in the dependable flow. Apart from augmentation of supplies in the dependable flow in some years, water at a lower percentage of dependability also becomes available for utilization

The other important point on which we must make up our mid even at this stage IS whether the scheme for the division of water should endure for ever or there should be room for review. Any scheme for the division of water is naturally to be evolved on the basis of the material placed before the Tribunal, that is, the data regarding the dependable flow, the data regarding the return flow, the present needs and the future needs as envisaged at present of the three States, the manner in which, these needs can be satisfied at, present or in the near future *etc*. Many water resource development projects are designed to be effective for 50-100 years or longer, it being generally assumed that the period of available hydrological and meteorological records permits prediction of floods, droughts and water supplies for the coming 50-100-years without taking into account any climatic trends or fluctuations([3]). But long term climatic trends and fluctuations are riot predictable. Again, if the available observations are in any way imperfect or have been taken when the precipitation has been gradually decreasing or the record is only of a short period, the forecast with regard to flow available in a river is bound to be defective. Again man's activities may influence the hydrologic cycle. Changes in vegetation, induced precipitation, evaporation control, effects of urbanisation etc. have their own effect on the river flow. Even the course of the river and the pattern of flows may change. Would it be prudent under these circumstances that a scheme for allocation of water which may be drawn up should be of. such character that it may endure in perpetuity or any scope be left for review after a lapse of time? It is evident that our estimate of the dependable flow may need revision in the light of flow data that maybe available in future. It is also evident that the dependable flow may in crease because of the return flow. It is also evident that because of the construction of the carryover storages in all the three States fuller utilisation of the waters of the river Krishna may be made possible.

In view of the uncertainty of the river flow and the impermanence of the current conditions of supply, it is not wise to make a final and unalterable distribution of the river waters. If conditions of supply materially change, a modification of the allocation may be necessary. ([4])

Moreover, in determining the equitable share of the States, all the factors which create equities in favour of one State or the other have to be weighed as at the date when the current 'controversy is mooted. ([5]) But population, engineering, economic, irrigation and other conditions constantly change and with changing conditions new demands for water continually arise. A water allocation may become inequitable when the circumstances, conditions and water needs upon which it was based are substantially altered.([6])

For all these reasons, a review and modification of the allocations may become necessary to keep pace with changing conditions.

In order to ensure flexibility in the allocation the U.S.A. Supreme Court usually retains jurisdiction to modify its decree and reserves liberty to the parties to apply for modification of the decree as and when future circumstances may require, ([7]). On petitions filed from time to time under the clause reserving liberty to the parties to apply at the foot of the decree, the Court has amended or superseded the earlier decree, taking cognizance of population and economic growth, ([8]) or for other reasons ([9])

We may also refer to the following passage at page 346 in the article "Water Supply Suggested Regulation' contributed by Lois G. Forer:-

"Despite the quest for certainty in the law and the desire to establish rights in perpetuity, a final decision cannot be rendered in water

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(3) Introduction to Hydrometeorology by Bruce & Clark, page 293. (First edition, 1966 and reprinted in 1969.

(4) Nebraska V. Wyoming 325 U.S. 589, 620, 622-623, 671-672, Report of Michael J. Doherty in the same case pp. 121-122;. Nile Water Agreement between Sudan and the United Arab Republic 1959 Article II para 5; Report of the Helmand River Commission, Afghanistan and lran p. 124

(5) Colorado V. Kansas 320 U.S. 383,393-394.

(6) Felix Frankfurter and James M. Landis, The Compact Clause of the Constitution, Yale Law Journal Vol. 34, pp. 685, 701; R.C. Martin and others, The River Basin Administration and the Delaware p. 145; Irrigation Commission 1972 Vol. I p.347.

(7) New Jersey V. New York 283 U.S. 336,348, Nebraska V. Wyoming 325 .U.S. 589-671. Arizona V. California 376 U.S. 340; Wisconsis V. Illinois 281 U.S

(8) New Jersey V. New York 347 U.S. 995; R.C. Martin and others. The River Basin Administration and-the:- Delaware p. 143.

(9) Nebraska V. Wyoming345 U.S. 981.

rights. Changes in demands upon the water supply and technological improvements in control of waters and of pollution demand continued reevaluation of legal rights. This necessary flexibility has been sought in a variety of ways, none altogether satisfactory. The Supreme Court has issued 'open end' decrees permitting the parties to apply for relief in the event of changed conditions, but this is not a simple procedure and a heavy burden is upon the moving party to show such conditions. Continuing jurisdiction is occasionally implemented by the device of a Court appointed river master who reports regularly to the Court. The master, of course, is without authority to modify the decree.

Extra-judicial adjustments have been effected by the parties themselves when exceptional circumstances have required them. The Great Lake States have consented to temporary diversion from Lake Michigan in excess of that permitted by the Supreme Court in order to remedy a dangerous condition in the Chicago Sanitary Canal. Similarly, in a time of severe drought in the East, the lower basin States did not compel New York City to maintain the requisite low flow specified under the Supreme Court decree. No Court approval was necessary since the affected States agreed not to press their legal rights under these exceptional circumstances." ([10]).

However, a Tribunal appointed under the Inter-State Water Disputes Act, 1956 is not a permanent body and it cannot retain jurisdiction to modify its decision, apart from its statutory power to do so upon a reference made to it within three
513 months of the decision, ([11]).

If any further modification of the final decision is necessary, a new tribunal must be appointed and a new reference must be made to it for this purpose.

For all these reasons, we think it necessary that our Order should expressly provide that the present allocations will be subject to review and modification after the lapse of a reasonable period of time.

After a careful consideration we are of the opinion that the order of the Tribunal may be reviewed at any time after the 31st May, 2000. This period is considered reasonable by us in view of the fact that during the intervening period there will be increasing demands for water for irrigation and other purposes, in the Krishna basin which may have to be examined in the light of the fresh data that may be available. It may be mentioned that the demands of the three States will by that time take much more realistic shape. Further in view of the stupendous advance in the technology in the matter of conservation of water and its-uses and also for other reasons it may become 514
necessary to examine the subject of apportionment of water after the 31st May, 2000. We have, however, provided that the authority or the tribunal which will be reviewing the order of this Tribunal shall not, as far as practicable, disturb any utilisation that may be undertaken by any State within the limits of the allocation made to it by the Tribunal. The Nile Commission of 1925 had recommended a similar provision to the effect that:—

"The Commission foresees that it will be necessary from time to time to review the question discussed in this report. It regards it as essential that all established irrigation should be respected in any future review of the question." ([12]).

If during the intervening period there is an augmentation of the waters of the river Krishna by the diversion of the waters of any other fiver, no State shall be debarred from claiming before the aforesaid reviewing authority or Tribunal that it is entitled to a greater share in the waters of the Krishna on account of such augmentation nor shall any State be debarred from disputing such claim.

Two other points may be stressed at this stage. 515
The first is that water is being allocated to the States for their beneficial use. In America there are provisions in the Constitutions of some of the Western States which relate the appropriative right to the use

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([10]) Harvard Law Review Vol. 75 (1961-62) page 332.

([11]) Inter-State Water Disputes Act, 1956, Ss. 5(3), 12. Section 131([7]) of the Government of India Act 1935 authorised the Governor General or His Majesty in •Council, as the case may be, to vary a final decision given on a water dispute see Report of the Indus (Rau) Commission, Vol. I, pp. 49-50, 68.

([12]) A.H Garretson & others "The Law of International Drainage Basins" page 283. See also La Plata River Compact, 1922, Art.VI at page 198 and Upper Colorado River Basin Compact, 1948, Art. XX at page 339, in 'Documents on the use and control of the waters of Inter-State and International Streams' compiled and edited by T. Richard Witmer.

of water to beneficial use ; and the water-rights statutes of ten States—as well as the Federal Reclamation Act-contain the historic pronouncement that beneficial use shall be the basis, the measure, and the limit of the right to the use of water, ([13]). In some compacts beneficial use has been made the basis, the measure and limit of the right to use of water. ([14]) The following passage gives the reason for incorporating such conditions :—

> "The underlying reason for all this constitutional, legislative, and judicial emphasis on beneficial use of water lies in the relation of available water resources to the ever-increasing demands made upon them. From time immemorial in various American western regions, the aggregate areas of good agricultural land have been greater than areas that could feasibly be served with available water supplies. Beneficial use of water promptly became a matter of public concern and public policy, because with the continuously unfavourable ratio of supply
> **516** to demand, waste of water—an antonym of beneficial use—or at least unnecessary waste, was not conducive to the public welfare. 'As a general principle, equity abhors waste, and delights to restrain it in a proper case.'
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> At the same time it was recognized that absolute efficiency in the diversion, conveyance, and distribution of water is not practicable and that at times some so-called 'waste' is inevitable. So the problem is to apply the limitation of economy in use of water within reasonable limits, in the last analysis to preclude any waste of water that can be reasonably avoided." ([15])

In our opinion water is to be allocated to the three States for beneficial use and for no other purpose. The term 'beneficial use' may, however, be construed in a wide sense. It may include any use of water which may be conducive to the physical or material well being of the inhabitants of a State or of the Country as a whole. In our opinion beneficial use shall include any use made by any State of the waters of the river Krishna for domestic, municipal, irrigation. industrial, production of power, navigation, pisciculture, wild life protection and recreation purposes.

This does not mean that a State which has not applied water allocated to it to beneficial use and has wasted it or used it for any purpose which can not be considered beneficial use is not to be charged with the quantity of water which it has used .

The second point is that in view of the scarcity of **517** water available in the Krishna basin it is expected that increased attention will be paid by all the three States to minimise the use of surface water as far as possible. Increased efficiency in agriculture, use of underground water, reducing evaporation losses, reclamation of waste water, and lining of the canals are some of the matters which demand urgent and energetic steps to be taken so that there may be increase in supply and economy in utilisations. Some of the demands of the States can be met not by clamouring for more water but by tightening belt in the use of water.

With these general observations we proceed to consider the scheme for division of water.

Various schemes for dividing the water of the river Krishna between the three States were suggested and examined. These envisaged :

1. Allocating the waters of certain tributaries of the river Krishna entirely to one State or another and dividing the remaining water on an equitable basis.

2. Allowing guaranteed supply of water to a lower State by an upper State and permitting the use of remaining water to the upper State with or without any restriction. ,

3. Restricting diversion by an upper State to its **518** share determined on an equitable basis leaving remaining water for use to a lower State.

4. Allocating the water of the river Krishna to the three States by percentages to be fixed by the Tribunal.

5. Mass allocation of water of the river Krishna to the three States upto a certain limit providing further that the parties are to share the water in certain percentages to be fixed by the Tribunal in surplus as well as deficit years.

After carefully examining all the proposals, the parties submitted document Ex. MRK-340 on the

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(13) Waters and Water Rights by Clark, Vol. One page 86, para 19.2.

(14) La Plata River Compact, 1922, at page 198, Upper Colorado River Basin Compact, 1948, at page 339, Sabine River Compact, 1953, at page 292; Pecos River Compact 1948, at page 238 in 'Documents on the use and control of the waters of inter-State and International Schemes' compiled and edited by T. Richard Witmer.

(15) Waters and Water Rights by Clark, Vol. One page 8750

, para 19.2.

4th May, 1973 which contained their views on the method of allocation to be adopted by the Tribunal. This document runs as follows :—

The parties submit as follows :—

1. There will be mass allocation of utilisable[1] dependable flow at 75 per cent.
2. There will be allocation on percentage basis[2] of water in surplus as well as deficit years of flow.
3. There will be restrictions with regard to use, the nature of which restrictions will be decided by the Tribunal.
4. There should be a joint control body to give effect to the decision of the Tribunal. The joint control body shall consist of one person with the rank of a Chief Engineer from each State, and two independent Engineers of equivalent rank and qualification to be appointed by the President of India. Such
519 independent person shall have no connection, direct or indirect, with any of the three States. The cost of the said controlling body and of the establishment and equipment for implementing the Tribunals's decision shall be borne and paid equally by the three States.

NOTE 1. According to Maharashtra and Mysore 100 per cent of the 75 per cent dependable flow is utilisable. According to Andhra Pradesh some quantity as determined by the Tribunal must be deducted from the dependable flow towards the inevitable waste

2. There is difference of opinion between the States regarding the percentages, in surplus as well as deficit flows, which difference will have to be adjudicated upon by the Tribunal. Such difference includes the contention of the State of Maharashtra that there are certain tributaries within the territory of a State where the upper States or State are not in a position to provide any relief arising from deficits in the tributaries, a contention which the States of Mysore and Andhra Pradesh dispute, for the said States contend that the overall deficit taking the entire river basin as a unit should be shared on an equitable basis by all the three States.

Sd.	Sd.	Sd.
H.M. Seervai	T. Krishna Rao	P. Ramchandra Reddi
for the State	for the State	for the State of
of Maharashtra	of Mysore	Andhra Pradesh
4.5.73	4.5.73	4.5.7

The scheme proposed by the parties under Document Ex. MRK-340 was considered in detail. In substance the scheme was that in every water year the flow available in that year in the river Krishna was to be divided for beneficial use between the parties, the share of the parties being fixed by the Tribunal by prescribing two limits; one limit upto the dependable flow and the other 520
limit for the flow above the dependable flow. The deficiency when the flow was less than dependable flow was to be shared in proportion to the shares of the parties fixed in the dependable flow by the Tribunal. The flow above the dependable flow was to be shared in another proportion to be fixed by the Tribunal. Under this scheme one important question which required consideration was with regard to constitution of the authority which will be supervising that waters of the river Krishna are going to be used by each of the three States in accordance with the order of the Tribunal. The other important point was regarding impounding the surplus water that may be flowing in the surplus years.

The great merit of this scheme was that in every water year, water available for utilisation in that water year was to be divided between the parties. Of course, provisions had to be made for the measurement of the water by a competent authority and for utilisation of water which may be going waste on account of non-development of the projects of any State or damage to its project. Provisions had also to be made laying down the limits for the construction of storages to impound surplus water. Provisions had also to be made for permitting the authority which was to supervise that the parties share water in accordance with the order of the Tribunal to direct the transfer of water from an upper State to a lower State from time to time.

All these matters were carefully considered and after 521
thorough discussion each of the State Governments prepared separate drafts of the scheme for division of the water of the river Krishna between the three States. Each draft was in two parts, Part I and Part II. Part II related to the constitution and powers of an authority which was called in the draft "The Krishna Valley Authority" and which was to supervise that the water was shared by the States in accordance with the order of the Tribunal. Part I related to other matters to which we have just made reference. It was realised that unless a joint control body or inter-State authority was established, it would be difficult to divide the waters of the river Krishna between the parties in every water year on the lines suggested by the parties. For this reason while Part I prepared by the parties differed on some material points, as was naturally to be expected, a common draft was prepared of

Part II.([16]) It was considered that at least on this point there must be an agreement betweeen the parties so that the Krishna Valley Authority having the constitution and powers as agreed upon by the parties in Part II be set up. Counsel for all the parties asked
522 for adjournment to ascertain whether each of the State Governments is agreeable to set up the Krishna Valley Authority having the constitution and powers as mentioned in Part II. Necessary adjournment was granted on the 27th July, 1973.

On the 17th August, 1973, learned Counsel for Maharashtra stated that the State of Maharashtra has authorised him to state that it is agreeable to set up the Krishna Valley Authority having the constitution and power as mentioned in Part II. Learned Counsel for Mysore stated that the State of Mysore has authorised him to state that it is agreeable to set up the Krishna Valley Authority having the constitution and powers as mentioned in Part II with certain modifications proposed by the State of Mysore. Learned Advocate General of Andhra Pradesh stated that the State of Andhra Pradesh has authorised him to state that the State of Andhra Pradesh is unable to give its formal consent to set up the Krishna Valley Authority having the constitution and powers as mentioned in Part II. He also stated that the State of Andhra Pradesh was not agreeable to the modifications suggested by the State of Mysore.

523 Learned Counsel of the State of Maharashtra has strenuously argued that in spite of disagreement between the parties on this point the joint control body can be set up under the order of the Tribunal. In support of this contention he has advanced several arguments. It is submitted that under Article 262 of the Constitution Parliament may by law provide for the adjudication of any dispute or complaint with respect to the use, distribution or control of the waters of, or in, any inter-State river or river valley and the inter-State Wate Disputes Act, 1956 was enacted by Parliament to provide for adjudication of disputes relating to the waters of inter-State rivers and river valleys. This Act contemplated the constitution of a Tribunal under section 4 and reference of the dispute to the Tribunal so constituted under section 5. Under section 6 "the decision shall be final and binding on the parties to the dispute and shall be given effect to by them". As contemplated under Art. 262(2) of the Constitution, Section 11 of the Act further provides that "notwithstanding anything con-, tained in any other law, neither the Supreme Court nor any other court shall have or exercise jurisdiction in respect of any water dispute which may be referred to a Tribunal under this Act".

524 On the basis of these provisions, it is contended by the learned Counsel for the State of Maharashtra that under the inter-State Water Disputes Act, 1956, it was intended that water dispute should be finally resolved by the adjudication of the Tribunal and the decision of the Tribunal is to bind the parties who have to give effect to it. A final and binding adjudication of a water dispute can only be made by the Tribunal which has power to make its decision effective by setting up, if necessary, a controlling body or authority which would implement the decision of the Tribunal. Though the Act in terms does not state that the Tribunal may set up such an authority, yet such a power is necessarily implied from the object of the Act, its provisions as well as by the ouster of jurisdiction of the Supreme Court or of any other court. It is contended that the Tribunal acting on the principles enunciated in the maxim "ubi aliquid concediture, concediture etiam id sine quo res ipsa non esse potest" should hold that it has all powers which are reasonably necessary for the accomplishment of the object to be secured, namely, the final adjudication of the dispute between the parties and the State Governments are bound to carry out the order of the Tribunal in the matter of setting up of the joint control body.

525 It is further submitted that the inter-State Wate Disputes Act, 1956 is enacted by Parliament in exercise of its legislative powers under Entry 56 List 1, Schedule Seventh of the Constitution. Under Art. 73(1) of the Constitution, the executive power of the Union extends "to the matters with respect to which Parliament has power to make laws". Under Art. 256 of the Constitution the executive power of the State shall be so exercised as to ensure compliance with the laws made by Parliament and the executive power of the Union extends to the giving of such directions to a State as may appear to the Government of India to be necessary for that purpose and thus the executive authority of the Union extends to giving directions to the State which would ensure compliance with the decision of the Tribunal,

It is further contended that compliance of the order of the Tribunal can also be secured by a writ of mandamus. Such a writ will not be barred under section 11 of the inter-State Water Disputes Act, 1956

(16) Appendix 'R;

because such enforcement does not fall within the definition of a 'water dispute' under that Act, The decision of the Tribunal resolves a dispute, and Section 6 gives effect to that decision and any party not carrying out the decision of the Tribunal is committing breach of its statutory duty and can be compelled
526 by a writ of mandamus to perform its mandatory duty to do or abstain from doing things which the decision of the Tribunal has directed it to do or abstain from doing.

It is further submitted by the State of Maharashtra that document Ex. MRK-340 filed by the parties on the 4th May, 1973, must be construed as an agreement between the parties and that agreement gives sufficient authority to the Tribunal to set up a machinery or authority to ensure the use of water by the States as directed by the Tribunal. The agreement shows that the States had agreed that there should be a joint control body to give effect to the decision of the Tribunal. It also mentions the composition of the joint control body and the qualifications of its Members. It further provides that the costs of the joint control body shall be borne by the three States equally. It is contended that there is an express term in the agreement that there should be a joint control body the constitution of which has been defined under the agreement. The other powers of the joint control body as detailed in Part II of the common draft are merely ancillary and can be spelt out by implication as it must be taken that the parties intended that the joint control body should have the power to engage the necessary staff and maintain the necessary establishment and should
527 have all other powers to give it business efficacy. It is submitted that the State of Maharashtra should not be put at a disadvantage because of the refusal of the Lower States to agree to the establishment of the authority as thereby there is danger that it might be deprived of its rightful share in the surplus water. In this connection it is submitted that even the State of Andhra Pradesh had prayed that a suitable and efficient machinery be set up to ensure proper regulation and distribution of legitimate shares of each State and now it cannot go back and assert the contrary.

Learned Counsel for the State of Mysore has urged that it is the Tribunal which has to decide as to how and in what manner control on the use of water made by the States should be effected so that in good as well as bad years proper distribution of water is ensured. This cannot be done without setting up a proper machinery. Effective guidelines for the working of the machinery may be laid down by the Tribunal, but the setting up of the machinery is a necessity which cannot be avoided. The decision of the Tribunal would necessarily involve the setting up of a machinery and the machinery so set up would become part of the decision of the Tribunal which would have to be given effect to by 528 the States.

The State of Andhra Pradesh has submitted that the Krishna Valley Authority as proposed would be a corporate body with powers to make its own rules regulating its business, employing its own personnel, entering into contracts and consequently suing or being sued in its own name. The power to create such a corporation is vested exclusively in Parliament under Entry 44 of List I of the Seventh Schedule to the Constitution of India. Such a corporation with objects extending over more than one State can be created only by Parliament and that power cannot be usurped by two or more States by entering into an agreement to set up such an authority. In view of this difficulty the Government of Andhra Pradesh felt that it is incompetent to enter into an agreement or to give its consent for the setting up of such a body without reference to Parliament.

It is contended that even in creating an inter-State Corporation under Entry 44 of List I of the Seventh Schedule, if any powers are conferred on such a corporation, which impinge upon the powers of the State legislature as mentioned in List II, it is necessary that the procedure laid down in Art. 252 of the Constitution should be followed and resolutions should 529 be passed by the concerned State legislatures empowering Parliament to legislate with respect to such matters as are contained in List II. The other mode by which such an authority can be created is by legislation by Parliament under Entry 56 of List I of the Seventh Schedule and in such a case there is no question of the States giving their consent to the creation of such an authority. It is contended that the inter-State Water Disputes Act does not envisage the setting up 6f the authority for enforcing the decision of the Tribunal. It is submitted that power to adjudicate is different from the power to execute the decision and in the absence of conferment of any express power on the Tribunal to pass an executable order the Tribunal cannot exercise this power. The Tribunal is constituted to adjudicate only disputes referred to it by the Central Government and it will be dissolved as soon as the Central Government is satisfied that no further reference to the Tribunal is necessary. It is argued that the Tribunal has no jurisdiction to constitute an authority to execute its own decision or to prescribe the mode of this decision by framing any scheme.

529 530 It is further submitted that the agreement dated the 4th May, 1973 cannot furnish any legal basis for setting up of any joint control body in respect of an inter-State river which can only be done by Parliament. Further, Clause 4 of the said agreement while contemplating the necessity of a Central Control Authority to give effect to the decision of the Tribunal does not touch upon the two relevant aspects as to who is to set up the joint control body or what should be the powers and functions of the said authority.

Learned Counsel for the States of Maharashtra and Mysore have submitted that the argument urged on behalf of the State of Andhra Pradesh that this Tribunal in setting up a joint control body will be setting up a corporation is altogether erroneous.

We have carefully considered the elaborate arguments advanced by the learned Counsel for the parties. Under Section 6 of the inter-State Water Disputes Act, 1956, it is provided that the Central Government shall publish the decision of the Tribunal in the Official Gazette and the decision shall be final and binding on the parties to the dispute. It is further provided that the decision of the Tribunal "shall be given effect to by them.". The law has not provided any separate machinery for giving effect to the decision of the Tribunal. In the best tradition of International Law and also in view of the fact that
531 all the States are units of the Federation of India and are bound to obey the law made by Parliament, Parliament in its wisdom left the matter of giving effect to the decision of the Tribunal to the good sense of the States concerned. It did not provide any separate machinery for it. It cannot be said that there is an omission in the law in the matter of providing a machinery for giving effect to the decision of the Tribunal. It is clear that Parliament considered this matter and was content by saying that the decision shall be given effect to by the parties to the dispute,

At the same time* it is also evident that Parliament did not place any limitations on the Tribunal in making the adjudication. The adjudication can take any shape. The water disputes are bound to differ from river to river. In determining the respective rights of the contending parties, a multitude of factors has to be considered and while in a given case an injunction restraining the upper States from utilising more water than a particular quantity may be sufficient in any other case further directions may have to be given. If the decision of a tribunal contemplates that for effective utilisation of the waters of a
532 river a machinery is to be set up which will allocate water from year to year to the contending parties and the States concerned cannot without the assistance of such machinery by their own acts give effect to the decision of the Tribunal, the provisions relating to the setting up of a machiney become an integral part of the decision of the Tribunal. Under section 6 of the inter-State Water Disputes Act, 1956, the States which are parties to the dispute have to give effect to the entire decision including that of setting up of the machinery. For example, if in the instant case we decide to make an order that the deficiency or the surplus, as the case may be, in every water year is to be shared by the parties in certain proportions it will be necessary that there must be an authority which shall determine in each water year whether there has been deficiency or surplus and to see that the waters of the river are divided according to the proportions fixed by the Tribunal. This means that the matter of setting up of an authority becomes the back-bone of the decision and an integral part of it and the States are bound to give effect to it. The States have to give effect to the decision of the Tribunal and set up an authority on the lines laid down in the order of the Tribunal. Of course, the Order of the Tribunal would provide for only doing such things as the States can perform by their volition. The order can- 533
not provide for doing things which are dependent on the will of any authority which is not a party to the proceedings before the Tribunal.

However, the real difficulty lies elsewhere. The authority which will be constituted under this scheme shall have to give findings on a number of matters on which there may be conflict between the three States. In Upper Colorado River Basin Compact, 1948([17]), the major purpose of which was the equitable division and apportionment of the use of the waters of the Colorado River System, the use of which was apportioned in perpetuity to the Upper Basin by the Colorado River Compact, a Commission which was the administrative agency for working out the Compact was created. The various articles of that Compact provided that the Commission is to give its finding on a number of matters. For example in Article VIII Clause (d) it was provided that :

> "The Commission, so far as consistent with this Compact, shall have the power to:
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> * * * * *
>
> (5) Collect, analyze, correlate, preserve and report on data as to the stream flows, storage, diversions and use of the waters of 534

(17) Upper Colorado River Basin Compact, 1948, at page 339 in 'Documents on the use and control of the waters of inter-State and International Streams' compiled and edited by T. Richard Witmer.

the Colorado River, and any of its tributaries;

(6) Make findings as to the quantity of water of the Upper Colorado River System used each year in the Upper Colorado River Basin and in each State thereof;

(7) Make findings as to the quantity of water deliveries at Lee Ferry during each water year;

(8) Make findings as to the necessity for and the extent of the curtailment of use, required, if any, pursuant to Article IV hereof;

(9) Make findings as to the quantity of reservoir losses and as to the share thereof chargeable under Article V thereof to each of the States;"

* * *

In Sabine River Compact, 1953([18]) a Commission appointed therein had to give findings on several matters involving apportionment of water between the States. In Pecos River Compact, 1948 ([19]) the main purpose of which was also to provide for equitable division and apportionment and the use of the water of Pecos, River an inter-State Administrative Agency
535 known as Pecos River Commission was created and this Commission had to give findings on several matters relating to apportionment of water according to the Compact.

In our case also while determining whether there is deficiency or surplus such an authority shall have to find out the utilisations made by all the States in a water year. This naturally involves a comprehensive collection of data regarding utilisations of all the States by that authority. There are bound to arise differences between the parties with regard to the quantity of water utilised by a party in a water year at one place or the other. The nature of the differences may be varied and unless the determination of utilisation made by that authority is made final and binding on the parties there will always be room for trouble. Again, when and how much water should be transferred from the reservoir of the upper States to meet the need of the lower State for use in a water year may be a cause of conflict between the parties and one or the other party may not be easily reconciled with the decision of the authority. There may be similar other matters of considerable importance to the parties on which the parties may differ. The State of Maharashtra has submitted that compliance 536 of the order of a Tribunal can be secured by a writ of mandamus which shows that dispute regarding the compliance of the order of the Tribunal can be brought in a court of law. It can be legitimately argued that the decision of the authority set up by the Tribunal could equally be a subject matter of writ of mandamus. This will leave room to the parties to question the decision of the authority in a court of law. We are mentioning all these things only to point out that the best way of resolving such differences would be to set up an authority which may command respect and confidence of the parties and then to make the determination of any dispute between the parties by that authority as final and binding on the parties, otherwise there may be endless litigation between the parties which it is our intention to avoid. The common draft of Part II which deals with the constitution, powers and duties of the authority, prepared by the parties clearly mentioned in sub-clause (C) of Clause XII that the decision of the authority on matters referred to in sub-clauses (A) and (B), shall be final and binding on the parties. The matters referred to in sub-clauses (A) and (B) of Clause XII of the common draft refer to the composition, powers and duties of the authority and the manner in which the authority is to perform its duties. This sub-clause (C) was purposely put in 537 the common draft as it was considered that setting up of an authority without such a sub-clause may prove meaningless.

The common draft has not been agreed upon by the parties. However wide may be the powers of the Tribunal in the matter of setting up of an authority, it is not possible to take the view that the Tribunal by its own decision can provide that a decision of an authority set up by it shall also be final and binding on the parties. ' If the decision of such authority is not going to be final and binding on the parties it may happen that the differences between them may make a turn which may take the functioning of the authority tedious and difficult at every step. These circumstances have impelled us to take the view that it will not be proper to set up any authority without the consent of the parties. Propriety of the matter rather than legality is playing a decisive part in our decision on this point.

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(18) Sabine River Compact, 1953, at page 292 in 'Documents on the use and control of the waters of inter-State and International Streams', compiled and edited by T. Richard Witmer.

(19) Pecos River Compact, 1948, at page 238 in 'Documents on the use and control of the waters of inter-State and International Streams', compiled and edited by T. Richard Witmer.

We may also point out that it is not possible for us to take the view that we can infer the consent of the parties from Ex. MRK-340 filed on the 4th May, 1973. In para 4 of that document there is a reference to a joint control body and its composition and
538 also to the cost of sanctioning of that authority. But the composition is contingent on the appointment of independent engineers of the rank and qualification of a Chief Engineer by the President of India. There is no guarantee that this contingency is to be fulfilled. Then the manner in which this control body will exercise its powers has not been defined precisely in this paragraph. This is a lacuna which the Tribunal is unable to fulfil. A court of law or a tribunal can only interpret an agreement as it exists. It cannot make out an agreement for the parties. Thus it Is not possible to derive any assistance from Ex. MRK-340 for inferring that the parties have agreed to constitute an authority irrevocably and finally.

We may, however, mention that the argument urged on behalf of the State of Andhra Pradesh that in setting up an authority we will be setting up a corporation, does not appeal to us. We need not give elaborate reasons for our view as we have decided not to set up a controlling authority.

We recognise that had it been possible to set up an authority on the lines envisaged in Part II of the common draft there would have been better utilisa-
539 tion of the waters of the river Krishna. Due to possibility of future change of conditions, inter-State water allocations necessitate expert administration rather than the imposition of a hard and fast rule.([20]) Only through continuous administrative processes, can the control of withdrawals and diversions be dynamically related to changing conditions so as to ensure equitable use of the waters of a river. ([21])

In an inter-State water controversy, ([22]) the U.S.A. Supreme Court appointed a river master to administer the provisions of the decree relating to diversions, releases and yields and other matters. However, it is unwise and impractical to impose an administrative agency by a judicial decree without the unanimous consent and approval of the parties.([23])

It has recently been suggested that the jurisdiction of 540
Federal courts and inter-State compacts in the United States do not provide sufficient continuing discretion for the efficient use of national water resources, and that a Federal regulatory agency should therefore be created. "Such a structure should comprehend these basic elements; a federal agency which can reflect and express national rather than sectional interest and goals; a democratic decision-making body, impartial and technically expert which can consider and evaluate projects in terms of national goals and development; adjudications rendered which embody sufficiently long-term guarantees to justify expenditure of enourmous amounts of money but which are flexible enough to allow adjustment to changing conditions; legal authority to divert waters in accordance with optimum economic needs and to require suitable compensation in terms of money, low-flow supplementation, water preference, hydroelectric preference, or other things of value". Forer, 'Water Supply, Suggested Federal Regulation. ([24])

An administrative agency can be set up by law made by Parliament under Entry 56 List I in the Seventh Schedule to the Constitution which may vest it with powers of unitary management of the river basin. ([25])

After deeply pondering over the matter we have 541
come to the conclusion that it would be better if we devise two schemes for the division of the waters of the river Krishna between the States of Maharashtra, Mysore and Andhra Pradesh. These schemes will be called Schemes A and B. Scheme A will come in operation on the date of the publication of the decision of this Tribunal in the Official Gazette under Section 6 of the Inter-State Water Disputes Act, 1956. Scheme B may be brought into operation in case the States of Maharashtra, Mysore and Andhra Pradesh constitute an inter-State administrative authority which may be called the Krishna Valley Authority by agreement between them or in case such an authority is constituted by legislation made by Parliament, Scheme A does not at all depend upon the agreement of the parties and comes into operation by virtue of the order of the Tribunal. It is altogether independent of Scheme B.

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(20) Colorado v. Kansas 320 U.S. 383, 392.

(21) Clyde Eagleton 'The use of Waters of International Rivers, The Canadian Bar Review Vol. 33(1955) p. 1018, 1027; R.C. Martin and others, The River Basin Administration and the Delaware' p. 146. Felix Frankfurter and James M. Landis; The Compact Clause of the Constitution, Yale Law Journal Vol. 34 pp. 685, 701 707; Joseph L. Sax Water Law Planning and Policy 1968 pp. 178—80.

(22) New Jersey v. New York 347 U.S. 995, R.C. Martin and others. 'The River Basin Administration and the Delaware' pp. 316-320.

(23) Report of Michael J. Doherty p. 123 in the case of Nebraska v. Wyoming 325 U.S. 589.

(24) 75 Harvard Law Review 332, 347—349 (1961).

(25) A U.S.A. statute authorised the Secretary of the interior to allocate and distribute the waters of the main stream of the inter-State Colorado river, within the limits defined by the Statute, see Arizona v. Californa 373 U.S. 546, 590.

Before discussing these schemes in detail, we first give the general outline of both the schemes. Under Scheme A, we divide the 75 per cent dependable flow of 2060 T.M.C. after taking into consideration certain factors to which we shall make reference presently. Having done that, we take note of the fact that in future there is likely to be augmentation in the dependable flow of the river Krishna on account of return flows. We have made a conservative estimate of such augmentation and under this Scheme we divide this additional water between the three States. We restrain the States of Maharashtra and Mysore from using more water than that which is allocated to each of them. We permit the State of Andhra Pradesh to use the remaining water but we lay down that by such use the State of Andhra Pradesh shall not acquire any right to use the waters of the river Krishna except to the extent allocated to it. In making allocations to the three States in this manner under Scheme A we do not expressly provide for the sharing of deficiency. But we may mention that we have taken notice of the fact that out of 100 years, there may occur deficiencies in 25 years and in these 25 years the State of Andhra Pradesh is likely to suffer more than the States of Maharashtra and Mysore. In this connection we have discussed the carryover capacities of the Nagarjunasagar Dam and the Srisailam Dam and have permitted the State of Andhra Pradesh to utilise the carryover capacities available in these two Dams.

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Under Scheme B we declare that in every water year the parties shall be entitled to use the waters of the river Krishna in certain proportion, if the total use made by all the three States in that water year is upto the dependable flow and if the total use made by the States in a water year is more than the dependable flow, it is to be shared by the three States in certain different proportions. This Scheme takes note of the fact that in every water year, surplus or deficiency, as the case may be, is to be shared by the three States.

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We take up the subject as to how, in our opinion, the water should be divided between the three States under Scheme A. In India, irrigation projects are designed on the basis of 75 per cent dependable flow available at the dam site so that it may be assured that the water stored at that dam will meet the demands for irrigation in at least three out of four years. We have already mentioned that the Indian Irrigation Commission, 1972, has recommended that this practice should continue in future. This method of devising irrigation projects has by now become an established practice in India. ([26]) The Indian Standards Institution on the 9th December, 1969 adopted as one of the general factors for design of live storages the followings :—

> "3.3 The storage provided in an irrigation project should be able to meet the demand of 75 per cent of the time whereas in power and water supply projects the storage should meet the demand for 90 per cent and 100 per cent of the time respectively, ([27])".

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We, therefore, think it proper that under Scheme A, water available at 75 per cent dependability should be distributed between the States of Maharashtra, Mysore and Andhra Pradesh.

We have already mentioned that for the purpose of this case, the 75 per cent dependable flow of the river Krishna upto Vijayawada is 2060 T.M.C. The case of the State of Andhra Pradesh is that in every water year some water is likely to go waste unutilised to the sea, as is borne out by the evidence on record. The learned Advocate General of the State of Andhra Pradesh has placed reliance on the evidence of Mr. Jaffer Ali (APW-6) pages 63 to 74 in this connection. The substance of his evidence is that 30 per cent of the available flow between the Nagarjunasagar Dam and Vijayawada could be utilised for irrigation in the Krishna Delta and the rest is likely to go waste unutilised to the sea. In Table No. 4(a) at page 64 of his evidence he has pointed out that in a year of 75 per cent dependability, taking the dependable flow to be 2002 T.M.C., the available free flow in the catchment will be 63.2 T.M.C. out of which only 18.9 T.M.C. could be utilised and the rest will go waste unutilised to the sea.

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The contention of the States of Maharashtra and Mysore is that no water would go waste in any water year out of the dependable flow and the entire water would be utilised. It is further submitted that in any case steps should be taken by the State of Andhra Pradesh that no water goes waste unutilised to the sea.

We proceed to examine the evidence on this matter. Mr. Jaffer Ali has given the following reasons to support his views (see page 68 of his evidence).

(i) There is no active storage available at the Krishna Barrage.

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(26) COPP Report on Nagarjunasagar page 5 (MRDK-II p. 11) CWPC; Silver Jubilee Number p. 65 (MRDK-II p. 225).
(27) Indian Standard Methods for fixing The Capacities of Reservoirs Part III Live Storage, p. 4.

(ii) The bulk of the available yield from the intermediate catchment, that is, between the Nagarjunasagar Dam and Vijayawada will be received from June to November and much of it during freshets.

(iii) The intermediate catchment is heavily intercepted by minor dams and numerous tanks. These ordinarily start surplusing from about the end of August intermittently for a few days at a time till about the end of October and on the days when these are surplusing there will be heavy discharge from the intermediate catchment very much in excess of the canal withdrawals.

(iv) Whenever there is heavy rainfall in the ayacut, the demand for irrigation - waters gets reduced and the canal discharge is also reduced. It is quite likely that when there is heavy rainfall in the ayacut, there is also heavy rainfall in the catchment
546 adjoining to the ayacut which will bring in heavy discharges at a time when the withdrawal by the canals is considerably reduced.

(v) The supply of water for delta irrigation will be from the unregulated discharge from-the intermediate catchment and the releases to be made from the Nagarjunasagar Dam and it will not be possible to make a correct forecast of the daily releases from the Nagarjunasagar Dam two or three days in advance, which is the time that is likely to be taken for the waters released from the Nagarjunasagar Dam to reach the Krishna Barrage, and the tendency will be to err on the safe side. Thus a considerable part of the discharge from the intermediate catchment is likely to be wasted during the monsoon months.

It is further pointed out by the learned Advocate General of Andhra Pradesh that even Mr. Framji (MRW-I) has admitted that there is likely to be some waste, as the entire water available from the catchment between the Nagarjunasagar Dam and Vijayawada cannot be utilised by diverting it from the Krishna Barrage for irrigation in the Krishna Delta. In this connection the learned Advocate General has referred to Table No. 2, which is the working table prepared by Mr. Framji of the Srisailam Dam, the Nagarjunasagar Dam and the Krishna Delta. In column 36 of this working table, divertable flow of this catchment is mentioned and Mr. Framji at page 544 of his evidence has stated that when the monthly flow at Vijayawada from the catchment below Nagarjunasagar is more than 10 T.M.C. 85 per cent of the flow has been assumed to be divertable subject to a maximum of the monthly canal diversions plus the pond losses, the remaining 547
15 per cent spilling over as mentioned in Column 37. When the monthly flow at Vijayawada from the catchment below Nagarjunasagar is less than 10 T.M.C. the entire quantity is assumed to be divertable.

We proceed to examine the evidence of the parties on this point. First we take up the point whether there is any storage available at the Krishna Barrage. Mr. Framji has made an assumption that a pondage of 4 T.M.C. will be available at the Krishna Barrage. At the bottom of page 1262 and beginning of page 1263 of his evidence he has explained as to how he had assumed that a pondage of 4 T.M.C. will be available. He has stated that 4 T.M.C. of water has been claimed by the State of Andhra Pradesh as evaporation losses at the Krishna Barrage and it is a substantial quantity indicating a large pondage with a large water spread. He has calculated the pondage as 6 T.M.C., but he has stated that he had conservatively assumed the modest figure of 3 to 4 T.M.C. as pondage. He has also pointed out that the combined capacity of the Krishna East Canal and the Krishna West Canal is of the order of 18,710 cusecs and has stated that considering the available pondage and the large capacity of the delta canals a flood peak of 50,000 to 60,000 cusecs can be absorbed. In our opinion the assumption that the pondage to the extent of 3 to 4 T.M.C. will be avail- 548
able at the Krishna Barrage is not wrong; specially in view of the fact that the State of Andhra Pradesh has claimed 4 T.M.C. of water as evaporation losses, as mentioned hereinbefore, which has been allowed to it as protected use. It may also be mentioned that the Krishna Barrage Report, MRK-175 prepared by the State of Andhra Pradesh mentions that the State of Andhra Pradesh could not afford to spill its share of water over the Anicut and run it to waste and that the purpose of construction of the barrage was to reduce wastage of water. Even taking all these circumstances into consideration, it is clear from the evidence that some water out of the flow between Nagarjunasagar and Vijayawada is likely to go waste unutilised to the sea, but it is not possible to assess exactly the quantity of such water likely to be so wasted. Even Mr. Jaffer Ali at page 66 of his evidence has stated that a rough estimate is only possible from the daily discharges of available yield.

We now examine this matter from the point of view whether it is possible to store water in the carryover storages in the territory of the State of Andhra Pradesh so that the reduction in the dependable flow that may be due to water thus going waste may be compensated.

549 It has been argued on behalf of the States of Maharashtra and Mysore that there will be augmentation in the dependable flow on account of the fact that the water in excess of the 75 per cent dependability flowing in 75 years and going waste unutilised to the sea can be impounded in a chain of reservoirs in the three States. It is submitted that there are already two such reservoirs in the State of Andhra Pradesh, (i) the Nagarjunasagar Dam, if the crest gates are allowed to be raised and (ii) the Srisailam Dam, which is under construction. It is further submitted that the installation of crest gates on the Nagarjunasagar Dam was not sanctioned. The States of Maharashtra and Mysore have been consistently opposing the installation of crest gates on this Dam. When the State of Maharashtra learnt that the Government of Andhra Pradesh was proceeding with the erection of crest gates on the Nagarjunasagar spillway, that State lodged a strong protest on the 12th April, 1967 apprehending that the simultaneous provision of the Nagarjunasagar crest gates and the Srisailam Dam would prejudice the present and future rightful interests of the upper States. Even in June, 1969, after the Tribunal had been appointed, the Planning Commission accorded clearance to the
550 revised Nagarjunasagar Project for an amount of Rs. 163.54 crores excluding crest gates on the spillway of the dam.

The salient features of the revised Nagarjunasagar Project are given in Annexure to letter No. 11-2(11)/67-I&P dated the 13th/16th June, 1969 of the Planning Commission to the Secretary, Government of Andhra Pradesh, Hyderabad (MRK-II pages 88-90). The features relevant for our discussion as given in the Annexure to that letter are as follows :—

Salient features of Revised Nagarjunasagar Project (Andhra Pradesh)-

1. Estimated Cost (Rs. crores):

(i) Dam	71.65	Excluding crest gates on the spillway of dam.
(ii) Right Bank Canal	47.74	Revised estimates in respect of Right and Left Bank Canals should be submitted at an early date.
(iii) Left Bank Canal	44.15	
	163.54	-

2. Annual Irrigation (Lakh acres). Crop.

	Right Bank Canal	Left Bank Canal	Total
(a) Paddy .	4.35	6.00	10.35
(b) Irrigated dry paddy .	1.60		1.60
(0 Ground nuts .	5.79	2.00	7.79
(d) Jowar		0.80	0.80
	11.74	8.80	20.54

551 It is contended by the State of Maharashtra that the State of Andhra Pradesh should not be allowed to raise the reservoir level at Nagarjunasagar to F.R.L. 590 by raising the crest gates unless it is prepared to share the benefit which would accrue to it by conserving more water therein with the upper States. The case of the State of Maharashtra is that the capacity of the Nagarjunasagar Dam is increased by 117 T.M.C. as admitted by Mr. Jaffer Ali at page 224 of his evidence, (Mr. Framji has taken it as 120 T.M.C.) and as such to that extent the Nagarjunasagar Dam will act as carryover reservoir. On this point the case of the State of Andhra Pradesh is that impounding of water by raising the crest gates is necessary even for the purpose of utilising the sanctioned quantity of water i.e., 264 T.M.C. and no carryover storage is available at Nagarjunasagar. In support of this contention the State of Andhra Pradesh has relied on the evidence of Mr. Jaffer Ali.

Now coming to the carryover storage which according to the States of Maharashtra and Mysore is available at Srisailam, Mr. Framji has stated at pages 611 to 619 of his evidence that at the Srisailam Reservoir the dead storage capacity is 158 T.M.C. and, therefore, the useful life of the reservoir is considered more than 300 years. The life may perhaps be even
552 greater as due to the construction of a larger number of reservoirs in the upper reaches the amount of silt coming down to the Srisailam Reservoir will be coming less than at present. In his opinion a life of over 200 years would be no demerit to the Srisailam Reservoir with a lower M.D.D.L. of R.L. 830 and thus lowering the M.D.D.L. to R.L. 830 will provide additional carryover of 60 T.M.C. Mr. Jaffer Ali stated at page 110 of his evidence that the dependability of the Krishna Delta irrigation would be increased by drawing water from the dead storage of the Srisailam Reservoir in lean years. He submitted statement C in which he showed that the Srisailam Reservoir level could be lowered down to R.L. 838 so as to make more water to the extent of 43.3 T.M.C. available for the Krishna Delta. The case of the State of Andhra Pradesh is that the Srisailam Reservoir level should not be lowered below R.L. 838.

In 1962 Project Report of Srisailam Hydro-Electric Project (Parts I to III) it is stated at page 10 that : —

' The M.D.D.L. of 854 has been fixed to ensure minimum cutting of the leading channel from the irrigation sluices, when undertaken at a future date. The C.O.P.P. Committee in their report on Nagarjunasagar Project have recommended lowering the M.D.D.L. to 830 as in their opinion the firm power potential could be increased to 377 M.W. at 60 per cent L.F. The working table for the reduced M.D.D.L. as proposed by Committee is appended."

553 Mr. Jaffer Ali in answer to Question No. 266 at page 209 of his evidence admitted that it was correct that if the dependability of the Krishna Delta was not to be increased beyond 75 per cent, then there was a minimum carryover of 43.3 T.M.C. (available at Srisailam). But this was on the assumption that the dependability of the Krishna Delta will be brought down to 75 per cent dependability in future. Mr. Jaffer Ali further admitted that not only storage to the extent of 43.3 T.M.C. will be available, but also extra water will be available for 94 per cent dependability. At page 219 of his evidence when asked whether the Srisailam Project could operate efficiently for the generation of sanctioned power at M.D.D.L. 830, the witness simply stated "It may, but I cannot commit myself".

In this state of evidence we are of the view that M.D.D.L. at Srisailam can be reduced substantially and still the project will function efficiently and a carryover ranging from 45 to 60 T.M.C. is available at the Srisailam Dam.

Now coming to the Nagarjunasagar Dam, Mr. Framji has submitted detailed carryover studies for a number of years which he had grouped together in five groups taking the additional storage available to the extent
554 of 120 T.M.C. in the Nagarjunasagar Dam and 60 T.M.C. in the Srisailam Dam; total 180 T.M.C. These detailed studies are mentioned in the evidence of the witness at pages 499 to 564. In these studies gross flow figure for the year 1900-01 is taken from MRDK-I page 119 corrected by 10 per cent and upstream extractions of 270 T.M.C. added to it. The gross flow figures for the other years are taken from the results of model experiments carried out at Poona in the year, 1967 with upstream extractions added. The crop pattern is taken as sanctioned in 1909 and the water requirements for these crops have been taken on the basis of the water requirements for such crops in the neighbouring projects, namely, the Munneru Project, the Wyra Project, the Pakhal Project and the Palair Project. With these assumptions he has prepared a working Table for the Srisailam Project, the Nagarjunasagar Project and the Krishna Delta and has come to the conclusion that there is increase of dependable flow in the Krishna river from 2176 T.M.C. to 2300 T.M.C.

Mr. Jaffer Ali also prepared working Tables 8 and 9 for the Srisailam and the Nagarjunasagar Reservoirs taking flow series from 1900-01 to 1950-51 as recorded by the State of Andhra Pradesh and mentioned in the Krishna Godavari Commission Report Annexure II pages 10 to 13 and taking the annual utilisation as agreed upon by the three States. His conclusions are given in his statement in answer 555
to Question No. 30 at pages 108 and 109 of his evidence which are as follows :—

"It will be seen from the working Tables of Srisailam and Nagarjunasagar reservoirs, i.e., Tables 8 and 9, that the storages as planned at these two reservoirs, i.e., F.R.L. 885 and M.D.D.L. 854 for Srisailam and F.R.L. 590 and M.D.D.L. 510 for Nagarjunasagar are just adequate to meet the full requirements of power generation at Srisailam and irrigation requirements under Nagarjunasagar and Krishna Delta in a dependable year, the extra stroage available at Nagarjunasagar above the minimum draw down level of 510 is only 23 thousand million cubic feet which is just about fortnight's requirement of irrigation. It is necessary that the tail reservoir on a river system should not Surplus during a dependable year as otherwise it will fail to the extent it has surplused. The reservoir can surplus even in a dependable year if the inflow during some of the monsoon months are so heavy that the reservoir is not able to hold these. Such a probability cannot be ruled out. It is, therefore, desirable to have adequate extra storage, particularly in the case of a tail reservoir over that obtained on the study made from the flow of the river in a dependable year which has occurred in the past. In my opinion, extra storage of 23 thousand million cubic feet at Nagarjunasagar is rather inadequate to meet such eventualities and possible delayed inflows."

It may be mentioned that it is clear from pages 87 to 91 of the evidence of this witness that he has not strictly adhered to the crop pattern as mentioned in the letter dated 13th/16th June, 1969 of the Planning Commission and has changed it. The reason given for the change is that the total water requirements for the cropping scheme given in the 556

letter of sanction with the deltas as mentioned in the Table will be 289.4 T.M.C and would thus exceed 264 T.M.C. by 25.4 T.M.C. The witness, therefore, changed the cropping pattern to 7.75, lakh acres of Khariff paddy and 12.79 lakh acres of irrigated dry crops in Rabi so that limit of 264 T.M.C. may not be crossed. It will appear from the evidence of Mr. Framji and Mr. Jaffer Ali that the requirements of 11.95 lakh acres of paddy as worked out by both the witnesses tally very closely. Mr. Framji estimated it as 210 T.M.C. at page 245 of his evidence while Mr. Jaffer Ali estimated this as 207 T.M.C. at page 288 of his evidence. The difference in the total water requirements between the two expert witnesses arises mainly for the areas of Rabi crops under the Jowar and groundnut. Mr. Framji has estimated this requirement as 54 T.M.C. whereas Mr. Jaffer Ali had estimated it 82.4 T.M.C. Mr. Framji's assumption of total requirements fit in with the sanctioned utilisation of 264 T.M.C. Mr. Jaffer Ali's assumption would make it 25.4 T.M.C. more than the sanctioned utilisation. The deltas of the crops are not mentioned in the sanction letter. Mr. Jaffer Ali made calculations of the water requirements on the basis of the deltas for such crops in Tungabhadra sub-basin and came to the conclusion that 289.6 T.M.C. will be required for
557 irrigating the area of 20.54 lakh acres instead of 264 T.M.C. It has been shown on behalf of the State of Maharashtra that irrigation of 20.54 lakh acres as mentioned in the sanction letter utilising 264 T.M.C. is possible without, installation of crest gates if the water requirements for Rabi crops are taken as prevailing in the neighbourhood of the Nagarjunasagar Dam in the State of Andhra Pradesh itself. In these circumstances we must reject the contention of the State of Andhra Pradesh that irrigation of 20.54 lakh acres with 264 T.M.C. is possible only by changing crop pattern and for this reason larger storage capacity will be required. Mr. Jaffer Ali has stated that some extra storage should be permitted for a terminal reservoir. Even then there is an extra storage capacity of about 90 T.M.C. available at the Nagarjunasagar Dam, if the crest gates are allowed to be put up.

The learned Advocate General of Andhra Pradesh has submitted that it will be hazardous to predict that the dependable flow will be augmented to a particular extent by storing excess waters that may be flowing to the sea in the surplus years in these two reservoirs. This argument has enough substance. Considerable research is required to give even an approximate idea of the additional water
558 which may be available by storing waters in these two reservoirs. It has been pointed out in "The Nile Basin" Vol. VII on the subject of the 'Future Conservation of the Nile' by Hurst, Black & Simaika (Reprinted 1951) in Chapter 7 "The Lake Albert Reservoir and Century. Storage" at page 57 that:

> "The problem therefore is to discover a general relation between the capacity of a reservoir and the output which it can guarantee. Obviously questions of probability are involved and an extended investigation is needed. This investigation has been made. It has meant research extending over a number of years on phenomena which resemble river discharges in their statistical characteristics, and some theoretical investigations involving the theory of probability. Part of this investigation is described in the 'The Nile Basin' ; Vol. V, p. 81 et seq."

The expert evidence which is before us is no doubt very helpful for saying that there will be some augmentation in the quantity of dependable flow, if water is permitted to be stored in the carryover capacity available at the Nagarjunasagar Dam and at the Srisailam Dam. But the study is confined to particular flow series. Much more extensive study is required, if we have to make a definite finding as to the extent to which the dependable flow will be augmented.

The learned Advocate General of Andhra Pradesh has also argued that under this Scheme of apportionment in deficit years when the flow is less than 2060 559
T.M.C., it will be the State of Andhra Pradesh which will suffer most on account of deficiency as its contribution to the total flow of the Krishna river is proportionately very small and the upper States may store bulk of the water available in the deficit years in the upstream storages, thus making it difficult for the State of Andhra Pradesh to meet its need for irrigation. It is submitted that the State of Andhra Pradesh should be permitted to utilise the carry-over storage capacity that may be available in these two Dams for storing waters in the surplus years for use in the deficit years. It is also urged that the crop pattern may change in future and there may also be changes in flow pattern. While considering Scheme A, in which no provision is made for sharing of deficiency, the argument of the learned Advocate General of Andhra Pradesh that in the deficit years it is likely to suffer most and for this reason it may be permitted to store water by utilising the carry over capacity that may * be available in these Dams deserves consideration.

The learned Advocate General of Andhra Pradesh has made a statement that "in view of the installation of crest gates in the Nagarjunasagar Dam and the completion of the Srisailam Dam in the near future,
560 the entire quantity of the 75 per cent dependable flow, that is, 2060 T.M.C. of the Krishna river may be allocated between the three States of Maharashtra, Mysore and Andhra Pradesh".

In view of the fact that a way has to be found out by which the State of Andhra Pradesh may be relieved of the difficult situation in which it may be placed in the deficit years and further in view of the fact that it is not possible to assess with any amount of definiteness the augmentation in dependable flow which is likely to take place on account of water being stored in the Nagarjunasagar Dam and the Srisailam Dam to the extent of carryover capacities available in them and further in view of the fact that it is not possible to determine exactly how much water, out of the flow of the river Krishna between Nagarjunasagar Dam and Vijayawada, will be going waste unutilised to the sea, we are of the opinion that it will be proper that till our decision is reviewed, the State of Andhra Pradesh may be permitted to store water by installation of the crest gates in the Nagarjunasagar Dam and also in the Srisailam Dam after its completion to the extent and in the manner it is feasible* for it to do so and to utilise the water so impounded in these storages in any manner it deems proper and in lieu thereof no deduction be made in 561
the dependable flow on account of the circumstance that some water out of the flow of the river Krishna between the Nagarjuanasagar Dam and Vijayawada will be going waste unutilised to the sea thus reducing the dependable flow.

Thus, we are of the opinion that the entire quantity of 75 per cent dependable flow, that is, 2060 T.M.C. of the river Krishna upto Vijayawada is available for division between the three States of Maharashtra, Mysore and Andhra Pradesh.

The next question to be determined is how the dependable flow of 2060 T.M.C. is to be divided between the States of Maharashtra, Mysore and Andhra Pradesh. The case of the States of Maharashtra and Mysore is that the State of Andhra Pradesh should not get any more water, that is, its share should be limited to 749.16 T.M.C. (roughly 750 T.M.C.). The State of Maharashtra has filed MR Note No. 26 dated the 25th July, 1973, which contains Statement No. I, giving details of population, culturable area, scarcity area and drainage contribution of each State and taking the percentage of each of these items and then taking average of these percentages, it has worked out the equitable share of the three States in 2060 T.M.C., and also in 2310 T.M.C.

The relevant extract of this statement is given 562
below :—

State	Population (millions)	%age	Culturable area (in T, Hectares)	%age	Scarecity area sq. miles	%age	Drainage contribution TMC	%age	Equitable %age
1	2	3	4	5	6	7	8	9	10
Andhra Pradesh	12.06	31.20	5,429	26.40	1,929	13.0	336.6	16.34	21.74
Mysore	14.50	37.40	9,270	45.43	6,113	31.30	760.9	36.94	37.77
Maharashtra	12.15	31.40	5,749	28.17	8,940	55.70	962.5	46.72	40.49
	38.71	100.00	20,448	100.00	16,982	100.00	2,060.0	100.00	100.00

	Equitable share in 2060 TMC	Equitable share in 2310 TMC
Maharashtra	834.10	936.32
Mysore	778.06	872.49
Andhra Pradesh	447.84	502.19
Total	2060.00	2310.00

On the basis of this statement, it is contended by the State of Maharashtra that had there been no committed uses by any State of the waters of the river Krishna, the share of the State of Andhra Pradesh would not have exceeded 447.84 T.M.C.

Another Statement No. II has been filed by the State of Maharashtra, in which the factor of scarcity area has been omitted and the following shares of the 563
three States have been worked out, taking into consideration population, culturable area, and drainage contribution :-

State	Equitable share . in 2060 TMC	Equitable share in 2310 TMC
Andhra Pradesh	508	569
Mysore	822	922
Maharashtra •	730	819

It is contended on behalf of the State of Maharashtra that the State of Andhra Pradesh is held entitled to receive protection to the extent of 749 T.M.C. of water, but this is far in excess of what it could have got as its equitable share, had there been no prior appropriation of water by any State and that the only way to remedy this inequity is to apportion the remaining water between the two States of Maharashtra and Mysore. It is further submitted by the State of Maharashtra that if the Tribunal decides to allocate any further quantity of water over and above the protected uses to the State of Andhra Pradesh it should be minimum and it should only be from the surplus flows and not from the 75 per cent dependable flow of 2060 T.M.C., otherwise it will cause serious deteriment to the upper States who would be left comparatively with small quantity of water for meeting the needs of their existing, under construction and contemplated projects. In preparing the two statements, the State of Maharashtra has taken notice of the areas which are within the basin, taking its stand that in deciding the equitable share of the Krishna waters between the three States, the needs of water for areas outside the basin should not be taken into consideration. It is urged that if the needs of other areas are to be taken into consideration then the resources available in those areas should also be taken into consideration. It is also contended that the culturable area and population in all the three States should also have to be taken into consideration in such a situation.

564

The State of Mysore has also proceeded on the same lines. It has submitted MY Note No. 13 dated the 2nd May, 1973 which contained a statement showing the percentage share of the basin States in the Krishna basin according to the State of Mysore. That statement is reproduced below:

565

STATEMENT SHOWING THE PERCENTAGE SHARE OF THE BASIN STATES IN KRISHNA BASIN

	Percentage share in			Reference
	Mysore	Maharashtra	Andhra Pradesh	
(a) Extent of drainage area	43.7	26.8	29.5	MRDK-XII, XIII III(7)
(b) Climate affecting the basin :				
(i) Area getting rainfall less than 400 mm in June-September period.	65.0	25.9	9.1	MYK VOL. I, p. 23
(ii) Area with potential evapotranspiration more than 180 cm.	51.8	13.8	34.4	Area Planimetered from map at p. 41 MYDK-XX enlarged.
(iii) Area having coefficient of variability more than 30 % of rainfall June-September period	47.5	32.7	19.8	MRDK Vol. XII XXII Page 1(3)
(c) Economic and social needs:				
(i) Extent of culturable command area under projects within the drainage basin.	52.1	18.1	29.8	As per figures furnished by the States in their Statement of Case. Charts and project reports.
(ii) Net area sown	45.8	30.7	23.5	Agreed statement filed on 1st May, 1973.
(iii) Culturable area	45.3	28.1	26.6	EX. MYK 301, MYDK XXI
(d) Population:				
(i) Total population	37.5	31.4	31.1	MRDK XII Page XXIV (1)
(ii) Population depending on agriculture in Krishna basin for livelihood.	38.0	28.1	33.9	MYDK-20 pp. 35-38
AVERAGES	47.4	26.2	26.4	

566 The case of the State of Mysore is that according to this statement, the shares of the three States, out of the dependable flow of 2060 T.M.C. would work out as follows:—

Maharashtra	540 T.M.C.
Mysore	976 T.M.C.
Andhra Pradesh	544 T.M.C
TOTAL	2060 T.M.C.

The State of Mysore has submitted that out of 2060 T.M.C. which is the 75 per cent dependable flow, 1693.4 T.M.C. has been reserved for protected uses in the three States. It is contended that as against 570 T.M.C., which is the in-basin need in Maharashtra, uses to the extent of 439.65 T.M.C. have been protected which means that Maharashtra's needs are already met with to the extent of 77 per cent. Similarly, as against the in-basin needs of 977 T.M.C. in the State of Andhra Pradesh, their protected uses are 749.16 T.M.C. thus meeting 77 per cent of their needs. But uses of the State of Mysore are protected only to the extent of 504.55 T.M.C. as against the needs of 1430 T.M.C. which means that only 35 per cent of the needs are allowed. It is urged that water now available for allocation out of the dependable flow is to be reserved for Mysore in the interest of justice and equity. Even this would satisfy the needs of Mysore only to the extent of 61 per cent.

567 The State of Mysore has also worked out various alternative formulae in paras 3.1, 3.2. 3.3 and 3.4 of MY Note No. 17 dated 25-7-1973 for the allocation of water between the three States. The shares of each State under the various alternative formulae of allocation are as follows:—

		Maharashtra T.M.C.	Mysore T.M.C.	Andhra Pradesh T.M.C.	Total T.M.C
I.	Allocation of virgin flows based on in-basin factors (para 1) .	540	976	544	2060
II.	Allocation of virgin flows based on total in-basin demands (para 2)	439	872	749	2060
III	Balance flows (after limiting Andhra Pradesh's use to protected use), shared by Maharashtra and Mysore in proportion to their respective in-basin factors (para 3) .	465	846	749	2060
IV.	Balance flows (after meeting all the protected use in the three States) shared between Maharashtra and Mysore in proportion of the total irrigable area under the remaining projects in the two States (para 4)	524	787	749	2060

The substance of the matter is that according to the States of Maharashtra and Mysore, Andhra Pradesh should not be allocated any water in the river Krishna beyond 749.16 T.M.C. 568

We have carefully considered this matter. As we have already pointed out that there is no mechanical formula for equitable apportionment of water and it will be a needless endeavour on our part to search for a formula which may assist us in dividing the waters of the river Krishna between the parties by taking into consideration certain factors and then working out percentages in the manner done by the States of Maharashtra and Mysore. Nonetheless the various factors which have been mentioned in the statements filed by the States of Maharashtra and Mysore go to show that these two States, in spite of their need for water, could not or did not utilise the waters of the river Krishna in the past to the extent they would have been held entitled to do so had an equitable distribution taken place at some earlier date. But we are dividing the waters of the river Krishna on the basis of the conditions and circumstances as prevailing at present and for reasons which we have already given, we have held that uses made by all the three States upto 1693.4 T.M.C. should prevail over the contemplated uses. It is earnestly submitted by the learned Advocate General of Maharashtra and the Counsel for the State of Mysore that to allocate any more water to the State of Andhra Pradesh out of the remaining water would be to perpetuate the inequity further. It would mean that the State which is making the least contribution and which has benefited to the largest extent would still claim more water at the expense of the States who are in dire need of water for irrigation. This, it is contended, is making the rich richer while the other States entitled to a much larger share will not even get the crumbs. It is argued that the balance has already tilted too heavily in favour of the State of Andhra Pradesh and any further allocation of water to it would amount to the denial of justice to the States of Maharashtra and Mysore. Their submission is that even when the entire remaining water is allocated to the States of Maharashtra and Mysore, their grievances will be redressed only partially. 569

We realise the force of the arguments of the learned Counsel for Maharashtra and Mysore. From the point of irrigable area, population or contribution to the total flow, the State of Andhra Pradesh for historical reasons is enjoying the benefit of the river Krishna to an extent which may appear to be disproportionate. But it has entered into field much earlier than the other States, and it has been able to develop

its economy by bringing large tracts of land under cultivation in its territory by the hard labour and
570 valiant efforts of its people and at great cost. It is no fault of the State of Andhra Pradesh that it had undertaken to build economy of the State much earlier than the other States. Nature also favoured it as ample water was available to it.

The arguments of the learned Counsel of Maharashtra and Mysore go too far when it is submitted by them that even pressing and urgent needs of the State of Andhra Pradesh for allocation of water should not be taken notice of by the Tribunal. At the same time all extravagant claims of the State of Andhra Pradesh for the share in the remaining water should be rejected. It is only when we are convinced that allocation of water for a particular project would generally benefit all the parties or that there are other special circumstances for allocation of water for any project or in any area that we may consider the claim of the State of Andhra Pradesh in a favourable light. But the door should not be entirely closed to it for allotment of some more water out of the water now available for allocation.

We proceed to consider the demands of the State of Andhra Pradesh. All the demands of the State of Andhra Pradesh are summarised in the tabular form in Table No. 1, which for the sake of convenience is given in Part II of this Chapter. The State of Andhra Pradesh has submitted AP Note No. 14
571 dated the 25th July, 1973 in which they have urged that out of the dependable flow, water should be allocated to it for two sets of projects; (i) allocation be made for committed and/or actual uses not included in the protected uses to the following extent:—

(i) Minor Irrigation	36.88 T.M.C.
(ii) Srisailam Hydro-Electric Project . .	33.00 T.M.C.
(iii) Kurnool Cuddapah Canal . . .	20.87 T.M.C.
(iv) Krishna Delta	23.01 T.M.C.
TOTAL	113.76 T.M.C.

and (ii) allocation be made for future uses to the following extent:—

1. MINOR IRRIGATION WORKS UNDER CONSTRUCTION: . The locations of the above works have already been submitted to the Tribunal vide Sheet No. VIII, Annexure II, page No. 3B of the minutes of discussion held on 12th and 13th February 1973. (Vide MRDK-Vol. XIV-Ex. MRK-331).	5.3 TMC ft.
2. JURALA IRRIGATION SCHEME-Stage I : This is to serve the area in Gadwal, Alampur and Atmakur Taluks of Mahabubnagar District which is a drought affected area. (Vide APPK-36 Ex. APK-364).	23.00 TMC ft.
3. PROPOSED MINOR IRRIGATION WORKS: ..... Vide the Minutes of discussions referred to under item No, 1.	14.09 TMC ft.
4 MUNNERU PROJECT (KHAMMAM DISTRICT) (K-12) . . (Vide APPK-31)	1.5 TMC ft.
5, KALIKOTA PROJECT (KHAMMAM DISTRICT) (K-12) (Vide APPK-17)	3.5 TMC ft.
6 . VARADARAJASWAMY PROJECT (KURNOOL DISTRICT) (K-7) (Vide APPK-31)	1.00 TMC ft.
TOTAL	48.39 TMC ft.

We proceed to examine the first set. The first item is 'Minor Irrigation' and the case of the State of Andhra Pradesh on this point is that the actual development of minor irrigation in the State of Andhra Pradesh, the extent of which is admitted by all the three States, shows an average utilisation of 153.14 T.M.C. from 1961-62 to 1966-67 and the quantity that has been allowed as protected use for minor irrigation is 116.26 T.M.C. Thus the balance of 36.88 T.M.C. should be allocated to it as this water is required for existing uses in minor irrigation. It is further submitted that almost the entire develpp-ment of the minor irrigation was in the scarcity and backward regions of the erstwhile Hyderabad State and of Rayalaseema region and that on no principle of equity this developed irrigation in scarcity and backward areas can be permitted to be destroyed by denying water for these schemes. The entire development carried out during the Third Five Year Plan
573 at a huge cost, both to the Centre and the State, and also to the individual citizen should not be ignored in making further allocation of the balance of dependable flow.

The State of Mysore has submitted in MY Note No. 22 dated the 20th August, 1973 that just because the State of Andhra Pradesh has gone on increasing its scope of irrigation beyond its legitimate share, water for utilisation under minor irrigation should not be further allocated to the State of Andhra Pradesh at the cost of other States. The plan of the Central Government to boost minor irrigation programme does not mean that one State should develop its minor irrigation resources at the cost of other States.

If the State of Andhra Pradesh is eager to go in for minor irrigation, the entire quantity of water for all such irrigation should come out of its equitable share based on in-basin factors. The State of Maharashtra has also supported the State of Mysore.

There is substance in this contention of the State of Mysore. The Tables based on the agreed statement of minor irrigation filed by the parties show that in the decade 1941-42 to 1950-51, the State of Andhra Pradesh was utilising on an average only 76.79 T.M.C. for minor irrigation. In the next decade it
574 started utilising on an average 116.51 T.M.C. while in the 7 years, 1961-62 to 1966-67, it started utilising on an average 153.14 T.M.C. We have already held that so far as minor irrigation is concerned, 116.25 T.M.C. is to be taken to be a protected use. We are of the opinion that if any more water is required for minor irrigation it must come by effecting economy in the use of water by the State of Andhra Pradesh elsewhere. The State of Andhra Pradesh has not lined its canals and even by lining the main canals it can save sufficient quantity of water to preserve its existing utilisation under minor irrigation. If we accept the argument of the State of Andhra Pradesh that the requirements for all the developed minor irrigation upto 1966-67 are to be set apart, it will mean further substantial depletion in the water available for allocation to the other States which will not be in consonance with the justice and equity in this case. We are, therefore, unable to allocate any more water to the State of Andhra Pradesh beyond 116.20 T.M.C. under the head 'Minor Irrigation'.

The second item is the Srisailam Hydro-Electric Project. It is submitted by the State of Andhra Pradesh that the Srisailam Project was sanctioned in 1963 and is actually under construction and an expenditure of over Rs. 40 crores has already been in-
575 curred on it. It is submitted that a sanctioned project which is under advanced stage of construction, should not be treated in any way different from the projects of other States which were sanctioned much later and on some of which hardly any work has been commenced. Both the States of Maharashtra and Mysore are opposed to the grant of any water for the Srisailam Project. The State of Maharashtra has submitted that it has been restrained from diverting water to the west from its share of water for future projects on the ground that irrigation should be preferred to power and for this very reason there is no justification to permit the State of Andhra Pradesh to evaporate 33 T.M.C. of water purely for power generation at the Srisailam Project. It is submitted that simply because the project has been sanctioned and is under construction and money is being spent on it, the State of Andhra Pradesh should not be allowed any water for it as it was being constructed after the State of Maharashtra had raised an objection to its construction. It is further submitted that the Koyna Hydel Project had also been constructed at an enormous cost and was producing power by using water, yet a restriction has been put on the utilisation at Koyna.

All these arguments lose much of their force when we find that the Srisailam Project, besides producing power of which there is a great need to the State 576
of Andhra Pradesh, will serve other very useful purpose. The storage at the Srisailam Reservoir will serve as a carryover reservoir. We have earlier pointed out the necessity of conserving the surplus water of the river Krishna for use in lean years and for this purpose a chain of carryover reservoirs shall have to be constructed in the Krishna basin. In all carryover reservoirs there are going to be evaporation losses, but their usefulness from the point of view of conservation of water for irrigation or for other purposes will be immense. When the necessity of carryover reservoirs is also being advocated by the States of Maharashtra and Mysore it would not be proper to hold that the carryover reservoir which is under construction at an enormous cost by the State of Andhra Pradesh should be allowed to go in ruin. We are, therefore, of the opinion that 33 T.M.C. should be further allowed to the State of Andhra Pradesh for the Srisailam Project

The next item under the first set is the Kurnool Cuddapah Canal. It is submitted by the State of Andhra Pradesh that next to the Krishna Delta this is the oldest scheme on the Krishna River System as it was commisioned as early as 1866. For this scheme 39.9 T.M.C. is allowed as protected use. It
577 is submitted that the cropping pattern was settled in G.O. Ms. No. 750, PWD, dated 22-3-1960 and the quantity of 39.9 T.M.C. was estimated as sufficient for the area to be irrigated, but this was an unrealistic estimate. The average utilisation during the period 1961-62 to 1968-69 is 66.68 T.M.C. In APK-I Appendix XVII at pages 123 to 125 the following demands have been shown for the Kurnool Cudda-pah Canal.

Committed utilisations as on 1960		
(1)	Kurnool Cuddapah Canal . .	39.9 T.M.C.
Committed after 1960		
(2)	Improvements to Kurnool Cuddapah Canal	29.5 T.M.C.
	TOTAL	69.4 T.M.C.

The State of Andhra Pradesh has confined its demand to 60.77 T.M.C. for this canal in AP Note No. 14 and has submitted that 20.87 T.M.C. should be further allocated to it to protect the irrigation which has actually developed. We have already pointed out that in 1961 Andhra Pradesh Government admitted that annual utilisation of 39.9 T.M.C. would be sufficient to meet the requirement of the area to be irrigated. We are, therefore, not inclined to allocate any more water for the Kurnool Cuddapah Canal.

The last item in the first set is the Krishna Delta.
578 The State of Andhra Pradesh has submitted that the requirement under the Krishna Delta for 1.5 lakh acres cannot be met from out of the quantity of 264 T.M.C. allowed for the Nagarjunasagar Project as this quantity is required for irrigating the areas under the command of the Nagarjunasagar Canals. It is submitted that the requirement for the additional area of 1.5 lakh acres in the Delta is 23.1 T.M.C. and it is to be met separately. We have examined this matter. The State of Andhra Pradesh has been granted protection to the extent of 264 T.M.C. for the Nagarjunasagar Project and 181.20 T.M.C. for the Krishna Delta. The State of Andhra Pradesh can by economic use irrigate the areas under the Nagarjunasagar Canals and the Krishna Delta by utilising 445.20 T.M.C. We are not inclined to grant any more water for these projects out of the dependable flow of 2060 T.M.C. We may, however, mention that we have given a share in the return flow to the State of Andhra Pradesh. The State of Andhra Pradesh may utilise part of its share in the return flow to which it will become entitled after the specified time as mentioned hereinbefore for the integrated operation of these two Projects. Meanwhile, enough water will be available to the State of Andhra Pradesh because the projects of the upper States are likely to take time to spring up and it will not suffer in any way.

579 Now let us examine the second set of demands made by the State of Andhra Pradesh. First item in this set is minor irrigation works under construction for which the demand is 5.3 T.M.C. It is submitted by the State of Andhra Pradesh that these works are under construction at places which are mentioned in MRDK-Vol. IV and water should be allowed to the State of Andhra Pradesh out of the dependable flow. This demand may be treated as at par with the demand for minor irrigation under the first set. For the reasons that we have already given we have refused that demand. For the same reasons we are not inclined to accept this demand also.

The next item in this set is the Jurala Irrigation Scheme Stage-I. There are certain special considerations with regard to this project. This project envisages to irrigate scarcity areas in Taluks of Gadwal, Alampur and Wanaparthy in Mahboobnagar District. The erstwhile Hyderabad State had taken up investigations of the Bhima Project and the Upper Krishna Project in the year 1930 for irrigating certain areas in Telengana region of the present Mahboobnagar District along with areas lying in the head reaches in Karnataka region which merged with the State of Mysore after the States reorganisation. These projects were included in the schemes put forward by 580
the erstwhile Hyderabad State at the time of 1951 Conference.

The case of the State of Andhra Pradesh is that the State of Mysore has now made changes in the Right Bank Canal of the Upper Krishna Project without extending benefits to contiguous areas in the State of Andhra Pradesh which were formally proposed to be irrigated. Under these circumstances the State of Andhra Pradesh is compelled to propose a substitute to benefit the scarcity areas in Telengana region. It has submitted a note on this Project which is APPK-36. Technically the feasibility of the Project is yet to be examined. In the note the proposal is to put a reservoir at about 5 miles upstream of Gadwal metergauge railway bridge with gross storage of 33 T.M.C. and live storage of 16 T.M.C. The irrigation under the Project is proposed in two Stages. In Stage-I irrigation will be confined to flow irrigation on either side to an extent of 1,05,000 acres. However, in Stage-II irrigation by lift will be taken up to the extent of 1,80,000 acres. In the first Stage there will be two canals; (1) the Right Bank Canal will be about 17 miles long serving the areas of Gadwal and Alampur Taluks in Mahboobnagar District which are scarcity affected areas, (2) the Left Bank Canal which will be about 36 miles serving Taluks of Atmakur and Wanaparthy of Mahboobnagar District which 581
are also scarcity affected areas. The total water requirement in Stage-I for the Right and Left Bank Canals is 16.80 T.M.C. Reservoir losses are taken to be 6.2 T.M.C. The crop pattern proposed is 60 per cent wet and 40 per cent dry and the requirements for wet and dry are taken at 20 T.M.C. and 10 T.M.C. respectively for one lakh acres.

The State of Andhra Pradesh, no doubt, has been allocated enough water for historical reasons, but still Telangana part of the State of Andhra Pradesh stands in need of irrigation. The area which we are considering for irrigation formed part of Hyderabad State and had there been no division of that State

there were better chances for the residents of this area to get irrigation facilities in Mahboobnagar District. We are of the opinion that this area should not be deprived of the benefit of irrigation on account of the reorganisation of States. If properly managed, Jurala Project Stage-I can operate by utilising about 18 T.M.C. We, therefore, think it proper that 17.84 T.M.C. of water at 75 per cent dependability should be allocated for Stage-I of the Project.

If it turns out that the Jurala Irrigation Project is not a practical proposition, it is expected that 17.84 T.M.C. would be utilised by the State of Andhra Pradesh elsewhere in Telangana region. We cannot conceive that the State of Andhra Pradesh having
582 put forward the claim for allocation of water for Telangana region and having received an allocation for use in that region would use it elsewhere outside that region.

The third item in this set is 'Proposed Minor Works' and the demand for this item is 14.09 T.M.C. We do not think any water is available out of the dependable flow for allocation to the State of Andhra Pradesh for other minor irrigation projects. The three other items which are under this set are new projects and the total demand for them is 6 T.M.C. The State of Andhra Pradesh should try to meet the demands by economising in the use of water at other places.

Thus 800 T.M.C., as detailed below, is allocated to the State of Andhra Pradesh as its share in the dependable flow of 2060 T.M.C.:—

1. Protected uses	749.16 T.M.C.
2. Srisailam Project	33.00 T.M.C.
3. Jurala Irrigation Project Stage-I .	17.84 T.M.C.
TOTAL	800.00 T.M.C.

The next question arises as to what should be the basis for division of the remaining dependable flow between the States of Maharashtra and Mysore. We have referred to the statement filed by the State of Mysore. The case of the State of Mysore is that the division of water between the two States must take
583 place on the basis of that statement. The State of Maharashtra has submitted that this statement gives erroneous impression as the State of Mysore has worked out percentages by taking area factor four times (drainage area, net sown area, culturable area, culturable commanded area) and population factor twice (total population, population depending on agriculture) and it has ignored the factor of contribution. Mysore has the largest percentage of drainage area in the Krishna basin and, therefore, the other areas will also be larger and for this reason the State of Mysore wants the area factor to be taken four times. We are of the opinion that on the very face of it the division of water between the two States on the basis of the statement submitted by the State of Mysore is neither just nor equitable.

In MY Note No. 17 dated the 25th July, 1973, the State of Mysore has further submitted four methods of the division of the dependable flow between the three States. Out of the four methods, the first is based on the assumption that the allocation is being made of the virgin flows of the river Krishna taking into consideration only the in-basin factors and the State of Andhra Pradesh is to get only 544 T.M.C. out of 2060 T.M.C. The other three methods take note of the protected uses of the State of Andhra Pradesh to the extent of 749 T.M.C. For reasons 584
already mentioned the first three methods do not deserve consideration. The fourth method proposes to divide the remaining water between the States of Maharashtra and Mysore in proportion to the total irrigable area under the remaining projects which have not been protected in the two States. Under this method the shares of the three States, according to the State of Mysore, should be as follows:—

The State of Maharashtra . . .	524 T.M.C.
The State of Mysore . . .	787 T.M.C.
The State of Andhra Pradesh . . .	749 T.M.C.
TOTAL	2060 T.M.C.

Division of the remaining water between the States of Maharashtra and Mysore in proportion to the total irrigable area under the remaining projects in the two States cannot form a sound basis of our decision for division of water between the two States, unless all the remaining projects are examined in order to find out which areas are sought to be irrigated under the various projects by the two States, how far such irrigation is practicable, what quantity of water shall be required for irrigating the area under each project and which projects can be undertaken within the space of next 25 to 30 years. In substance we have to exa- 585
mine how far it is possible to satisfy the reasonable demands for irrigation of these two States by allocating the remaining water between them. This will furnish better criteria for division of the remaining water between the two States than any academic or mechanical formula.

Generally speaking the allocation of water should be made after a full consideration of the needs and requirements of these two States which is reflected in the Krishna case by the projects which they have

under contemplation. What we have, therefore, done is to examine each project of these States and express our views whether it is worth consideration or not in the sense that it meets the requirements of an area in the States concerned. In saying that the project is worth consideration we do not wish to be understood to say that the project, if feasible, should be adopted. Likewise when we say that the project is not worth consideration we do not say that no water should ever be allowed for it. If at some future date more water becomes available it is possible that more projects may come upto the worth consideration standard. In assessing whether the project is worth consideration or not we have taken into account the physical characteristics of the area like rainfall etc., the catchment area, the commanded area, the ayacut of
586 the project, the fact whether the project is meant for irrigating the scarcity area or not and such other facts. In other words we determine on pragmatic considerations what needs of the States of Maharashtra and Mysore can be satisfied so that an equitable way may be found out for distributing the balance of the dependable flows between the two States. It should not be taken that our observations relating to the projects which we have noted as worth consideration are to be accepted in any way as final and binding by the Planning Commission or any other authority. Our examination of the project reports and other relevant documents has a very limited purpose and it is to determine what are the reasonable needs of the two States so that an equitable way may be found out for distributing the remaining water between the two States. It is, of course, always to be borne in mind that the allocation of waters though based on consideration of certain projects being found to be worth consideration are not on that account to be restricted and confined to those projects alone. Indeed the States (and this applies to all the States) would be entitled to use the waters for irrigation in such manner as they find proper subject always to the restrictions and conditions which are placed on them.

One important aspect which has to be kept in mind is that besides its own contribution the State
587 of Andhra Pradesh is to receive a large quantity of water from contributions made from other States to the waters of the river Krishna. The river Bhima which rises in the Western Ghats in Poona District of Maharashtra flows for a total length of 535 miles through the States of Maharashtra and Mysore and falls in the river Krishna. The river Tungabhadra which rises in the Mysore State falls in the river Krishna beyond Kurnool. This river is formed by the union of two rivers—Tunga and Bhadra— which rise in the Western Ghats. The united river Tungabhadra flows for 338 miles through the States of Mysore and Andhra Pradesh. Both these rivers make a very substantial contribution to the river Krishna. If the interests of the State of Andhra Pradesh are to be safeguarded in the matter of receiving water from the river Krishna, it is necessary that the main stream of the river Krishna, should continue to receive sufficient water from the river Bhima and the river Tungabhadra. It is only then that all the three sources of supply of water to the State of Andhra Pradesh will remain open. This means that there should be no overcrowding of projects in K-5 and K-6 sub-basins, as also in K-8 and K-9 sub-basins. The Krishna Godavari Commission has mentioned at page 287, paragraph 15-36 that on the river Krishna until river flow data have been observed for a number of years 588
in accordance with the recommendations made in paragraph 9-44, it would not be advisable to undertake any further major or medium project in sub-basins K-8, K-9, K-10, K-11 and K-12. It has further observed that the requirements of all the projects in sub-basins K-1 to K-8, as indicated by the State Governments, could not be met by the available supplies even if these could be made fully utilisable. The maximum shortage was in sub-basin K-7.

The State of Mysore has submitted MY Note No. 19 dated the 25th July, 1973 in which it has been contended that the 75 per cent dependable flow of the river Tungabhadra upto Tungabhadra Dam is 456 T.M.C. On this point it has relied on the evidence of Mr. Framji, (MRW-1) page 287. Against this the committed use upstream upto Tungabhadra Dam is 319 T.M.C. The State of Mysore has further claimed 58 T.M.C. of water upto Tungabhadra Dam.

The State of Mysore has calculated the 75 per cent dependable flow of the river Tungabhadra at Sunkesula as 565 T.M.C. as shown below:—

		T.M.C.
1	Upto Tungabhadra Dam. . . .	455.6
2.	From Tungabhadra Dam upto Rajolibunda Diversion Scheme	95.9
3.	From Rajolibunda Diversion Scheme to Mysore Border	9.5
4.	From Mysore Border upto Sunkesula .	4.1
	TOTAL	565.1

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(Items (1) to (3) are as per p. 287 of MRW-1. Item (4) is in proportion to catchment areas below Mysore border upto Sunkesula and from Sunkesula to confluence).

The case of the State of Mysore is that after meeting the further requirements of the State to the extent of 79.2 T.M.C. of water (58 + 21.2 = 79.2) about 39 T.M.C. of water will be available out of the dependable flow at Sunkesula and below Sunkesula further 15.6 T.M.C. of water will be available. Thus 54.6 T.M.C. of water would flow down to the river Krishna.

So far as Vedavathi sub-basin (K-9) is concerned, even according to the State of Mysore there is very little scope for allocation of water in that sub-basin.

The State of Andhra Pradesh has given a very dismal picture of the flow of the river Tungabhadra that will go to the river Krishna after meeting the committed utilisation. The total protected utilisation in the Tungabhadra (K-8) and Vedavathi (K-9) sub-basin are as follows :—

Tungabhadra Sub-basin (K-8).	398.61 T.M.C.
Vedavathi Sub-basin (K-9)	50.54 T.M.C.

590 The balance of the dependable flow after deducting the quantum under protected uses is as follows according to the State of Andhra Pradesh (see A.P. Note No. 16 dated the 26th July, 1973).

Average yield of T.B. River (including Vedavathi) at Sunkesula	558.6 T.M.C. (APA 65, dated 12-9-72)
Average yield of Tungabhadra River below Sunkesula upto confluence with Krishna	10.45 T.M.C. (APA 67, dated 13-9-72)
Average yield of Tungabhadra including Vedavathi upto junction with Krishna 75 per cent dependable yield of Tungabhadra (including Vedavathi) upto Sunkesula would work out to (by arranging the	569.05 T.M.C.
	471.7 T.M.C.
On prorata basis, 75 per cent dependable yield of Tungabhadra (including Vedavathi) upto junction with Krishna would work out to.	471.7x569.05
	558.6
	= 480.6 T.M.C.
Balance 75 per cent dependable yield available in Tungabhadra river after deducting the utilisations protected so far.	480.6—449.15 = 31.45 T.M.C.

The State of Andhra Pradesh has. therefore, submitted that no further allocation should be made to the State of Mysore in view of the fact that there is • already over appropriation in the Tungabhadra and Vedavathi sub-basins.

591 The Krishna Godavari Commission at page 23 of its report has observed that the Tungabhadra river is perhaps the only well observed river in the Krishna and Godavari River Systems. Regular discharge observations have been made at Sunkesula since 1904. According to the Krishna Godavari Commission Report the average yield in K-8 sub-basin is 520 T.M.C. only *(see* page 243). The sharp difference of opinion between the States of Mysore and Andhra Pradesh is due to the fact that while the State of Mysore has relied on the discharge data available at the Tungabhadra Dam, the State of Andhra Pradesh has relied on the discharge data available at the Sunkesula Anicut. The relative value of these data have been a subject matter of lengthy arguments before us. No useful pur-- pose would be served in going into detail about the merits of the data available at these two places as it is clear from the case of the State of Mysore itself that if the river Tungabhadra is to continue to contribute a significant quantity of water to the main stream of the river Krishna after meeting the demands under the protected uses of the States of Mysore and Andhra Pradesh there is a very limited quantity available for further allocations in K-8 sub-basin unless further study of the discharge data in K-8 sub-basin gives a different picture. The same applies with greater force with regard to Vedavathi (K-9) sub-basin. According to Krishna Godavari Commission Report the average annual yield in this sub-basin is 56.4 T.M.C. which has been rounded off to 50 T.M.C. *(see* page 246 of the Krishna Godavari Commission Report). Accord ing to the States of Maharashtra and Mysore the average annual yield in the sub-basin is 87.8 T.M.C. [see the evidence of Mr. Framji (MRW-I) Pages 301-3021. The average annual yield may be taken to be in between the two estimates. The protected utilisation of the two States of Mysore and Andhra Pradesh in this sub-basin is already 50.54 T.M.C. Thus there is very limited scope for further utilisation of water at 75 per cent dependability in this sub-basin. 592

So far as the river Bhima is concerned, there is also a need for caution. There is limited scope for allowing further utilisation of the water of the river Bhima if it is to continue to make some contribution to the main stream of the river Krishna. While it would be difficult to place restrictions on the States of Maharashtra and Mysore for utilising the waters of the tributaries of the river Bhima, it would be proper that further exploitation of the waters of the main stream of the river Bhima by any State should be permitted only under exceptional circumstances. These considerations are to be borne in mind while examining the project reports of the States of Maharashtra and Mysore. 593

We shall first examine the demands for irrigation of the State of Maharashtra. The State of Maharashtra has filed MR Note No. 30 on the 16th August, 1973 showing the sub-basinwise demand as per Master Plan, the quantity of water protected and further demand of the State of Maharashtra from the 75 per cent dependable flow for projects in the Krishna basin on the assumption that further westward diversion of water will not be permitted. That note shows that in all the

sub-basins K-l, K-2, K-3, K-5 and K-6 in the State of Maharashtra its demands for irrigation according to Master Plan are for 860 T.M.C. Out of these, demands for 439.6 T.M.C. have been protected. Thus according to Master Plan, the unsatisfied demand is for 421.2 T.M.C. out of which the State of Maharashtra has now confined its claim to 280.3 T.M.C. as shown in the Statement MR Note No. 30. That statement gives all the projects for which water for irrigation is claimed according to Master Plan and the reduced demands according to MR Note No. 30. In addition to the demands contained in the Master Plan, the State of Maharashtra has filed MRPK-31 which contains the details of the existing and under construction bhandaras, weirs and lift irrigation schemes some of which
594 are not included in the Master Plan. According to the State of Maharashtra, the utilisation of the bhandaras, weirs and lift irrigation schemes mentioned in MRPK-31 but not included in the Master Plan amounts to 19.06 T.M.C. Out of this, demands for some weirs, bhandaras and lift irrigation schemes may merge with the demands for projects claimed by the State of Maharashtra. The State of Maharashtra has claimed that the demand for bhandaras, weirs and lift irrigation schemes which may not merge with the projects must be given preference over other demands.

We have got prepared Table No. 2 which shows the demands of the State of Maharashtra as shown in the Master Plan, the utilisation for each demand for which protection has been granted and the future demands made in accordance with MR Note No. 30. This Table also mentions demands for bhandaras, weirs and lift irrigation schemes. In this Table demands for minor irrigation requiring less than 1 T.M.C. have been consolidated basinwise instead of demand for each minor irrigation project being shown separately.

Coming to the demands of the State of Mysore, we find that in Statements Nos. 5 and 6 Annexure III at page 97 of MYK-I the details of the demands for projects for which water for irrigation is claimed have been given. In Appendix II to MY Note No. 17, a
595 statement has been filed by the State of Mysore showing the demands basinwise. We have got prepared Table No. 3 of the demands of the State of Mysore on the same lines as Table No. 2. That Table shows the demands made by the State of Mysore in Statements Nos. 5 and 6 Annexure III in MYK-I, the utilisation for which protection has been granted for each demand and the quantity of water claimed under MY Note No. 17.

We have examined all the project reports of both the States and also the other demands and have formed our opinion as to which of the demands of both the States are worth consideration and how much water should be allocated for each demand so that the reasonable demands of both the States may be assessed. In order to facilitate further discussion it is not proper to break the chain by giving the details of such examination at this place. The better way would be only to mention here the demands which, in our opinion, are worth consideration for assessing the needs of both the States and the quantities of water required for them and give the details of our examination alongwith the two Table Nos. 2 and 3 in Part II of this Chapter.

The demands for allocation of water from the dependable flow for the State of Maharashtra, which were assessed as worth consideration by us in Part II of this Chapter, excluding the demand for protected **596** uses, are as under :—

		T.M.C.
1.	Krishna Canal Ex-Khodshi weir	3.00
2.	Koyna Hydel and Koyna Krishna Lift Scheme	23.40
3.	Dudhganga	14.00
4.	Gudavale Lift Scheme	3.10
5.	Mutha System ex-Khadakwasla	9.60
6.	Kukadi Project	18.80
7.	Barhanpur Project	1.48
8.	Sina at Nimgaon	1.70
9.	Sina at Kolegaon	4.50
10.	Hingni Pangaon	1.50
11.	Bhandaras, etc.	17.80
12.	Minor Irrigation	26.47
	TOTAL	125.35

The demands for allocation of water from the dependable flow for the State of Mysore which were assessed as worth consideration by us, excluding the demands for protected uses are as under :—

		T.M.C.
1.	Dudhganga Project	4.00
2.	Upper Krishna Project	52.00
3.	Ghataprabha Project	55.00
4.	Malaprabha Project (including upper Malaprabha Project)	9.00
5.	Ramthal Lift Irrigation Scheme	4.50
6.	Bhima Irrigation Project	11.00
7.	Diksanga Project	1.00
8.	Amaria Project	2.27
9.	Bennithora Project	5.43
10.	Gandhorinala Project	2.20
11.	Upper Mullamari Project	1.30
12.	Lower Mullamari Project	4.40
13.	Kagna Project	2.00
14.	Vijayanagar Channels	6.35
15.	Minor Irrigation	30.00
	TOTAL	190.45

597

We are of the opinion that out of 2060 T.M.C., 1693.36 T.M.C. be allocated to the three States for protected uses as already mentioned and the remaining may be divided between the" three States as follows :—

	T.M.C.
1. State of Maharashtra	125.35
2. State of Mysore	190.45
3. State of Andhra Pradesh	50.84
TOTAL	366.64

Thus out of the dependable flow of 2060 T.M.C. the share of each State is as follows :—

	T.M.C.
1. State of Maharashtra	565.00
2. State of Mysore	695.00
3. Stale of Andhra Pradesh	800.00
TOTAL	2060.00

598 We have already determined the quantity of water which will be added to the 75 per cent dependable flow of the river Krishna upto Vijayawada on account of return flows and we have also determined how this water is to be shared by each State. This completes our discussion as to how the dependable flow of the river Krishna available for distribution is to be divided between the Stales of Maharashtra, Mysore and Andhra Pradesh.

We have to make some provisions relating to certain matters which arise out of this scheme for apportionment. Many of these provisions are based on agreed statements filed by the parties, some of them are merely incidental to the scheme of apportionment. In order to give a complete picture and to facilitate further discussion we consider it proper to refer to the Final Order of the Tribunal which is set out in Chapter XVI and which embodies all the provisions on the subject of apportionment of water of the river Krishna between the Slates of Maharashtra, Mysore and Andhra Pradesh.

Clause I of our Order gives the effective date on which the Order will come into force.

Clause II relates to underground water and is based on the agreed statement of the parties.

599 Clause III relates to the dependable flow and augmentation in the dependable flow due to return flows which we have already discussed.

Clauses IV and V embody the scheme for apportionment of water of the river Krishna between the three States of Maharashtra, Mysore and Andhra Pradesh which we have already discussed in detail. In Clause V we have stated with regard to the States of Maharashtra and Mysore that each of them shall not use in any water year more than a particular quantity of water specified therein. It is necessarily implied that both these States may use, in any water year, water of the river Krishna upto the quantities specified in that Clause subject to the conditions and restrictions imposed by us and subject to the availability of water. We make it clear that water has been allocated to each of the three States enbloc and that subject to the conditions and restrictions placed by us, each State shall have the right to make beneficial use of the water allocated to it in any manner it thinks proper. We further make it clear that the water allocated to each State is for all beneficial purposes including domestic and industrial uses and no separate allocation is made for such uses.

Clause VI gives the definition of beneficial use which we have already discussed.

Clause VII defines how a use is to be measured and 600
is self-explanatory. The second part of Clause VII is based on the agreed statement filed by the parties.

Clause VIII is self-explanatory.

In Clause IX we have placed restrictions on the use of water in the Krishna basin by the three States. We have already explained the reasons for placing such restrictions in the case of Tungabhadra and the Vedavathi sub-basins and on the main stream of the river Bhima. We have also placed restriction on the State of Maharashtra that it shall not use in any water year more than 7 T.M.C. from the Ghataprabha sub-basin (K-3) as otherwise the requirements of the State of Mysore for the projects in that sub-basin may suffer. We have also placed restriction on the State of Andhra Pradesh that it shall not use more than 6 T.M.C. from the catchment of the river Kagna in the State of Andhra Pradesh so that waters of that river may reach the main stream of the river Bhima. While placing restrictions on the use of water beyond the stated quantity by a State we have laid down an upper limit which is slightly above the total requirements of that State as assessed from the demands which have been either protected or which we have held as worth consideration.

Clause X relates to the restrictions placed on the State of Maharashtra on the westward diversion. We 601
have already assigned our reasons for incorporating this Clause.

Clause XI is self-explanatory and does not require any discussion.

Clause XII is regarding Gauging sites in the Krishna River System and is self-explanatory. It is based on the agreed statement dated the 20th August, 1973 (Appendix N) of the parties.

In Clause XIII provision is made for preparation and maintenance of certain records and is self-ex planatory.

The provisions contained in Clauses XII and XIII are necessary as they would furnish the machinery for determining how much water is "used by each State in each water year. They will also furnish valuable data which may be of considerable importance in future.

Clause XIV deals with the review of the order of the Tribunal by a competent authority or tribunal after the 31st May, 2000. We have already assigned our reasons for incorporating this Clause.

Clause XV is self-explanatory and does not require any discussion.

Clause XVI is regarding definition of certain terms and does not require any explanation.

Clause XVII provides that any matter covered by the order of the Tribunal may be altered, amended or modified either by agreement between the parties or by legislation by Parliament.

602

These provisions of the Final Order cover all matters mentioned in Issue No. II and its sub-issues.

Issue No. II is, therefore, decided as provided in these clauses of the Final Order.

With regard to Issue No. IV (B) (a) we may mention that we have divided only the dependable flow of the river Krishna between the States of Maharashtra, Mysore and Andhra Pradesh and we have also placed restrictions on the use of water by the States of Mysore and Andhra Pradesh in the Tungabhadra sub-basin (K-8) as mentioned hereinbefore. In our opinion no further directions are necessary for the release of the waters from the Tungabhadra Dam.

(i) for the benefit of the Kurnool Cuddapah Canal;

(ii) for the benefit of the Rajolibunda Diversion Scheme; and

(iii) by way of contribution to the Krishna river.

Issue No. IV (B) (a) is decided accordingly.

Now we proceed to examine how the waters of the river Krishna should be divided between the parties under Scheme 'B'. The essential element in this Scheme is that the States of Maharashtra, Mysore and Andhra Pradesh share the utilisable waters of the river Krishna in each water year in stated proportions depending on the availability of water in that year, that is, if there is any deficiency in that year all the States suffer and if there is surplus all the States get the benefit, according to their shares fixed by the Tribunal. Another important feature is that it provides for fuller utilisation of the waters of the river Krishna by permitting the parties to construct additional storages in their territories to impound the water that may be flowing in excess of the dependable flow in any water year to be used in that very water year or in the succeeding water years. We have already laid stress on the point that for such a scheme to be workable, an inter-State administrative authority, which may be called the Krishna Valley Autho rity, should be established by agreement between the parties and failing such agreement between the parties by any law made by Parliament under Entry 56 List I of the Seventh Schedule of the Constitution.

603.

For the fuller utilisation of the waters of the river Krishna we are of the opinion that such an authority should be established to supervise and regulate, if necessary, that the water available for utilisation in the river Krishna in each year be shared by the three States. For reasons which we have already mentioned we are not setting up such an authority under our Order. But if such an authority is set up either by agreement between the parties or under the law made by Parliament we consider it proper to place on record our views as to how in that case the waters of the river krishna should be divided between the States of Maharashtra, Mysore and Andhra Pradesh. Ultimately it is for the parties or for the law made by Parliament to draw up a final scheme and our views are subject to modification in both the cases.

604.

We may sum up our views in the following paragraphs :—

1. An inter-State administrative authority to be called the Krishna Valley Authority may be establish ed by agreement between the parties and failing such agreement between them, such authority may be es tablished by any law made by Parliament.

2. Upon the establishment of the Krishna Valley Authority, the waters of the river Krishna shall be divided between the States of Maharashtra, Mysore and Andhra Pradesh as mentioned hereinafter.

(A) In case the total quantity of water used by all the three States in any water year is not more than 2060 T.M.C.. the States of

Maharashtra, Mysore and Andhra Pradesh shall share the water in that year in the following proportions :—

State of Maharashtra . . .	565 T.M.C.
State of Mysore	695 T.M.C.
State of Andhra Pradesh . . .	800 T.M.C.

(B) If the total quantity of water used by all the three States in a water year is more than 2060 T.M.C., the States of Maharashtra, Mysore and Andhra Pradesh shall share the water in that water year as mentioned below :— 605

Upto 2060 T.M.C. as stated in paragraph 2 (A) and remaining water above 2060 T.M.C. equally by all the three States.

3. (A) If in any water year any State is not able to use any portion of the water allocated to it during that year on account of the non-development of its projects, or damage to any of its projects or does not use it for any reason whatsoever —

(i) that State will not be entitled to claim the utilised water in any subsequent water year ; and

(ii) any other State may make use of the utilised water, and such use shall not be charged to the share of that other State, but thereby it shall not acquire any right whatsoever in any such use.

(B) Failure of any State to make use of any portion of the water allocated to it during any water year shall not constitute forfeiture or abandonment of its share of water in any subsequent water year nor shall it increase the share of any other State in any subsequent water year even if such State may have used such water.

4. For the fuller utilisation of the waters of the river Krishna the States of Maharashtra, Mysore and Andhra Pradesh may construct such storages and at such places as may be determined by the Krishna Valley Authority for impounding water which would otherwise go waste to the sea.

606 5. It shall be the duty of the Krishna Valley Authority to ensure that the waters of the river Krishna are stored, appropriated and used to the extent and in the manner provided in these paragraphs and for this purpose the said authority may do all things necessary, proper or convenient for the performance of its duties independently or in co-operation with the Government agency of the three States and of the Government of India.

6. The Krishna Valley Authority is charged with the duties of ensuring that from time to time the waters of the river Krishna are made available for the beneficial use of the States of Maharashtra, Mysore and Andhra Pradesh in accordance with the provisions contained in these paragraphs and of maintaining the account of the use made by each State in each water year.

7. (A) The Krishna Valley Authority shall collect the details of the uses made by each State from time to time and after such scrutiny as it deems proper it shall subject to the provisions contained in paragraph 3 charge each State with the use made by it.

(B) When the water is not flowing over the terminal reservoir in the State of Andhra Pradesh, the releases from such terminal reservoir either for production of power or for irrigation shall be so regulated as to avoid any waste of water by spilling it over the terminal reservoir. 607

Any waste resulting solely from the defective regulation of the releases from such terminal reservoir as determined by the said Krishna Valley Authority shall be reckoned as use by the State of Andhra Pradesh.

8. In every water year in the second week of October, last week of December and last week of May, the Krishna Valley Authority shall determine tentati vely the quantity of water which is likely to fall to the share of each State in accordance with the aforesaid paragraphs and adjust the uses of the parties in such a manner that by the end of the water year each State is enabled, as far as practicable, to make use of the water according to its share.

9. A(i) For giving effect to the aforesaid provisions the Krishna Valley Authority may from time to time direct the transfer of water from the project of an upper State to the project of a lower State and may take any other step for ensuring that each State may use in each water year the quantity of water allocated to it in that water year.

(ii) During the period 1st of May to 30th of September in any water year the Krishna Valley Authority shall not direct transfer of water from any project in any upper State —

(a) except in times of acute water shortage and for urgent need of water by a lower State; and

(b) if greater hardship or distress is caused to the project of the upper State from which 608

water is directed to be transferred than to the project of the lower State to be benefited by such transfer.

When directing the transfer of water the Krishna Valley Authority may give appropriate directions regarding the manner in which the water so transferred shall be used by the State receiving the water.

10. If it is found on final accounting at the end of the water year that the water used in the water year by any State is in excess of or less than its share under Paragraph 2, the said Authority may, subject to the provisions of Paragraph 3, take such steps as it deems necessary to adjust the water accounts of the parties by regulating the extent of the use of water to be made by each State in succeeding years.

11. If the water stored in one State is released for use of any other State by the directions of the Krishna Valley Authority, the State using the water shall be charged with the losses due to evaporation, after it has received the water in its storage, but the losses incident to the diversion, impounding or conveyance of water in one State for use in another State shall be deducted from the total water available for distribution.

The provisions contained in Clauses II, VI, VII, IX, X, XI, XIV, XV, XVI and XVII of Scheme A may with such modifications, as may be deemed necessary, form part of Scheme B.

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It may appear that the division of water in every water year in the stated proportions as envisaged by us in the above paragraphs may present unsurmountable difficulties even if the Krishna Valley Authority is established for it may be difficult to forecast in each water year as to how much water will be flowing in the river Krishna in that water year and how much water is being utilised by each State. Much of this difficulty is solved by nature. In the Krishna basin all the rivers are rain-fed rivers getting waters during monsoons. As we have already mentioned, the south-west monsoon season during June to September contributes about 73 per cent of the annual rainfall of the Krishna basin, the normal date of the on-set of the south-west monsoon in the Krishna basin is between 1st and 10th June. The normal date of the withdrawal of the South-west monsoon in the Krishna basin is between 1st October and 15th November. We have also mentioned that other rainy seasons are as well defined. The north-east monsoon causes occasional showers, the amount of rainfall decreasing as the monsoon advances from the coast towards the interior. The season, October to December, contributes only about 17 per cent of the normal rainfall of the Krishna basin. There is a little rain during the winter season during the months of January and February and very little rain in the hot weather season during the months of March, April and May. This being the position in every water year one can get an approximate idea of the total amount of water that is going to be available in a water year by the end of the month of October. No doubt the picture will not be complete but a workable data is available on the basis of which steps can be taken by the Krishna Valley Authority to see that in the waters of the river Krishna the parties get their share as mentioned aforesaid. Under our scheme in every water year in the second Week of October, last week of December and last week of May, the Krishna Valley Authority shall tentatively determine the shares of all the States. The Krishna Valley Authority will be in a position to give directions to the parties to adjust their utilisations in such a way that the use made by each State at the end of a water year is, as far as practicable, according to its share. This does not mean that any appropriate directions cannot be given earlier. The Krishna Valley Authority is to ensure that the parties get waters in proportion to their shares. For this purpose it can take any step which it deems proper at any time. The Krishna Valley Authority may even direct transfer of water from the project to upper State to the project of the lower State from time to time.

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The States of Maharashtra and Mysore have raised objections to conferring on the Krishna Valley Authority the power of transfer of water from the reservoir of the upper State to the reservoir of the lower State in a water year before the end of October on several grounds :—

(i) It is not practicable for water once released from an upper State storage to be brought back to that State later, if the necessity arises.

(ii) Transfer of water may prejudicially affect the predominantly Rabi crop in the upper project from which water is being directed to be released for the benefit of lower project.

(iii) Greater hardship or distress may be caused to the project of an upper State from which water *is* directed to be released than is caused to the project of the lower State for whose benefit water is being directed to be transferred.

(iv) Beneficial use from the north-east monsoon in the months of October to December is the highest in the State of Andhra Pradesh and least in the State of Maharashtra.

It has been further submitted that as far as practicable water should be released from the nearest upper storage to ensure least loss in transit and time and that the release of water at a time from an upper storage should be for small quantities for short period of about a week, so as not to seriously affect or prejudice the upper State in getting its share of water when account is taken in the months of October
612 and December.

We take it that the Krishna Valley Authority will be composed of high ranking engineers who are expected to use their discretion in the matter of transfer of water from one State to another judiciously. In exercising this discretion they are bound to take notice of the following :—

(1) That it is not practicable that water once released from the upper State storage cannot be brought to that State later on in case such water is required to adjust the claim of the upper State for its share.

(2) That the water is to be released for re lieving the distress to the lower State and the extent or manner in which the distress is to be relieved should be such that greater hardship or distress is not caused to the upper State.

(3) That the rainfall from the north-east mon soon in the months of October to December is higher in the lower States than in the uppermost States.

(4) That water is to be released from the place where there exists sufficient quantity to per mit such release.

613 (5) That releases in early part of south-west monsoon are to be avoided as far as possi ble for the reason that even the fate of the upper States in the matter of receiving rainfall is uncertain and further it is ex pected that the lower State will keep some water in their storages for irrigating the Khariff crops in case there is deficiency in the rainfall in the months of May and June.

These are some of the obvious matters which are expected to be kept in view by the Krishna Valley Authority while directing transfer of water from one State to another. But it is not possible to envisage all the situations in which the transfer of water from one State to another may be necessary. A highly competent body such as the Krishna Valley Authority which will not only consist of the representatives of the States but also of the Government of India will take due care while directing the transfer of water from one State to another. As a further safeguard, it may be provided that the direction of transfer of water from one State to another shall be by a resolution passed in a meeting in which all the available members nominated by the Government of India are present.

To remove any misgivings of the upper States, we have thought it proper that some of the points raised by the upper States may be specifically mentioned in 614
Scheme B for giving definite guidance to the Krishna Valley Authority. We have, therefore, considered proper to mention certain safeguards in the matter of transfer of water in Paragraph 9(A) (ii).

It is likely to happen at the end of the year when final accounting is done that there may not be complete adjustment of the shares of the parties. Inspite of the able and efficient tackling of the problem by the Krishna Valley Authority a complete -balancing of the account of the parties according to their shares is not to be expected. For this reason we have thought it proper that a provision as mentioned in Paragraph 10 be inserted.

Thus, the objections that this scheme may not prove workable are not so cogent as to dissuade us from advocating that scheme B may be given effect to by the parties or by law.

The question of construction of carryover reservoirs by all the three States was considered by us from two aspects :—

(1) what should be the extent to which each State should be permitted to construct carry over reservoirs? and

(2) at which place in their territories?

As we have already mentioned construction of carryover reservoirs is one of the essential elements in this scheme. But to determine how much extra water should be impounded by each State in its 615
territory and at which place is mainly a technical job. It would not be prudent for us to express any opinion on these two aspects. In our opinion this matter may be determined by the Krishna Valley Authority which will be composed of eminent engineers who can give better opinion after examining all the hydrological and technical aspects of the matter.

It is further contended by the States of Maharashtra and Mysore that the State of Andhra Pradesh has been allocated water much in excess of what it is otherwise entitled on account of the protection that has been

granted to its users and it should not be allowed any more share in the water which may be flowing in excess of 2060 T.M.C. in any year. It is contended that such additional water be reserved for the States of Maharashtra and Mysore. The State of Andhra Pradesh has controverted this argument on various ground we have already referred to.

There may be four circumstances under which such additional water may be available. These are : —

(i) When the water flowing above the 75 per cent dependability is impounded in the chain of reservoirs in the three States to be used in the same year in which it is to be impounded or in subsequent years.

(ii) When there is augmentation in the flow of the river Krishna on account of return flow.

616 (iii) If there has been under-estimation in estimating the dependable flow at 75 per cent dependability as 2060 T.M.C., and

(iv) Because of increasingly more use of water upstream which would reduce transit losses.

In the first case the State of Andhra Pradesh would be impounding water in its own reservoirs and it will be hard to deny any share to the State of Andhra Pradesh in the waters so impounded. So far as the return flow is concerned, the case of the State of Andhra Pradesh for a share in the return flow is much stronger as the water which shall be available to the State of Andhra Pradesh for irrigation is likely to be somewhat of inferior quality than the rain water and the State of Andhra Pradesh can be compensated by giving a share to it in the return flow. So far as the other two circumstances are concerned, it will not be possible to determine whether the additional water which has become available in a water year is due to any of the first two circumstances or due to any of the last two circumstances. In this view of the matter we arc of opinion that in the additional water above 2060 T.M.C. that may be available for utilisation each year all the three States should Share equally.

Yet another objection that may be raised is that it will be difficult to determine the shares of each parties by reference to the water used by each State in each water year. But if each State is in a position 617 to make use of the water allocated to it obviously the water used by each State will furnish the criteria for measuring of the total water available for utilisation in a particular year. But if the upper State is unable to use the water for the non-development of its projects, or damage to any of its projects, separate provision has been made in Paragraph 3 permitting any State to make use of such water without being charged with for making use of it. It has been further provided that the State which is unable to use water shall not be entitled to claim the unutilised water in any subsequent year. This will clear the hurdle in determining the shares with reference to the use made by each State in a particular year.

It was contended before us that considering the present development and progress of some of the projects it will take a very long time for the upper States to be in a position to utilise all the waters falling to their shares under this scheme. We do not think that the scheme should be discarded for this reason. The Krishna Valley Authority after it is established is likely to take time before it can function in a full-fledged manner. In the first instance such an authority may be established with a skeleton staff so that it may collect all the necessary data well in advance of the full development of projects by the upper States. The 618 lower States do not suffer because they have been permitted to use the water which the upper States are not able to utilise on account of non-development of projects or for any other reason.

The other provisions relating to this scheme are self evident and do not require elaborate discussion.

In the end so far as the scheme B is concerned, we leave the question of the enforcement of such a scheme to the good sense of the parties or to the wisdom of Parliament.

CHAPTER X IV

619

Approtionment of the waters of the river KRISHNA

PART—II

Demands of the State of Andhra Pradesh—As we have mentioned in Part I of this Chapter, Table No. I which is given below shows the demands of the State of Andhra Pradesh as per its cases set out in APK-I, utilisations held protected by us and the demands made by the State of Andhra Pradesh out of the dependable flow as set out in AP Note No 14 :-

TABLE No 1

ANDHRA PRADESH

Statement showing the demands by the State of Andhra Pradesh as per APK-1, protected utilisations and demands made in AP Note No 14 out of the 75 per cent dependable flow

(All figures in T M C)

Sl. No	Name of Project	Demand as per APK-I Pages 123 to 125	Protected utilisation	Balance demand	Demand out of dependable flow vide AP Note 14
1	2	3	4	5	6
1	Krishna Delta System	214.0	181.20	32.8	23.01
2	Kurnool-Cuddapah Canal (See also item No 23)	39.9	39.9		20.87
620 3	Muniyeru Project	3.7	3.3	0.4	
4	Tungabhadra Project Right Bank Low Level Canal (Andhra Share) . . .	29.5	29.5		
5	Bhairavanithippa	4.9	4.9		
6	Nagarjunasagar Project	481.0	281. 0	200.0	
7	Tungabhadra Project Right Bank High Level Canal Stages I & II	32.5	32.5		
8	Dindi	5.3	3.7	1.6	
9	Palair	4.2	4.0	0.2	
10	Pakhal	2.8	2.6	0.2	
11	Wvra	4.0	3.7	0.3	
12	Koilsagar	3.9	3.9		
13	Rajohbunda Diversion Scheme	15.9	15.9		
14	Musi Project	9.5	9.4	0.1	
15	Minor Irrigation (See also item No 24 and 37)	105.3	116.26		36.88 (Item No. A (I) (2) (1) 5.30 Item No. A (II) (1) 14.09 Item No A (II) (3)
16	Lankasagar	1.0	1. 0		
17	Kotipallivagu	2.0	2.0		
18	Srisailam	33.0		33.0	33. 0

1	2	3	4	5	6
19.	Vaikuntapuram Pumping Scheme	2.6	2.6	. .	. .
20.	Okachettivagu	4.8	1.9	2.9	. .
21.	Gajuladinne	2.0	2.0	—	—
22.	Guntur Channel	7.0	4.0	3.0	. .
23.	Improvements to Kurnool-Cuddapah Canal (See also Item No. 2)	29.5	. .	29.5	. .
24.	Minor Irrigation (See also items No. 15 and 37)	2.1	. .	2.1	. .
25.	Upper Krishna Project Extension to Andhra Pradesh	54.4	. .	54.4	. .
26.	Sangameswaram Canal Scheme Statges I & 11	315.0	. .	315.0	. .
27.	Pulichintala	73.0	. .	73.0	. .
28.	Nagarjunasagar Project Stage-III	69.0	. .	69.0	. .
29,	Bhima Project	100.7	. .	100.7	23.0*
30.	Tungabhadra Project Left Bank Low Level Canal Extension to Andhra Pradesh	19.2	. .	19.2	. .
31.	Rajolibunda Right Canal Scheme	12.9	. .	12.9	. .
32.	Muneru Project	1.5	. .	1.5	1.5
33.	Kalikota	3.5	. .	3.5	3.5
34.	Varadarajaswamy Project	1.0	. .	1.0	1.0
35.	Srisailam Left Canal Scheme	150.0	. .	150.0	. .
36.	Water Supply and Industrial Use	120 0	3.9	116.1	. .
37.	Minor Irrigation (See also Hems No. 15 and 24)	47.5		47.5	. .
	TOTAL	2,008.1	749.16	1269.9	162.15

622 We have discussed the projects for which demands have been made out of the dependable flow in Col. No. 6 of the above Table in Part-I of this Chapter. We have allocated 800 T.M.C. as detailed below to the State of Andhra Pradesh as its share in the dependable flow of 2060 T.M.C. :—

1.	Protected uses	749.16	T.M.C.
2.	Srisailam Project	33.00	T.M.C.
3.	Jurala Project Stage 1	17.84	T.M.C.
	Total :	800.00	T.M.C.

The demands of the State of Andhra Pradesh for a share in the flow in excess of 2060 T.M.C., (Which is called the 'Surplus Flow') as mentioned in AP Note No. 14, are as follows :—

1	Krishna Delta	65.00	T.M.C.
2	Nagarjunasagar Project	42.00	T.M.C.
3.	Jurala Irrigation Scheme Stage-II	28.20	T.M.C.
4.	Sangameswaram Canals	40.90	T.M.C.
5.	Srisailam Left Bank canal	150 00	T.M.C
6.	Nagarjunasagar Project Stage-II	203.00	T.M.C
	Total :	529.10	T.M.C.

623 The quantity of water which is available in excess of the dependable flow of 2060 T.M.C. is that due to return flow as already mentioned in Part-I. We have given a share to the State of Andhra Pradesh in the return flow. As compared to the demands made by the State, this will be a very small quantity. The State of Andhra Pradesh may utilise the quantity of water allocated to it as its share in the return flow for any of its projects, subject to the conditions and restrictions imposed by us on the utilisations of the waters of the river Krishna.

This completes our discussion so far as the demands of the State of Andhra Pradesh are concerned.

624 *Demands of the State of Maharashtra*.—We proceed to discuss the various projects for which demands of the State of Maharashtra are to be considered in the light of the observations made by us in Part-I of this Chapter. These demands are contained in the following Table No. 2 which shows the sub-basinwise demands as per Master Plan, the utilisations protected and the future demands made in MR Note No. 30 from 75 per cent dependable flow for projects in the Krishna basin of the State of Maharashtra on the assumption that further westward diversion of water is not permitted :—

* I n place of the Bhima Project and Upper Krishna Project Extensin to Andhra Pradesh , the State of Andhra Pradesh has now claimed the quantity of water as shown in col. No. 6 for Jurala Project Stage-I.

TABLE No. 2

Statement showing the Sub-basinwise demand as per Master Plan, the utilisations protected and the future demands made in MR Note No. 30 from 75 per cent dependable flow for projects in the Krishna basin of Maharashtra State on the assumption that further west-ward diversion of water is not permitted.

(All figures in T.M.C.)

Sl. No	Name of the Project	Demand as per Master Plan	Protected utilisation	Balance according to Master Plan	Future demand from 75 per cent dependable flow (vide MR Note 30)
1	2	3	4	5	6
	I. K-I Sub-basin (Upper Krishna)				
1.	Krishna Project	35.9 (1.0)	36.3 (1.0)	(0.6)	
2.	Urmodi Project	6.2		6.2	6.2
625 3.	Tarali Project	6.7		6.7	6.7
4,	, Krishna Canal ex-Khodshi Weir	5.7 (2.5)	2.7	3.0 (2.5)	3.0
5.	Koyna Hydel and Koyna Krishna Lift Scheme with Varunji Weir	129.4	74.8	54.6	54.6
6.	Wang Project	12.1		12.1	12.1
7.	Warna Project	57.4	47.7	9.7	9.7
8,	. Radhanagari Project	11.0	11.0		
9.	Kadvi Irrigation Project	15.6		15.6	8.0
10.	Kasari Irrigation including Kaljewadi	42.4		42.4	12.0
11.	Kumbhi Irrigation	17.5		17.5	10.0
12.	Phonda Irrigation Project	4.2		4.2	3.0
13.	Vedganga Irrigation Project	27.7		27.7	10.0
14.	Tulshi Project	3.5	2.6	0.9	
15.	Dudhganga Project (Maharashtra portion)	26.0		26.0	18.0
16.	Morna Project	1.6		1.6	1.6
17.	Phaye Project	1.4		1.4	1.4
18.	Minor Irrigation (utilising less than one T.M.C. annually)	42.3	11.1	31.2	26.2
	GRAND TOTAL of K-1	446.6 (3.5)	186.2	260.8 (3.1)	182.5
II.	K-2 Sub-basin (Middle Krishna)				
19.	Minor Irrigation (utilising less than one T.M.C. annually)	2.0	0.1	1.9	1.3
	GRAND TOTAL of K-2	2.0	0.1	1.9	1.3
III	I. K-3 Sub-basin (Ghataprabha)				
626 20.	Hiranyakeshi Irrigation Project	32.2		32.2	12.0
21,	, Gudavale Lift Scheme	3.1		3.1	3.1
22.	Minor Irrigation (utilising less than one T.M.C. annually)	1.9	1.0	0.9	0.9
	GRAND TOTAL of K-3	37.2	1.0	36.2	16.0

1	2	3	4	5	6
	[V. *K-5 Sub-basin (Bhima)*				
23.	Tata Hydel Works	45.0	45.0		
24.	Mutha System ex-Khadakwasla	33.1 (1.1)	23.5	9.6 (1.1)	9.6
25.	Kukadi Project	38.9 (2.0)	20.1	18.8 (2.0)	18.8
26.	Ghod Dam Project	10.4	10.4		
27.	Chaskaman Project	(10.0)		(10.0)	
28.	Kundali Project	(2.5)		(2.5)	
29.	Bhima Irrigation Project	90.7	90.2	0.5	
30.	Nira System ex-Vir	65.2	34.61	15.9	15.9
31.	Barhanpur Project	1.5	14. 7	1.5	1.5
32.	Mhaswad Project	2.2	2.2		
33.	Ashti Project	1.0	0.7	0.3	
34.	Begumpur Lift Scheme	5.3 (10.1)		5.3 (10.1)	5.3
35.	Sina at Nimgaon	1.8		1.8	1.8
36.	Mangi Project	1.2	l.l	0.1	
37.	Sina at Kolegaon Project	4.3		4.3	4.3
38.	Ekruk Tank Project	2.0	1.8	0.2	
39.	Khasapur Project	1.3	1.3		
40.	Hingni Pangoan Project	1.6		1.6	1.6
41.	Sina Lift Scheme	3.0 (3.0)		3.0 (3.0)	3.0
42.	Sholapur City Water Supply	1.6	0.3	1.3	
43.	Minor Irrigation (utilising less than one T.M.C. annually)	28.5	4.8	23.7	16.4
	GRAND TOTAL of *K-5*	338.6 (28.7)	250.7	87.9 (28.7)	78.2
	VK-6 Sub-basin				
44.	Kurnoor Project	1.9	1.5	0.4	
45.	Minor Irrigation (utilising less than one T.M.C. annually)	2.5	0.1	2.4	2.4
	GRAND TOTAL of *K-6*	4.4	1.6	2.8	2.4
	Grand total of K-1 to *K-3* and *K-5* to *K-6*				
	(a) Major and Medium works above one T.M.C.	751.6	422.5	329.5	233.2
	(b) Minor works less than one T.M.C.	77.2	17.1	60.1	47.2
	TOTAL (a + b)	828.8 (32.2)	439.6	389.6 (31.8)	280.4

NOTE : Figures in brackets in Cols. 3 and 5 are of regeneration flows.

627

628 We proceed to examine the following projects for which the State of Maharashtra has claimed water out of the dependable flow :—

1. Urmodi Project
2. Tarali Project
3. Krishna Canal ex-Khodshi Weir
4. Koyna-Krishna Lift Irrigation Scheme
5. Wang Project
6. Warna Project
7. Kadvi Irrigation Project
8. Kasari Hydro Electric Project
   and
   Kaljewadi Lift Irrigation Scheme
9. Kumbhi Multipurpose Project
10. Phonda Irrigation Project
11. Vedganga Irrigation Project
12. Dudhganga Project
13. Morna Project
14. Phaye Project
15. Hiranyakeshi Irrigation Project

16. Gudavale Lift Scheme
17. Mutha System ex-Khadakwasla
18. Kukadi Project
19. Chaskaman Irrigation Project
20. Nira System ex-Vir
21. Barhanpur Project
22. Begumpur Lift Irrigation Scheme
23. Sina at Nimgaon Gangurda Project
629 24. Sina at Kolegaon Project
25. Hingani Pangaon Project
26. Sina Lift Scheme
27. Bandharas etc.
28. Minor Irrigation.

630 URMODI PROJECT

The Report on the Urmodi Project is given at pages 1 to 36 of MRPK-26. The Project envisages the construction of—

(a) A storage on the Urmodi river at Parali in Satara Taluka of Satara District ;

(b) Left and Right Bank Canals from the sto rage to irrigate 25,000 acres (cropped area 38,750 acres) in Satara and Karad Talukas. This includes the irrigation on the existing Walse Bandhara on the Urmodi river. The existing Walse Bandhara is just downstearm of the proposed Urmodi Dam; and

(c) It also provides for water supply to Satara town.

The Urmodi Project has not been cleared by the Government of India.

In the Master Plan, the demand stipulated is 6.2 T.M.C. of dependable flow for an irrigation of 20,000 acres. The Project Report, however, shows that the Project is planned to utilise 7.08 T.M.C. for
631 irrigation and 0.16 T.M.C for water supply to Satara town (last para, page 7, MRPK-26). The storage proposed at Parali has a gross capacity of 5.20 T.M.C. (page 8, ibid) ; the live storage proposed is 5.05 T.M.C. (page 7, ibid).

The Left Bank Canal has a gross commanded area of 17,100 acres with an ayacut of 11,050 acres entirely in Satara Taluka. The Right Bank Canal has a gross commanded area of 21,600 acres with an ayacut of 13,950 acres, of which 10,600 acres are in Satara Taluka and 3350 acres in Karad Taluka. The total ayacut of the Urmodi Project is thus 25,000 acres (pages 8 and 9 of MRPK-26).

The Project proposes to utilise 6.49 T.M.C. of water at canal head annually (page 15, MRPK-26) for 38,750 acres of irrigation. The total area under cultivation including 2,500 acres of unirrigated pulses is 41,250 acres. The duty at canal head will be 5.97 acres per mcft. of water. The delta works out to 3.87 feet.

The area commanded lies in Satara and Karad Talukas of Satara District. The normal rainfall in the commanded area of Satara Taluka is 39.79 inches and that in the commanded area of Karad Taluka is 29.33 inches (page 3, Sr. No. 10, MRPK-26).

The Project Report (MRPK-26) mentions at page 632
9 that the existing Walse Bandhara irrigates a small area of Khariff crops in the commanded area of the Urmodi Project, but this irrigation is very uncertain due to lack of storage support and therefore this existing area is included in the area proposed to be irrigated from this Project.

Looking to the intensity of rainfall and other factors, in our opinion the demand for this Project is not worth consideration for the present. The demand for bandhara will be considered separately. 633

TARALI PROJECT

The Report on the Tarali Project is given at pages 37 to 77 of MRPK-26. The Project envisages the construction of—

(a) A storage on the Tarali river near Awarde village in Patan Taluka of Satara District.

(b) A Right Bank Canal from the storage and the remodelling of the existing Left Bank Canal from the Tarali Bandhara to irrigate 26,100 acres (cropped area 40,450 acres) in Patan, Karad and Satara Talukas of Satara District. This includes the irrigation on the existing bandhara on the Tarali river downstream of the proposed dam and irriga tion from an existing bandhara on the Mand river (page 47, MRPK-26).

The Project has not so fat been cleared by the Government of Inida.

In the Master Plan, the demand stipulated is 6.7 T.M.C. of dependable flow for an irrigation of 19,000 acres. The Project Report, however, shows that the Project is planned to utilise 7.56 T.M.C. for an ayacut of 26,100 acres (pages 44, 45 and 46 of MRPK-26). The storage provided at Awarde has a gross 634
capacity of 5.63 T.M.C. and a live capacity of 5.36 T.M.C. (page 37, MRPK-26).

The Left Bank Canal has a gross commanded area of 7,000 acres with an ayacut of 5,450 acres in Satara Taluka of Satara District. Most of this area is under the command of the existing canal from the Tarali Bandhara. The Right Bank Canal has a gross commanded area of 28,000 acres between the Tarali and the Koyna rivers in Patan and Karad Talukas. The ayacut is 20,650 acres. Therefore, total ayacut of the Project is 26,100 acres.

The Project envisages the utilisation of 7.06 T.M.C. of water annually at the canal head (page 54 of MRPK-26) to irrigate 40,455 acres. The total area under cultivation including 2,610 acres of unirrigated pulses in 43,060 acres. The annual evaporation losses are 0.50 T.M.C The duty at canal head of utilisation will be 5.72 acres per mcft. The delta at canal head will be 4.04 ft.

The rainfall in the commanded area of this Project in Karad Taluka is 28.15 inches (Sr. No. 9, page 39 of MRPK-26). Rainfall in the commanded area in
635 Satara and Patan Talukas have not been given in the Report. But the Urmodi Project Report states normal rainfall of Satara Taluka as 39.79 inches (page 3 of MRPK-26).

The Project Report (pages 47 and 48 of MRPK-26) states that the existing ayacut under the Tarali Bandhara is 5,450 acres and some seasonal irrigation is done at present, but the supplies to the bandhara are too uncertain. It is proposed to firm up the supplies to the existing bandhara from the proposed Tarali Storage.

Looking to the intensity of rainfall and other factors, we are of the opinion that demand for this Project is not worth consideration for the present. The demand for bandhara will be considered separately.

636 KRISHNA CANAL EX-KHODSHI WEIR

The note on the Krishna Canal ex-Khodshi Weir is given at page 3 of MRPK-28.

There is an existing weir at Khodshi on the Krishna river with a Left Bank Canal, 41 miles long, commanding an area of 36,800 acres in Karad Taluka of Satara District and Tasgaon Taluka of Sangli District. The ayacut of the scheme is stated to be 36,300 acres. It is stated that this irrigation depends on diverting the run-of-the-river supplies at the pick-up-weir sites. 5.7 T.M.C. of the dependable flow has been stated as the requirement of this Project in the Master Plan and also in the Project Note in MRPK-28. Out of 5.7 T.M.C. claimed, 2.7 T.M.C. has been given as the protected use of this Project. In MR Note 30, at Sr. No. 4, the balance 3 T.M.C. has been claimed for this Project.

In MRPK-31 under item I (j) (i) it is stated that the existing bandharas and lift irrigation schemes on the Krishna river irrigate 4513 acres of cane and 9005 acres of Kharif and Rabi seasonals. As the run-of-the-river supplies at the Khodshi Weir during the latter part of Rabi and hot weather period are not adequate, the irrigators supplement the insufficient canal 637
supplies from the Khodshi Weir by lifting the water directly from the Krishna river. The river supplies lifted water directly from the Krishna river by these bandharas and by the lift irrigation schemes are 2.47 T.M.C. This is in addition to the protected use of 2.7 T.M.C. for canal supplies. As stated in MR Note 30, an additional 3 T.M.C. of water from the dependable flow claimed for the Krishna Canal ex-Khodshi Weir in addition to the protected use of 2.7 T.M.C., will cover the demand of 2.47 T.M.C. for these bandharas and lift irrigation schemes also.

In our opinion, demand for 3 T.M.C. for this Project is worth consideration. It will cover the demand for bandharas and lift irrigation schemes also.

KOYNA-KRISHNA LIFT IRRIGATION SCHEME 638

The Report on the Koyna-Krishna Lift Irrigation Scheme is given at page 7 and pages 13 to 24 of MRPK-28. The Scheme has the following features:—

(a) A storage on the Koyna river at Jalkhawadi has already been constructed to store 98 T.M.C. (gross) of water (live storage 94 T.M.C.). A quantum of 16 T.M.C. is reserved from this existing storage for re leases during the fair weather for irrigation under the Koyna-Krishna Lift Irrigation Scheme.

(b) A weir is proposed to be constructed on the Koyna river 30 miles downstream of the existing Koyna Dam at a place called Warunji providing a pondage of 0.7 T.M.C.

(c) Out of 16 T.M.C. to be released during the fair weather at the foot of the Koyna Dam after generating power, 15.4 T.M.C. will reach the Warunji Weir and will be diverted 639
(lifted) for irrigation. In addition to this 15.4 T.M.C. a part of the flows from the catchment area below the Koyna Dam upto the Warunji Weir, namely 8 T.M.C., will be diverted (lifted) for irrigation during the

monsoon period from the run-of-the-river supplies at Warunji. The total annual irrigation diversion at Warunji will accordingly be 15.4 + 8.00 = 23.4 T.M.C.

(d) This 23.4 T.M.C. of water will be lifted by pumping (26 ft. lift) from the Warunji Weir over the Koyna-Krishna Ridge into the Kri shna river upstream of the existing Khodshi Wier.

(e) This will be further lifted by 176 feet from above the Khodshi Weir and fed into the Borkhal Canal (under construction) at Mile 54.

(f) The Borkhal Canal will be enlarged from Mile 54 onwards and extended to carry this water into Yerala Valley to irrigate an ayacut of 1,10,000 acres in Tasgaon and Miraj Talukas of Sangli District.

640 The Koyna Dam together with crest gates has already been completed in 1967 to store 98 T.M.C. of water. Other components of this Project as detailed above have not so far been cleared by the Government of India, but the storage contains a reserve of 16 T.M.C. which may be utilised for irrigation downstream of the Koyna Dam.

In the Master Plan, the requirement of water for this Project was 16 T.M.C under Sr. No. 7, and 5 6 T.M.C. under Sr. No. 10, that is, a total of 21.6 T.M.C. to serve an ayacut of 84,000 acres. The Project Note, however, provides a utilisation of 23.4 T.M.C. to irrigate an ayacut of 1,10,000 acres (cropped area 1,76,000 acres).

For irrigating 1,76,000 acres, the annual diversion proposed is 23.4 T.M.C. Therefore, duty will be 7.5 acres/mcft, and the delta will be 3 feet.

The area commanded under this Scheme lies in Tasgaon and Miraj Talukas of Sangli District (page 13 of MRPK-28). The average annual rainfall of Tasgaon Taluka over a period of 27 years was 22 inches and that of Miraj Taluka was 22.12 inches (Column 13, page 151 of MR-8). It is contended
641 by the State of Maharashtra that both these Talukas have had low annual rainfall during the ten years 1949 to 1958. The Miraj Taluka had an annual rainfall of less than 22.12 inches in five years (1949, 1951, 1952, 1954 and 1958), the lowest annual rainfall being 12.59 inches. The Tasgaon Taluka during these ten years had an annual rainfall less than 22 inches in four years (1949, 1952, 1954 and 1958), the lowest annual rainfall being 16.29 inches (Statement 'B' at page 151 of MR-8). At page 13 of MRPK-28 it is stated that, "there is a vast culturable land potential in the Yerala basin in dire need of irrigation as it is chronically scarcity-affected area. The Yerala river itself has very meagre water resources as the river rises-and flows through very low rainfall areas and the small quantity of water in the river cannot cater to the irrigation requirements of the vast lands in its basin." The State of Maharashtra has given top priority to this Project in their priority list.

In MRPK-31, the State of Maharashtra has indicated that part of the ayacut proposed under this Project is being irrigated from bandharas and lift irrigation schemes which have come into operation after 1960. As given under item I(j) (iii) of MRPK-31, the area irrigated under these bandharas and lift irrigation schemes is 3,556 acres of cane and 7722 **642** acres of seasonal crops, and the corresponding utilisation is 1.865 T.M.C.

In the remarks column against Sr. Nos. 8 and 10 of Statement III attached to MR Note 26, the Maharashtra State has submitted that in case the Tribunal does not allow further westward diversion from the Koyna storage, the scope of the Koyna-Krishna Lift Scheme could be increased to 32.5+21.6 = 54.1 T.M.C., for which an adequate area requiring irigation exists in the Yerala Valley in Talukas of Walva, Tasgaon and Kavthe-Mahankal (formerly part of Jath Taluka) in Sangli District. Walva Taluka has an average annual rainfall of 26-06 inches (10 years average rainfall of the years 1949 to 1958) and Jath Taluka has an average rainfall of 20.72 inches (27 years average of the years 1930 to 1958)—vide Statement 'B' at page 151 of MR-8. Jath Taluka has been classified as a "scarcity" Taluka in that report and also in the Irrigation Commission Report of 1972 (Vol. I, page 422). It is contended that an additional diversion of 32.5 T.M.C. for irrigating the areas in the Yerala Valley would go a long way towards alleviating the scarcity conditions in Jath and Kavthe-Mahankal Talukas of Sangli District, and in **643** offsetting the vagaries of rainfall in Tasgaon and Walva Talukas.

In our opinion the demand for 23.4 T.M.C. as shown in the Project Report for irrigating 1,76,000 acres of scarcity areas in Tasgaon and Miraj Talukas of Sangli District is worth consideration. This will cover the demand for bandharas (item No. I(j) (iii)—MRPK-31).

WANG PROJECT **644**

The note on the Wang Project is given at pages 78 to 121 of MRPK-26.

The Project envisages the construction of a storage on the Wang river, a right bank tributary of the Koyna river, at Gude Maldan in Patan Taluka of Satara District for irrigation of an ayacut of 42,023 acres (cropped area 56,276 acres). The planned gross utilisation is 12.1 T.M.C.

There are existing weirs, bandharas and lift irrigation schemes in the commanded area of the Wang Project. The area irrigated by these existing bandharas is 11,657 acres (3487 acres cane, and 8,170 acres seasonal crops). The water utilisation by these works is 1.83 T.M.C. *(vide* item I(j) (v) of MRPK-31).

The gross storage is 11.38 T.M.C. and the live storage capacity is 8.18 T.M.C. The annual evaporation losses are 1.16 T.M.C. *(vide* page 78, Sr. No. 5 i, 5 iii and 5 v of MRPK-26).

Out of 56,276 acres of proposed irrigation, 38,596 acres are to be irrigated in Zone I (rainfall above 30 inches) and 17,680 acres in Zone II (rainfall below 30 inches).

645 For irrigating 56,276 acres the net diversion at canal head is 10.94 T.M.C. *(vide* page 88 MRPK-28). The duty will work out to 5.14 acres/mcft. The delta will work out to 4.5 feet.

The commanded areas lies in Patan and Karad Talukas of Satara District and Walva Taluka of Sangli District. The average annual rainfall (average of 10 years) of Patan Taluka is 69.5 inches and that of Karad Taluka is 32.1 inches *(vide* page 133 of MR-8). The 10 years average annual rainfall of Walva Taluka is 26.06 inches *(vide* page 151 of MR-8).

In view of the intensity of rainfall and other factors, the demand for this Project is not worth consideration for the present. The demand for bandharas will be considered separately.

646 WARNA PROJECT

The Project Report of this Project submitted to the Central Water and Power Commission (C.W. & P.C.) in 1964 (MRPK-5 and 6) provided :—

(a) A storage on the Warna river at Khujgaon with a gross capacity of 87.2 T.M.C.

(b) Right and Left Bank Canals to irrigate 1,40,550 acres and 1,90,100 acres respec tively—total 3,30,650 acres.

(c) Lift Irrigation of 22,150 acres on the Right Bank and 11,150 acres on the Left Bank—total 33,300 acres *(vide* para 1.1.01, page l, MRPK-4).

(d) Gross utilisation 57.25 T.M.C. *(vide* pages 16 and 17, MRPK-4).

While clearing the Project the Central Water and Power Commission deleted the lift irrigation of 33,300 acres (page 5, MRPK-6). The Project was sanctioned for a diversion of 40.50 T.M.C. (page 5, para 3.3.00, and page 6, para 3.5.01, MRPK-6) and for the irrigation of an ayacut of 1,99,000 acres (page 11, MRPK-6) by flow irrigation only. The cropped area proposed to be irrigated was 2,41,800 acres (para 9.1.02, page 19, MRPK-6). The gross 647 storage of 87 T.M.C. (page 7, MRPK-6) was, however, sanctioned without reduction. The estimated evaporation losses are 7,07 T.M.C. (page 17, MRP.K-4). This Project has been protected for the gross utilisation of 47.7 T.M.C.

The State of Maharashtra had claimed 9.8 T.M.C. at Sr. No. 11 of MRK-II, page 53 for the lift irrigation area which was deleted at the tune of the sanction of the Warna Project by the Government of India.

The crops that are proposed to be irrigated under the lift irrigation scheme are (page 204, MRPK-5)—

1. Sugar-cane	11,300 acres
2. Long Staple Cotton . . .	11,000 acres
3. Two Seasonals	11,000 acres
TOTAL	33,300 acres

With a utilisation of 9.8 T.M.C. (or 9.7 T.M.C. as in MR Note 30) the duty and delta will work out to—

Duty 3.43 acres/mcft.

Delta 6.7 feet.

The area proposed to be irrigated lies in Shirala and Walva Talukas of Sangli District and Panhala, Hatkanangale and Shirol Talukas of Kolhapur District (page 7 of MRPK-5). The average annual rain- 648 fall in each of these Talukas is as below:—

Shirala . . .	36.0 inches	Page 151 of MR-8
Walva . . .	26.1 inches	
Panhala . . .	66.2 inches	Page 118 of MR-8
Hatkanangale . .	29.2 inches	
Shirol . . .	29.1 inches	

There are six bandharas on the Warna river irrigating 8487 acres of sugar-cane and 80 acres of seasonal crops utilising 3.11 T.M.C. of water, and these areas would be merged with this scheme for 9.7 T.M.C. utilisation. (Item I(c) in MRPK-31).

In our opinion, allocation of 9.8 T.M.C. for this Project is not worth consideration. Part of the demand may be met by effecting economy in utilisation in the main project. The demand for the bandharas will be considered separately.

649 KADVI IRRIGATION PROJECT

The Project Report for the Kadvi Multipurpose Project is at pages 57 to 112 of MRPK-27.

The Project envisages the construction of a storage on the Kadvi river near Nivla Village in Shahuwadi Taluka of Kolhapur District. The Kadvi river is a right bank tributary of the Warna river joining it below the Khujgaon Dam. It was proposed to divert 7.6 T.M.C. for power generation to the west, 5 T.M.C. for irigating the ayacut of 14,800 acres in the Valley on the eastern side by lift irrigation.

With 3 T.M.C. for evaporation losses, the total proposed utilisation was 15.6 T.M.C. The gross storage provided at Nivla is 38.45 T.M.C. of which 14.95 T.M.C. is the live storage *(vide* page 6. Sr. No. V(a) and V(b) in MRPK-27).

This Project has not been sanctioned by the Government of India so far.

The ayacut of 14,800 acres is proposed to be irrigated under the following crops (page 96, Appendix-6, of MRPK-27):—

1. Sugar-cane	9,768 acres
2. Paddy	3,552 acres
3. Khariff Vegetables . . .	1,480 acres
TOTAL	14,800 acres

650 The duty and delta for irrigating 14,800 acres with a utilisation of 5 T.M.C. would work out to—

Duty	2.96 acres/mcft.
Delta	7.8 feet

The Project is intended to irrigate areas in Shahuwadi Taluka of Kolhapur District. The recorded average annual rainfall of Shahuwadi Taluka is 75.9 inches (page 118 of MR-8).

In MR Note 26, the State of Maharashtra had contended that in case westward diversion for power generation is disallowed, it would still be possible to use beneficially the entire 12.6 T.M.C. for irrigation on the eastern side in the Kadvi Valley. Later, in MR Note 30, the State of Maharashtra has submitted that in case westward diversion for power generation is not permitted, 8 T.M.C. may be allowed for irrigation on the eastern side instead of 5 T.M.C. shown for irrigation in the Master Plan.

We have already rejected any diversion for irrigation westwards after considering all the relevant materials. Looking to the intensity of rainfall and other factors, we are of the opinion that any demand for water for irrigation eastwards is also not worth consideration for the present.

KASARI HYDRO ELECTRIC PROJECT 651

AND

KALJEWADI LIFT IRRIGATION SCHEME

These two Projects have been considered together by the State of Maharashtra in MR Note-30. The Kasari Project, as shown in the Master Plan and in the Project Report (MRPK-7 and 8) contemplated the diversion of 31.88 T.M.C. to the west for power generation and irrigation in Konkan; no irrigation was provided on the eastern side. The Kasari Multipurpose Project was submitted in 1966 to the Central Water and Power Commission (C.W. & P.C.), but it has not been cleared so far by the Government of India. The Project for irrigation on the eastern side, as envisaged in this note, has not been cleared by the Government of India.

The Kaljewadi Lift Irrigation Scheme envisages the construction of a storage dam near Pisatri Village in Kolhapur District. The water stored by this dam is to be let down into the river and lifted downstream at five pick-up weirs on the Kasari river to irrigate an ayacut of 25,100 acres in Panhala Taluka of Kolhapur District. The Kaljewadi Storage at Pisatri is on the Kaljewadi nallah, which is a right bank tributary of the Kasari river. The gross storage at the Kaljewadi Dam is 7.45 T.M.C. and the live storage is 7.37 T.M.C. (Page 39, Annexure II of MRPK-28). The net utilisation under the scheme is 7.4 T.M.C. for irrigation; with 0.6 T.M.C. evaporation losses, the gross utilisation would be 8 T.M.C. in all. This Project also has not been cleared so far by the Government of India. 652

The ayacut of 25,100 acres was proposed to be irrigated under the following crops (Annexure IV at page 42 of MRPK-28) :—

1. Sugar-cane	16,566 acres
2. Paddy	6,024 acres
3. Khariff Vegetables . .	2,510 acres
TOTAL	25,100 acres

To irrigate 25,100 acres it was proposed to utilise 7.4 T.M.C. The duty and delta would work out to:—

Duty 3.4 acres/mcft.

Delta 6.75 feet.

The commanded area lies in Panhala Taluka which has an average annual rainfall of 66.2 inches (page 118 of MR-8).

In MR Note 30, the State of Maharashtra has contended that if westward diversion for the Kasari
653 Power Project is not permitted, it may be allowed to combine the Kasari Storage with the Kaljewadi. Scheme and utilise 12 T.M.C. instead of 8 T.M.C. under the Kaljewadi Scheme for the irrigation of lands in the Kasari Valley.

It is stated that there are already existing weirs, bandharas and lift irrigation schemes (Item I (e) of MRPK-31) on the Kasari river irrigating 5,565 acres of cane and 247 acres of Khariff and Rabi seasonals in the proposed ayacut of the Kaljewadi Scheme utilising 2.08 T.M.C. of water.

We have already rejected any diversion for irrigation westwards after considering all the relevant materials. Looking to the intensity of rainfall and other factors, we are of the opinion that any demand for water for both these projects is not worth consideration for the present. The demand for bandharas will be considered separately.

654 KUMBHI MULTIPURPOSE PROJECT

The Report on the Kumbhi Multipurpose Project is at pages 1 to 51 of MRPK-27.

The Project envisaged construction of a storage on the Kumbhi river near Shenwadi Village in Gaganbawda Taluka of Kolhapur District. The gross use planned was 17.5 T.M.C. of which 9.5 T.M.C. was to be diverted westward for power generation and irrigation in Konkan, 6.0 T.M.C. was to be used for irrigating an ayacut of 18,000 acres on the eastern side and the balance 2 T.M.C. was allowed for evaporation losses. This Project has not been sanctioned by the Government of India. The proposed gross storage was 19.77 T.M.C. with a live storage capacity of 17.07 T.M.C. (page 1 of MRPK-27):—

The crops proposed to be irrigated using 6 T.M.C. on the eastern side are as under (page 4 and page 38 of MRPK-27): —

1. Sugar-cane	11,880 acres
2 Paddy	4,320 acres
3. Khariff Vegetables . . .	1,800 acres
TOTAL . . .	18,000 acres

655 The duty and delta, therefore, would work out to:—

Duty 3 acres/mcft.

Delta 7.6 feet.

The ayacut lies in Karvir Taluka of Kolhapur District. The average annual rainfall of Karvir Taluka is 34.2 inches (page 118 of MR-8).

The State of Maharashtra in MR Note No. 26 have contended that if westward diversion for power generation of 9.5 T.M.C. is not permitted, it could and would use the entire17.5 T.M.C. for irrigation on the eastern side. Subsequently, in MR Note 30, they have claimed a total use of 10 T.M.C. only (including evaporation losses for this Project).

It is pointed out that there are already existing weirs, bandharas and lift irrigation schemes on the Kumbhi and Dhamni rivers serving part of the ayacut of 18,000 acres, proposed under this Project, irrigating 2983+480=3463 acres of cane and 204 acres of Rabi seasonals and utilising 1.33 T.M.C. of water *(vide* item Iff) and I(g), MRPK-31)

We have already rejected any diversion for this Project for irrigation westwards after considering all the relevant materials. Looking to the intensity of rainfall and other factors, we are of the opinion that
656 any demand for water for irrigation eastwards is not worth consideration for the present. The demand for bandharas will be considered separately.

PHONDA IRRIGATION PROJECT 657

The note on the Phonda Multipurpose Project is given at pages 29 to 32 of MRPK-28.

The Project envisages the construction of a storage on the Bhogawati River, a tributary of the Panchaganga near Asne village, 8 miles upstream of the existing Radhanagari Reservoir in Radhanagari Taluka of Kolhapur District. It was proposed to divert 3.67 T.M.C. towards the west for power generation and irrigation of 9,000 acres in Ratnagiri District. No irrigation was contemplated on the eastern side *(vide* pages 31 and 32 of MRPK-28).

The proposed gross storage is 4.0 T.M.C. and the proposed live storage is 3.7 T.M.C. The fair weather lake losses are 0.25 T.M.C. *(vide* page 31, MRPK-28).

This Project has not been sanctioned by the Government of India.

In Col. 10 of MR Note 30 it was urged by the State of Maharashtra that if the westward diversion of 4.2 T.M.C. is not permitted by the Tribunal, 3.0 T.M.C. should be permitted to be used for irrigation in the Bhogavati valley as adequate cultivable land is available in that valley. In MR Note 26, it is clarified that
658

this irrigation will be in Karvir Taluka of Kolhapur District. The ten years average annual rainfall of Karvir Taluka is 34.2 inches *(vide* page 118 of MR-8).

We have already rejected any diversion for this Project for irrigation westwards after considering all the relevant material. Looking to the intensity of rainfall and other factors, we are of the opinion that any demand for water for irrigation eastwards is not worth consideration for the present.

659 VEDGANGA IRRIGATION PROJECT

The State of Maharashtra has prepared a Project Report in three volumes of the combined "Hiranyakeshi and Vedganga Multipurpose Project" which are in MRPK-9, MRPK-10 and MRPK-11. The Project has not yet been cleared by the Government of India.

The Vedganga Project envisaged the construction of a storage on the Vedganga River near the village Nandoli in Bhudargad and Kagal Talukas of Kolhapur District. It was proposed to divert 19.98 T.M.C. westwards for power generation and irrigation in Ratnagiri District. It was also proposed to divert 4.0 T.M.C. for irrigating 12,850 acres on the eastern side *(vide* MRPK-11, page 3, para 1.2.04 and page 10 of MRPK-9).

There are already existing weirs, bandharas and lift irrigation schemes in the proposed commanded area of the Vedganga Irrigation Project covering the irrigation of 4,522 acres (4392 acres sugar-cane and 130 acres Rabi seasonals) and utilising 1.64 T.M.C. *(vide* item I(d) of MRPK-31).

In the Master Plan, the demand for irrigation on the eastern side was shown as 4.0 T.M.C. to irrigate 12,000 acres *(vide* MRK-II page 53 item 17) while in the Project Report, it was 3.2 T.M.C. for the fair-weather irrigation and 0.71 T.M.C. for the monsoon irrigation, totalling 4.03 T.M.C. to irrigate 12,850 acres *(vide* page 31 of MRPK-9):— 660

The crops proposed for irrigation on the eastern side are (page 27 of MRPK-9).

Sr. No.	Crop	Percentage	Area in Acres
1.	Sugar-cane . . .	66	8,481
2.	Paddy	24	3,084
3.	Khariff Vegetables . .	10	1,285
			12,850

For irrigating 12,850 acres, the net diversion proposed at the canal head is 4.03 T.M.C. Therefore, the duty will be 3.22 acres per mcft. The delta will be 7.14 feet.

The commanded area lies in Bhudargadh and Kagal Talukas of Kolhapur District *(vide* page 20 of MRPK-10). The 10 years' average annual rainfall of Bhudargadh Taluka is 71.9 inches and that of Kagal Taluka is 29.6 inches *(vide* page 118 of MR-8).

It is claimed that this Project would firm up the irrigation on the existing bandharas covering 4522 acres in the command of this Project with a utilisation of 1.64 T.M.C. of water (item I(d) of MRPK-31). 661

In MR Note 26, the State of Maharashtra has contended that if westward diversion for power generation and irrigation is not permitted for this Project, then 17 T.M.C. could be beneficially utilised for irrigation on the eastern side. Later, in MR Note 30, the State of Maharashtra has claimed only 10 T.M.C. for irrigation on the eastern side for this Project.

We have already rejected any diversion for this Project for irrigation westwards after considering all the relevant material. Looking to the intensity of rainfall and other factors, we are of the opinion that any demand for water for irrigation eastwards is not worth consideration for the present. The demand for bandharas will be considered separately.

DUDHGANGA PROJECT 662

The Report on the Dudhganga Project is given in MRPK-15.

The Dudhganga Project Report was first submitted to the Central Water & Power Commission (C.W. & P.C.) in 1964 to irrigate 1,16,000 acres in Maharashtra State only. The C.W. & P.C. suggested extension of the benefits of irrigation to the adjoining Mysore area and also a modification in the yield of water on the basis of the actual gauging data at Radhanagari. The modified Project (MRPK-15) was submitted to the C.W. & P.C. in October 1967, as a joint Project for the benefit of Mysore and Maharashtra. The Project has not been cleared so far by the Government of India.

This Project envisages construction of:—

(a) A storage dam and reservoir on the Dudhganga River near Assangaon in Radhanagari Taluka of Kolhapur District.

(b) A Left Bank Canal to irrigate an ayacut of 86,800 acres with a cropped area of 1,13,900 acres in Maharashtra and Mysore States.

663 (c) A Right Bank Canal to irrigate an ayacut of 44,800 acres with a cropped area of 64,700 acres in Maharashtra and Mysore States.

The gross storage proposed is 31.34 T.M.C. with a live storage 29.54 T.M.C. Evaporation losses are estimated at 1.8 T.M.C. (page 2 Sr. No. V(i)(iii) & (vi) of MRPK-15). The total ayacut is 1,31,600 acres, of which 99,500 acres lie in Maharashtra and 32,100 acres lie in Mysore (MRPK-15 page IV). The proposed total irrigation is 1,78,600 acres of which 1,36,600 acres lie in Radhanagari, Bhudargadh, Karvir, Kagal, Hatkanangale and Shirol Talukas of Kolhapur District of Maharashtra State and 42,000 acres lie in Chikodi Taluka of Belgaum District of Mysore State (MRPK-15 page 6).

The zone-wise distribution of irrigated area in the two States and the water requirements in the zones are given on the next page (pages 52, 56, 58 and 60 of MRPK-15):--

664

Zone	Cropped area in acres in Maharashtra	Water required in Maharashtra-in T.M.C.	Located in talukas of Maharashtra	Cropped area in acres in Mysore	Water required in Mysore in T.M.C.	Located in talukas of Mysore	Total cropped area in acres	Total water required in T.M.C.
1	2	3	4	5	6	7	8	9
Zone I-rain-fall above 50 inches, vide Index Map at the end of MRPK-15	35,700	5.00	Radhanagari and Bhudargadh	••	••	••	35,700	5.00
Zone II-rain-fall between 30 inches & 50 inches, vide same Map as above	38,200	5.99	Karvir	10,800	1.69	Chikodi	49,000	7.68
Zone III-rain-fall less than 30 inches, vide same Map as above .	62,700	14.31	Kagal Hatkanangale Shirol	31,200	7.11	Chikodi	93,900	21.42
TOTAL	1,36,600	25.30		42,000	8.80		1,78,600	34.10

665 It is thus seen that a proposed cropped area of 62,700 acres, having rainfall less than 30 inches lies in Maharashtra and a proposed cropped area of 31,200 acres having rainfall less than 30 inches lies in Mysore.

The Project envisages a total utilisation of 34.10 T.M.C. at Canal head for an irrigation of cropped area of 1,78,600 acres. The duty, therefore, will be 5.25 acres/mcft. The delta will be 4.35 feet.

The average annual rainfall in the commanded area in Maharashtra is given below. The average annual rainfall in Talukas of Kagal, Hatkanangale and Shirol are less than 30 inches (page 48 of MR-8):—

Taluka	Average annual rainfall
1. Radhanagari	158.0
2. Bhudargadh	71.9
3. Karvir	34.2
4. Kagal	29.6
5. Hatkanangle	29.2
6. Shirol	29.1

The average annual rainfall in Chikodi Taluka of Belgaum District of Mysore State is less than 30 inches.

As mentioned above the water requirements of Maharashtra for area in Zone III *i.e.* having rainfall less than 30" is 14.31 T.M.C. Adding 1.3 T.M.C. as proportionate lake losses the total requirement works out to 14.31 + 1.3 = 15.61 T.M.C. In MR Note 30, a quantity of 18.0 T.M.C has been claimed from the dependable flow for the Project. 666

There are already six existing weirs, bandharas and lift irrigation schemes in the proposed commanded area of the Dudhganga Project, irrigating 4744 acres and utilising 1653 mcft. (item I(b) of MRPK-31). In the priority list filed by the State of Maharashtra, this Project is given high priority and is included in Group 'A'.

Looking to the facts that this is a joint project of the States of Maharashtra and Mysore, that the State of Maharashtra has attached high priority to this Project and that now the demand for water is mainly confined to the area under Zone No. III, we

are of the opinion that demand for this Project to the extent of 14 T.M.C. is worth consideration. This will cover the demand for bandharas on the Dudhganga river.

667 MORNA PROJECT

The note on the Morna Project is given at page 1 of MRPK-29.

The Project envisages the construction of a storage reservoir on the Morna river in Shirala Taluka of Sangli District to irrigate 6,030 acres (4,230 acres by flow and 1,800 acres by lift) and utilising 1.6 T.M.C. gross.

It is proposed to irrigate an ayacut of 6030 acres. The following crops are proposed to be irrigated:—

Sr. No.	Crop	Percentage	Area in acres
1.	Perennials	25	1,510
2.	Kharif Seasonal	20	1,205
3.	Rabi Seasonals	35	2,110
4.	Two Seasonals	15	905
5.	Hot Weather Seasonals .	5	300
	TOTAL	100	6,030

For irrigating 6,030 acres the proposed net diversion at canal head is 1,386 mcft. The duty will be 4.35 acres per mcft. and the delta will be 5.44 feet.

668 The commanded area lies in Shirala Taluka of Sangli District. The ten years average annual rainfall of Shirala Taluka is 36.0 inches (vide page 151 of MR-8).

Looking to the rainfall and other factors, the demand for this Project is not worth consideration.

669 PHAYE PROJECT

The note on the Phaye Project is given at page 2 of MRPK-29.

The Project envisages the construction of a storage reservoir on a left bank tributary of the Vedganga river near Phaye in Bhudargadh Taluka of Kolhapur District to irrigate, by lift, an ayacut of 7,200 acres and utilising 1.4 T.M.C. of water.

The ayacut proposed to be irrigated is 7,200 acres and the following crops are proposed to be irrigated :—

Sr. No.	Crop	Percentage	Area in acres
1.	Perennials	25	1,800
2.	Kharif Seasonals	20	1,440
3.	Rabi Seasonals	35	2,520
4.	Two Seasonals	15	1,080
5.	Hot Weather Seasonals . . .	5	360
	TOTAL	100	7,200

For irrigating 7,200 acres, the proposed net diversion at the canal head is 1,200 mcft. The duty, therefore, will be 6 acres/mcft. and the delta will be 3.84 feet,

The commanded area lies in Bhudargadh Taluka of Kolhapur District. The ten years average annual rainfall of Bhudargadh Taluka is 71.9 inches (vide page 118 of MR 8). 670

Looking to the intensity of rainfall and other factors, the demand for this Project is not worth consideration.

HIRANYAKESHI IRRIGATION PROJECT 671

The State of Maharashtra has prepared a Project Report of the combined "Hiranyakeshi and Vedganga Multipurpose Project" which is MRPK-9, MRPK-10 and MRPK-11.

The Hiranyakeshi Project envisages construction of a storage reservoir on the Hiranyakeshi River near Arja village in Arja Mehal of Kolhapur District. It is proposed to divert westwards ex-Vedganga Reservoir 24.21 T.M.C. for power generation and irrigation in Ratnagiri District. It is also proposed to divert 6.73 T.M.C. for irrigating 21,440 acres on the eastern side in the valley (vide pages 30 and 31 para 2.11.02 of MRPK-9).

The gross storage at Ajra is 27.45 T.M.C. and the live storage is 26.48 T.M.C. The annual evaporation losses are estimated as 2.40 T.M.C. (vide page
II Sr. No. 51, 5iii and 5vi).

The Project has not been cleared by the Government of India.

There are already existing weirs, bandharas and lift irrigation schemes in the proposed command of this Project irrigating 4,604, acres (4560, acres of sugar-cane, and 44 acres Rabi seasonals), and utilising 1.69 T.M.C. of water (vide item III (a) of MRPK-31)- 672

In the Master Plan, a requirement of 5.0 T.M.C. to irrigate 14,500 acres is claimed (vide page 54 item 27), while in the Project Report, the requirement is 6.73 T.M.C. (5.54 T.M.C. in the fair weather and 1.19 T.M.C. in monsoon) for irrigation of 21,440 acres (vide page 31 of MRPK-9).

For irrigating 21,440 acres, the proposed net diversion at the canal head is 6.73 T.M.C. Therefore, the duty will work out to 3.18 acres per mcft. The delta in feet would be 7.20 feet.

The ayacut lies in Arja Mahal and Gadhinglaj Taluka of Kolhapur District (vide page 20 of MRPK-10). The ten years average annual rainfall of Arja Mahal is 74.8 inches and that of Gadhinglaj Taluka is 39.2 inches (vide page 118 of MR-8).

It is claimed by the State of Maharashtra that this Project would firm up the irrigation on the existing seven bandharas irrigating 4,604 acres in the command of this Project utilising 1.69 T.M.C. of water. Of these seven bandharas, Kochari and Gotur bandharas were constructed prior to 1960; but it is
673 claimed that utilisations on them have not been protected.

In MR Note 26, the State of Maharashtra has claimed that if the westward diversion for power generation and irrigation is not permitted on this Project, then 27.2 T.M.C. can be and should be permitted to be utilised for irrigation on the eastern side. Later, in MR Note 30, the State of Maharashtra has claimed only 12 T.M.C. for irrigation on the eastern side for this Project.

Looking to the intensity of rainfall and other factors, demand for this Project is not worth consideration for the present. Demand for existing bandharas will be considered separately.

674 GUDAVALE LIFT SCHEME

The note on the Gudavale Lift Irrigation Scheme is given at pages 173 to 186 of MRPK-28.

The Project envisages the construction of a storage reservoir on the Ghataprabha river near Kolhapur District, and letting down water into the river for lift irrigation schemes by constructing pick-up-weirs downstream. The total irrigation contemplated is 11,270 acres with gross utilisation of 3.74 T.M.C. (page 176 para 4.4 of MRPK-28).

The gross storage of the dam is 3.57 T.M.C. and the live storage is 3.43 T.M.C. The annual lake losses being estimated to be 0.42 T.M.C. (vide page 176 MRPK-28).

In the Master Plan, a requirement of 3.1 T.M.C. for irrigation of 8,400 acres is shown. In the Project Note, the utilisation contemplated is 3.74 T.M.C. for the irrigation of 11,270 acres.

There are already existing weirs, bandharas and lift schemes in the proposed command of this Project, irrigating 3,692 acres (3578 acres of sugar-cane and 114 acres Rabi seasonals) and utilising 770+395 = 1165 T.M. Cft. say 1.2 T.M.C. (vide items IIIb and IIIc of MRPK-31). 675

For irrigating 11,270 acres with the proposed net diversion at canal head of 3.32 T.M.C., the duty would be 3.4 acres per mcft. The delta will be 6.8 feet.

The commanded area lies in Chandgadh and Gadhinglaj Talukas of Kolhapur District. The ten-years average annual rainfall of Chandgadh Taluka is 115.7 inches and that of Gadhinglaj Taluka is 39.2 inches (vide page 118 of MR-8).

Under the existing weirs, bandharas and lift irrigation schemes 1.2 T.M.C. is already being utilised from the water of the river Ghataprabha. The demand for this Project being only for 3.1 T.M.C. (including 1.2 T.M.C.) is worth consideration.

MUTHA SYSTEM EX-KHADAKWASLA 676

The report on the Mutha System Ex-Khadakwasla is given at pages 137 to 160 of MRPK-28.

The Khadakwasla Project consists of three storages at Panset, Warasgaon and Khadakwasla and a Right Bank Canal from the Khadakwasla Dam, 152 miles long, to irrigate 1,28,000 acres. Besides this, the Project also assures the irrigation on the existing Left Bank Canal and caters partly to the water supply requirements of the Poona City, the National Defence Academy and the Central Water and Power Research Station, Khadakwasla. It is proposed to utilise 33.1 T.M.C. gross at Khadakwasla, of which 25.9 T.M.C. is for irrigation and 5.0 T.M.C. is for the aforesaid water supply requirements. The annual lake losses from the three lakes are estimated to be 2.2 T.M.C.

However, the Project as cleared by the C.W. & P.C. contemplates a total utilisation of 23.5 T.M.C. only, including 3.1 T.M.C. as water supply to Poona and Kirkee and an irrigation of 77,000 acres (page 144 of MRPK-28). The length of the canal sanctioned is only 101 miles (page 137 ibid). The Khadakwasla Project has been protected for a use of 23.5

677 T.M.C. The Project Report for the utilisation of an additional 9.6 T.M.C. has not yet been cleared by the Government of India.

In the Master Plan, the requirement of water for this Project is shown to be 34.2 T.M.C. (33.1 T.M.C. from the dependable flow, and 1.1 T.M.C. from regeneration), for the irrigation of an area of 1,28,000 acres.

The additional area proposed to be irrigated under this Project (by increasing the capacities of the storages at Panset and Warasgaon and by the extension of the Right Bank Canal by 51 miles) is 1,28,000—77,000 = 51,000 acres, and the corresponding additional cropped area is 58,140 acres.

For irrigating 58,140 acres the annual diversion proposed is 9.6 T.M.C. Therefore, duty will be 6.06 acres per mcft., and the delta will be 3.8 feet.

The commanded area between mile 101 to mile 152 of the Right Bank Canal lies in Indapur Taluka of Poona District (Refer Index Map at page 160 MRPK-28). The average annual rainfall of Indapur Taluka over the period of 27 years is 24.46 inches (column 13 page 221 of MR-8). Indapur Taluka has been classified as a 'B' type scarcity area (vide page 13 of MR-7). The Irrigation Commission Report, 1972, has also identified this Taluka as a drought-prone area (vide Appendix 8-1 page 422 of its report in Volume I). The Government of Maharashtra has given a high priority to this Project in their priority list.

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In our opinion, additional demand of 9.6 T.M.C. for this Project is worth consideration, as it will irrigate 51,000 acres in scarcity areas of Maharashtra.

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KUKADI PROJECT

(Additional)

The report on the Kukadi Project is given in MRPK-17.

The integrated Kukadi Project submitted to the Central Water and Power Commission in April, 1965 had the following features:-—

(a) Storages on:—

(i) the Kukadi River at Manikdoh and Yedgaon;

(ii) the Ar River at Pimpalgaon Joge;

(iii) the Ghod River at Dimbhe Bk; and

(iv) the Mina River at Wadaj.

(b) A pick-up-weir at Basti Savargaon.

(c) The canal system for irrigation of 1,20,212 acres in the Ghod and Mina valleys and Pushpavati canals, and 1,45,728 acres from the Kukadi Left Bank Canal ex-Yedgaon (MRPK-17, page 21). The total irrigation contemplated was 2,65,940 acres with total utilisation of 42.91 T.M.C. (net use 40.0 T.M.C. and annual evaporation losses 2.91 T.M.C.).

The Planning Commission has cleared only a part of the Project under their Letter No. II-10(1) (14) / 68-IP dated the 4th October, 1968 for the annual irrigation of 1,45,728 acres from the Kukadi Left Bank Canal System for a gross utilisation of 20.07 T.M.C. 680

This Project has been protected for a utilisation of 20.07 T.M.C. The water claimed now is for providing irrigation in the remaining area of 2,65,940—1,45,728 = 1,20,212 acres. The utilisation claimed is 42.91—20.07 = 22.84 T.M.C.

In the Master Plan (vide MRK-II, page 55, Sr. No. 3.2), the requirement of water for this Project has been shown as 38.9 T.M.C. from the 75 per cent dependable flow and 2.0 T.M.C. from regeneration flow for irrigating 2,98,100 acres. The sanctioned utilisation is 20.07 for irrigating 1,45,728 acres. In MR Note 26 and in MR Note 30 a requirement of 38.9—20.07 = 18.83 T.M.C., say 18.9 T.M.C. has been claimed for the Kukadi Project. The balance area proposed to be irrigated is 2,98,100—1,45,728 = 1,52,272 acres.

In MR Note-33, it has been stated:—

"The area of irrigation proposed in the Kukadi Project was 2,65,940 acres and the net diversion, 40 T.M.C. (vide MRPK-17, page XII). The talukas proposed to be served were Ambegaon, Junnar and Sirur Talukas of Poona District and Parner and Shrigonda Talukas of Ahmednagar District (vide page 11, MRPK-17).

At the time of preparing the Master Plan, it was envisaged that in the ultimate stage of this Project with a net utilisation requirement of 38 T.M.C. (including 2 T.M.C. due to regeneration) the benefits of irrigation would spread to the larger area of 2,98,100 acres (column 9, Master Plan—MRK II, page 55, Sr. No. 32). This will be possible by extending the irrigation on the Kukadi Left 681

Bank Canal into Karjat Taluka of Ahmednagar District and Karmala Taluka of Sholapur District, which are chronically scarcity-affected areas and by reducing the intensity of irrigation".

The ayacut proposed to be irrigated by the part of the project yet to be cleared is 1,52,272 acres (2,98,100—1,45,728 acres).

For irrigating 1,52,272 acres, the proposed annual diversion being 18.0 T.M.C. the duty will be 8.45 acres/mcft.

The delta will be 2.74 feet.

The area proposed to be commanded by part of the Project not yet sanctioned lies in Shrigonda and Karjat Talukas of Ahmednagar District and in Karmala Taluka of Sholapur District. The average annual rainfall of Shrigonda Taluka over the period of 27 years is only 19.27 inches, and that of Karjat Taluka is only 22.69 inches (Sr. No. 11 and 12 page 182 of MR-8). The average annual rainfall of Karmala Taluka over the period of 27 years is only 22.96 inches (page 168 of MR-8). The rainfall in all these three Talukas is thus very low. These three Talukas have been classified as 'A' category scarcity areas *(vide* page 14 of MR-7). These three Talukas have also been identified, as drought-affected areas by the Irrigation Commission of 1972 *(vide* page 422 Appendix 8.1 of Vol. I of the Commission's Report). **682**

It is claimed that this Project will help in alleviating the scarcity conditions in the chronically-affected scarcity areas of Shrigonda, Karjat and Karmala Talukas, which are in dire need of irrigation facilities.

In our opinion the demand of 18.80 T.M.C. for this Project is worth consideration, as it will irrigate scarcity areas in Shrigonda, Karjat and Karmala Talukas of the State of Maharashtra.

683

CHASKAMAN IRRIGATION PROJECT

The report on the Chaskaman Project is given in the volumes I & II of MRPK-19 and MRPK-20.

This Project envisages the construction of—

(a) Storage reservoir on the river Bhima at the village Bibi in Khed Taluka of Poona District; and

(b) A Left Bank Canal from the storage for irrigation 72,000 acres in Khed and Sirur Talukas of Poona District.

The Chaskaman Project has not yet been cleared by the Government of India, but the State of Maharashtra has stated that this Project is already under construction as a scarcity work.

In the Master Plan, the requirement is shown to be 10.0 T.M.C. from regenerated flow for an irrigation of 72,000 acres. The Project Report, however, shows that the Project is planned for a utilisation of 10.19 T.M.C. of 75 per cent dependable flow. The storage proposed at Bibi has a gross capacity of 8.56 T.M.C. (page 1, MRPK-19) and live storage capacity of 7.60 T.M.C. (page ii, MRPK-19).

The Left Bank Canal has an ayacut of 72,000 acres in Khed and Sirur Talukas of Poona District. **684**

The Project proposes to utilise annually 9.22 T.M.C. at the canal head (page 14, MRPK-20) for an area of 72,000 acres of irrigation. The duty at canal head will be 7.8 acres per mcft. The delta will be 2.94 feet.

The area commanded lies in Khed and Sirur Talukas of Poona District. The average annual rainfall of Khed Taluka over the period of 10 years has been 23.0 inches and in Sirur Taluka over the same period of 27 years, it has been 18.98 inches (column 12 & 13, page 221 of MR-8). Sirur Taluka has been classified as 'A' type scarcity area *(vide* page 13 of MR-7).

The Irrigation Commission Report, 1972, has also identified Sirur Taluka as a drought-prone area *(vide* Appendix 8.1, page 422 of its report in Volume I).

The Government of Maharashtra has given priority for this Project in their priority list.

In MRK Vol. II at page 55, the State of Maharashtra has claimed 10 T.M.C. for this Project out of the water available on account of regeneration. It is very doubtful whether any water will be available for this Project out of the dependable flow if the water for other projects of the State of Maharashtra upstream is allowed. We have considered the demands for the upstream projects as worth consideration. In these circumstances, the demand for this Project is not worth consideration. **685**

NIRA SYSTEM EX-VIR **686**

(Additional)

The Report on the Nira System ex-Vir is given in MRPK-28 at pages 59 to 64.

The Nira System ex-Vir in operation at present comprises of the following:—

(a) An existing storage reservoir on the Yelwandi River at Bhatghar with a live storage of 24.2 T.M.C.

(b) An existing storage reservoir at Vir on the Nira River with a live storage of 9.4 T.M.C.

(c) Left and Right Bank Canals from the Vir Dam, 100 miles and 106.5 miles long respectively, for irrigating 76,000 acres and 1,79,000 acres respectively, i.e. totalling 2,55,000 acres and utilising 49.3 T.M.C.

This system is protected for a utilisation of 49.3 T.M.C.

It is proposed in addition to construct a storage reservoir on the Nira River at Nandgaon having a gross capacity of 12.42 T.M.C. and a live capacity of 12.20 T.M.C. The existing Nira Left Bank Canal will be remodelled to irrigate an additional area of
687 44,000 acres in Indapur Taluka of Poona District. The Right Bank Canal will be extended beyond the tail end to irrigate an additional area of 21,000 acres in Sangola Taluka of Sholapur District. The additional gross use on both these canals will be 15.9 T.M.C. and the net use will be 14.1 T.M.C. The proposed extension of irrigation from the Nira Canal has not been sanctioned by the Government of India.

In the Master Plan, a requirement of 16.2 T.M.C. is shown for this Project for irrigating an area of about 66,000 acres *(vide* item 40 page 56, MRK-II).

For irrigating a cropped area of 66,200 acres the annual diversion at canal head is 14.1 T.M.C. The duty, therefore, will be 4.7 acres/mcft.

The delta will be 4.86 feet.

The commanded area lies in Indapur Taluka of Poona District and Sangola Taluka of Sholapur District. The average annual rainfall of Indapur Taluka over the period of 27 years has been 24.46 inches *(vide* Col. 13 page 221 of MR-8) and that of Sangola Taluka over the same period of 27 years has been 19.59 inches (page 168 of MR-8). Indapur Taluka has been classified as 'B' type and Sangola Taluka
688 has been classified as 'A' type scarcity area (vide pages 13 and 14 of MR-7). These two Talukas have also been identified as drought-prone areas by the Indian Irrigation Commission of 1972 (vide Appendix 8.1 page 422 Vol. I of Commission's Report).

It is claimed that this Project would help in alleviating the acute scarcity conditions in Indapur and Sangola Talukas by providing much-needed additional irrigation facilities.

The Nira System Ex-Vir has already been protected to the extent of 49.3 T.M.C. This Project is an extension of that Project. Savings must be affected in the Nira System Ex-Vir to irrigate the area proposed to be irrigated under this Project. There were complaints of water logging in the Nira Valley. The demand for the Project is not worth consideration

BARHANPUR PROJECT 689

The note on the Barhanpur Project is given at page 6 of MRPK-29.

The Barhanpur Project envisages construction of a storage reservoir on the Karha River near Barhanpur village in Baramati Taluka of Poona District, for irrigating an area of 14,300 acres utilising 1.48 T.M.C. (gross).

It is proposed to irrigate an ayacut of 11,000 acres with the corresponding cropped area of 14,300 acres.

For the irrigation of 14,300 acres, the proposed net diversion at the canal head is 1,110 mcft. The duty will work out to 12.8 acres/mcft., and the delta will be 1.78 feet.

The commanded area lies in Baramati Taluka of Poona District. The average annual rainfall of Baramati Taluka over the period of 27 years has been 18.07 inches *(vide* page 221 of MR-8). This Taluka has been classified as 'B' type scarcity area *(vide* page 13 of MR-7).

It is claimed that this Project will go a long way in alleviating the scarcity conditions in the Baramati Taluka by providing irrigation facilities to this area.

In our opinion the demand of 1.48 T.M.C. for this Project is worth consideration.

BEGUMPUR LIFT IRRIGATION SCHEME 690

The note on the Begampur Lift Irrigation Scheme is given at pages 65 to 75 of MRPK-28.

The Project envisages construction of a barrage on the Bhima river near the village Kasur in Sholapur District and lifting water from this barrage into a Left Bank Canal to irrigate 60,000 acres in the scarcity affected South Sholapur Taluka. According to the project note in MRPK-28, the diversion proposed is

14.2 T.M.C. of which 8.2 T.M.C. is from regeneration flo ws and the balance 6.0 T.M.C. is from the 75 per cent dependable flows *(vide* para 5.2, page 68 of MRPK-28). In the Master Plan the planned diversion (lifting) is 15.4 T.M.C. (Sr. No. 45, column 6, page 56 of MRK-II), of which 5.3 T.M.C. is from 75 per cent dependable flow and the balance 10.1 T.M.C. is from regeneration flows. The net diversion proposed for irrigating 60,000 acres is 14.2 T.M.C. The duty and delta therefore will work out, as below:—

Duty = 4.25 acres/mcft.

Delta = 5.45 feet.

In MR Note 30, the State of Maharashtra has claimed 5.3 T.M.C. of the dependable flow for this Project. The ayacut is situated in South Sholapur
691 Taluka of Sholapur District (page 75 of MRPK-28).

The average annual rainfall of South Sholapur Taluka is 25.77 inches (Statement 'B' page 168 of MR-8). This Taluka has been identified as a scarcity area in the Fact Finding Committee Report (Pages 161, 166 and 167 of MR-8). The Indian Irrigation Commission has also identified South Sholapur Taluka as "Drought-affected" (page 422, Vol. I of Indian Irrigation Commission Report of 1972).

This Project which is a lift irrigation scheme involves construction of a barrage on the river Bhima itself. It is stated in the note on this Project that a large storage cannot be planned at the project site due to costly submergence problems and the scheme is limited to diverting the run-off of the river during the Khariff season and meeting the. fair weather requirements mainly by anticipating regeneration flow and the normal post-monsoon flow in the river. Unless a systematic study is undertaken about the yield in the river Bhima at the project site after taking into account the upstream utilisations, the demand for this Project cannot be considered favourably. The rainfall in the commanded area is about 26 inches. Taking all these things into consideration, in our opinion demand for this Project is not worth consideration for the present.

692 SINA AT NIMGAON GANGURDA PROJECT

This Project envisages the construction of a storage reservoir on the Sina River, a left bank tributary of the river Bhima, near the village of Nimgaon Gangurda in Karjat Taluka of Ahmednagar District, with an ayacut of 16,600 acres and corresponding irrigation (cropped area) of 18,260 acres. The gross utilisation proposed is 1.8 T.M.C.

For irrigating 18,260 acres, the proposed net diversion at the canal head is 1.38 T.M.C., and the duty will, therefore, work out to 13.3 acres per mcft. The delta will work out to 1.74 feet.

The commanded area lies in Karjat Taluka of Ahmednagar District. The average annual rainfall of Karjat Taluka over the period of 27 years has been 22.69 inches *(vide* page 196 of MR-8). This Taluka has been classified as 'A' type scarcity area *(vide* page 14 of MR-7). This Taluka has also been identified as a drought-affected area by the Indian Irrigation Commission of 1972 *(vide* Appendix 8.1 page 422, Vol. I of the Commission Report 1972) The Project is under construction *(vide* MR Note 26, Sr. No. 46) as a scarcity work.

It is claimed that this Project is essential for alle- 693
viating the scarcity conditions in Karjat Taluka by providing irrigation facilities to this area.

In our opinion demand of 1.7 T.M.C. for this project is worth consideration.

SINA AT KOLEGAON PROJECT 694

The note on the Sina At Kolegaon Project is given in MRPK-28 at pages 77 to 87.

This Project envisages the construction of a storage reservoir on the Sina river, a left bank tributary of the Bhima river, near Kolegaon village in Karmala Taluka of Sholapur District. The Right and Left Bank Canals from the storage reservoir would irrigate 44,200 acres in Karmala and Madha Talukas of Sholapur District and Paranda Taluka of Osmanabad District. The Project has not so far been approved by the Government of India.

The gross storage is 4.66 T.M.C. and the live storage is 2.95 T.M.C. The annual evaporation losses are estimated at 0.9 T.M.C. (vide page 81 paras 4.3 and 4.4 of MRPK-28).

The gross utilisation proposed is 4.5 T.M.C. and the net utilisation is 3.6 T.M.C. *(vide* page 81, para 4.3 of MRPK-28).

The area proposed to be irrigated is 39,000 acres and the corresponding cropped area proposed is 44,200 acres. For irrigating 44,200 acres, the net diversion at the canal head is 3.6 T.M.C. Therefore, the duty
will work out at 12.2 acres per mcft. and the delta 695
will be 1.89 feet.

The commanded area lies in Karmala and Madha Talukas of Sholapur District and in Paranda Taluka

of Osmanabad District. The average annual rainfall of Karmala Taluka over a period of 27 years has been 22.96 inches, and of Madha Taluka over the same period has been 21.23 inches (vide page 168 of MR-8). The average annual rainfall of Paranda Taluka over the 27 years' period has been 25.83 inches *(vide* page 79 of MR-8). Karmala Taluka has been classified as 'A' type and Madha Taluka is classified as 'B' type scarcity area (vide page 14 of MR-7). All the three Talukas have been identified as drought-prone areas in the Indian Irrigation Commission Report of 1972 (vide Appendix 8.1 page 422, Vol I of the Commission's Report).

It is claimed that this Project would help in alleviating the scarcity conditions in Karmala, Madha and Paranda Talukas by providing irrigation facilities.

In our opinion the demand of 4.5 T.M.C. is worth consideration.

696

HINGANI PANGAON PROJECT

The note on the Hingani Pangaon Project is given at page 13 of MRPK-29.

The Project envisages the construction of a storage reservoir on the Bhogavati River, a tributary of the Sina river, near Pangaon village in Barsi Taluka of Sholapur District, for an ayacut of 13.900 acres and corresponding irrigation (cropped area) of 16,680 acres utilising 1.50 T.M.C.

For irrigating 16,880 acres, the proposed net diversion at the canal head being 1,340 mcft. the duty will work oat at 12.4 acres per mcft, and the delta will be 1.84 feet.

The commanded area lies in Barsi Taluka of Sholapur District. The average annual rainfall in Barsi Taluka over the period of 27 years has been 27.91 inches (vide page 168 of MR-8). This Taluka has been classified as 'C' type scarcity area (vide page 14 of MR-7). This Taluka has also been identified as drought-prone area by the Indian Irrigation Commission of 1972 (vide Appendix 8.1 page 422, Vol. I of Commission's Report).

The Project is already under construction.

In our opinion the demand of 1.50 T.M.C. for this Project is worth consideration.

697

SINA LIFT SCHEME

The note on the Sina Lift Scheme is given at pages 91 to 101 of MRPK-28.

The scheme envisages the construction of a barrage on the Sina river near village Chincholi in Sholapur District and lifting water from this barrage into a Left Bank Canal for irrigating 20,000 acres in the scarcity-affected areas of Akkalkot Taluka. According to the Project Note in MRPK-28, 4.70 T.M.C. is proposed to be diverted (lifted) for irrigation at this barrage. The evaporation losses at the barrage are estimated to be 0.4 T.M.C. Therefore, the gross utilisation planned is 4.70+0.40 = 5.10 T.M.C. Out of this, 1.8 T.M.C. is stated to be from regeneration flows and 3.30 T.M.C. from the 75 per cent dependable flows (paras 5.2 and 5.3, page 94 of MRPK-28). In the Master Plan, the diversion planned was 6 T.M.C. (Sr. No. 53, Col. 6, page 57 of MRK-II), of which 3 T.M.C. from the dependable flows and 3 T.M.C. from the regeneration flows. In MR Note 30, the State of Maharashtra has claimed 3 T.M.C. from the dependable flows for this scheme. The net diversion proposed for irrigating 20,000 acres is 4.70 T.M.C. The duty and delta, therefore, will work out as under :—

698

Duty	4.25 acres/mcft.
Delta	5.45 feet.

The ayacut is situated in Akkalkot Taluka of Sholapur District (page 97 of MRPK-28). The average annual rainfall of Akkalkot Taluka is 27.07 inches (Satement B, page 168 of MR-8). This Taluka has been identified as a scarcity area under category 'C' in the Fact Finding Committee Report (pages 161, 165, 167 of MR-7). The Indian Irrigation Commission has also identified Akkalkot Taluka as a "drought-affected" area (page 422, Vol. I of Indian Irrigation Commission Report of 1972).

This is a lift irrigation scheme for providing irrigation in an area where there is a rainfall of 27 inches. In our opinion demand for this Project is not worth consideration for the present.

699 *Water requirements of Bandharas and Lift Irrigation Schemes of the State of Maharashtra as mentioned in MRPK-31 are given in the Table below which also shows the utilisations which have been protected.*

Item No. in MRPK-31	Page No. of MRPK-31	Name of Scheme	Estimated annual withdrawal in Mcft.	Utilisation protected in Mcft.	Utilisation not protected in Mcft.
(1)	(2)	(3)	(4)	(5)	(6)
		I — K-1 Sub-basin			
I (a)	2	Urmodi and Tarali bandharas	1,570	—	1,570
(b)	2	*Six* bandhoras on the Dudhganga river	1,653	—	1,653
(c)	2	Six bandharas on the Warna river	3,111	—	3,111
(d)	2	Six bandharas on the Vedganga river	1.635	—	1.635
(e)	3	Five bandharas on the Kasari river	2,076	—	2,076
(f)	3	Three bandharas on the Kumbhi river	1,151	—	1,151
(g)	3	One bandhara on the Dhamni river	178	—	178
(h)	3	Five bandharas on the Tulshi river	232	232	
J (i)	4	Lift Irrigation in comanded area of Khodshi Canal	2,470	—	2,470
J (ii) .	4	Lift Irrigation on the Left Bank of the Krishna river .	720	—	720
J (iii)	4	Lift Irrigation on the Left Bank of the Krishna river in commanded area of Koyna Krishna Lift Scheme.	1,865	—	1,865
J (iv)	4	Lift Irrigation on Left Bank of the river Krishna upto Mysore State border.	747	—	747
700 J (v)	4	Lift Irrigation on the Right Bank of the river Krishna in commanded area of Wang Project.	1,832	—	1,832
J (vi)	5	Lift Irrigation on the Right Bank of the river Krishna in the commanded area of sanctioned Warna Left Bank Canal.	4,100	4,100	—
J (vii)	5	Lift Irrigation on the Right Bank of the river Krishna in the commanded area of sanctioned Warna Right Bank Canal.	2,520	2,520	—
J (viii)	5	Lift Irrigation in rest of the area under the Right Bank of the Krishna river upto Mysore State border.	1,234	—	1,234
		TOTAL OF K-l	27,094	6,852	20,242
		II—K-3 Sub-basin			
3(a)	6	Seven bandharas on the Hiranyakeshi river . . .	1,693	—	1,693
(b)	6	Two weirs on the Tamraparni river	770	—	770
(c)	6	Two weirs on Ghataprabha	395	—	395
		TOTAL OF K-3	2,858	—	2,858
		GRAND TOTAL OF K-l & K-3	29,952	6,852	23,100

701 In MRPK-31, it is mentioned that utilisations for irrigation on bandharas and lift irrigation schemes to the extent of 1570 + 2470 + 4100 + 2520 + 232 = 10,892 Mcft. (I (a)) (I (j) (i)) (I(j)(vi)) (I(j)(vii)) (I(h)) have been shown in the Master Plan and therefore, for these no demand is made in MRPK-31 and the demand is confined to—

K-l Sub-basin	16,202 Mcft.
K-2 Sub-basin	—
K-3 Sub-basin	2,858 Mcft.
K-5 Sub-basin	—
K-6 Sub-basin	—
TOTAL	19,060 Mcft.

In MRPK-31 the total utilisation of 29.952 TMC has been shown for the various bandharas, weirs and lift irrigation schemes Out of this utilisations to the extent of 6.852 TMC have been protected We may mention here that utilisations on the existing weirs of Gotur and Kochari on the Hiranyakeshi river have been treated by us as not protected The following bandharas and lift irrigation schemes will merge with the projects which we have considered worth consideration —

702

1	Lift irrigation in Khodshi command	2470 Mcft
2	Weirs on Dudhganga river to be covered by Dudhganga Project	1653 Mcft
3	Weirs on Tamraparni river and on Ghataprabha river to be covered by Gudavale Lift Scheme (770 + 395)	1165 Mcft
	TOTAL	5288 Mcft

Now the demand of the State of Maharashtra with respect to the bandharas, weirs and lift irrigation schemes is as follows —

1	Total requirements of weirs, bandharas and lifts not protected	23,100 Mcft
2	Deductions for bandharas in Khodshi Canal command area, Dudhganga command area and Gudavale command area	5,288 Mcft.
	Balance need for bandharas, weirs and lifts	17,812 Mcft

In our opinion, this demand to the extent of 178 TMC is worth consideration as all the bandharas, weirs and lift irrigation schemes are in operation or under construction.

MINOR IRRIGATION

703 The State of Maharashtra has made the following demands for minor irrigation —

Sl. No	Name of the Project	Demand in Master Plan	Use which has been protected	Balance	Future demand from 75 per cent dependable flow in MR Note No 30
I	*K-l Sub-basin (Upper Krishna)*			(All figures in TMC)	
	1 Minor Irrigation (utilising less than one TMC annually)	42.3	11.1	31.2	26.2
II	*K 2 Sub-basin (Middle Krishna)*	2.0	0.1	1.9	1.3
	1. Minor Irrigation (utilising less than one TMC annually)				
III	*K-3 Sub-basin (Ghataprabha)*	1.9	1.0	0.9	0.9
	1 Minor Irrigation (utilising less than one TMC annually)				
IV	*K-5 Sub-basin (Bluma)*	28.5	4.8	23.7	16.4
	1 Minor Irrigation (utilising less than one TMC annually)				
V	*K-6 Sub-basin*	2.5	0.1	2.4	2.4
	1 Minor Irrigation (utilising less than one TMC annually)				
	TOTAL	77.2	17.1	60.1	47.2

704 The demands for minor irrigation includes the demands for the following projects, which according to the State of Maharashtra were in existence even before 1960 .—

Sl No	Sub-basin	Name of the Project	Utilisation in T.M.C.
1	K 1	Nehr Tank	0.5
2	K-5	Budihal Tank	0.9
3	K-5	Kada Project	0.5
4	K 5	Mehkari Project	0.7
5	K-5	Chandani Project	0.9
6	K-6	Harni Project	0.6
		TOTAL	4.1

We allow the demand for these Projects

Looking to the entire circumstances, we are of the opinion that in addition to 4.1 TMC, the demand to the extent of 22. 37 TMC be taken as worth consideration Thus in our opinion the total demand of 26. 47 TMC is worth consideration.

705 As a result of examining the projects of the State of Maharashtra for which water has been claimed from the dependable flow of 2060 TMC, we are of the opinion that the demand for the following pro-

jects is worth consideration to the extent mentioned against each item :—

		T.M.C.
1.	Krishna Canal Ex-Khodshi Weir	3.00
2.	Koyna Hydel and Koyna Krishna Lift Scheme	23.40
3.	Dudhganga	14.00
4.	Gudavale Lift Scheme	3.10
5.	Mutha System ex-Khadakwasla	9.60
6.	Kukadi Project	18.80
7.	Barhanpur Project	1.48
8.	Sina at Nimgaon	1.70
9.	Sina at Kolegaon	4.50
10.	Hingani Pangaon	1.50
11.	Bhandaras, etc	17.80
12.	Minor Irrigation	26.47
	TOTAL	125.35

The State of Maharashtra has further claimed 117.1 T.M.C. in the water flowing in excess of the dependable flow of 2060 T.M.C. (which is called the 'Surplus Flow') as follows :— 706

		T.M.C.
1.	Krishna Project	16.30
2.	Krishna Canal Ex-Khodshi Weir	2.50
3.	Wang Project	2.20
4.	Warna Project	9.20
5.	Mutha System ex-Khadakwasla	7.40
6.	Kukadi Project	16.10
7.	Chaskaman Project	16.00
8.	Kundali Project	2.50
9.	Nira System ex-Vir	27.80
10.	Begumpur Lift Irrigation Scheme	10.10
11.	Sina at Kolegaon	4.00
12.	Sina Lift Scheme	3.00
	TOTAL	117.10

On the very face of it this demand cannot be satisfied as the only flow that is available for distribution in excess of the 2060 T.M.C. is that due to the return flow as already mentioned in Part I. We have given a share to the State of Maharashtra in the return flow. The State of Maharashtra may utilise the quantity of water allocated to it as its share in the return flow for any of its projects subject to the conditions and restrictions imposed by us on the utilisation of waters in the various sub-basins. 707

This completes our discussion so far as the demands of the State of Maharashtra are concerned.

Demands of the State of Mysore : We proceed to discuss the various projects for which the demands of the State of Mysore are to be considered in the light of the observations made by us in Part I of this Chapter. These demands are contained in the following Table No. 3 which shows the sub-basinwise demands as per Statements 5 and 6 of Annexure III in MYK-I, the quantity protected, and further demands out of the 75 per cent dependable flows for projects in the Krishna basin in the State of Mysore :— 708

TABLE No. 3

Statement showing the Sub-basinwise demand as per Statements 5 and 6 of Annexure III in MYK-I, the quantity protected, and further demand out of 75 per cent dependable flows for projects in the Krishna basin in the State of Mysore.

Sl. No.	Name of Project	Utilisation as per Master Plan (Statements 5 and 6 of Annexure III, MYK-I) T.M.C.	Protected utilisation T.M.C.	Balance Demand T.M.C.	Demand out of balance 75 per cent dependable flows T.M.C.
(1)	(2)	(3)	(4)	(5)	(6)
	K-1 Sub-basin				
1.	Dudhganga Project	10.00	—	10.00	4.00
2.	Minor Irrigation	1.71	0.18	1.53	1.03
	TOTAL K-l SUB-BASIN	11.71-	0.18	11.53	5.03
	K-2 Sub-basin				
1.	Upper Krishna Project	442.00	103.00	339.00	125.00
2.	Bijapur Lift Irrigation Scheme	63.00	—	63.00	—
3.	Don Project	3.66	—	3.66	—
4.	Minor Irrigation	15.93	2.47	13.46	9.16
	TOTAL K-2 SUB-BASIN	524.59	105.47	419.12	134.16

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(1) (2)	(3)	(4)	(5)	(6)
K-3 Sub-basin				
1. Ghataprabha Project (all Stages)	120.00	36.60	83.40	55.00
2. Gokak Canal	1.40	—	1.40	1.40
3. Weir Schemes	5.00		5.00	
4. Markandeya Project	4.00	—	4.00	12.00
5. Bellarynala	3.00		3.00	
6. Minor Irrigation	11.73	1.03	10.37	6.85
TOTAL K-3 SUB-BASIN	145.13	37.63	107.17	75.25
K'4 Sub-basin				
1. Malaprabha (including Left Bank Canal and Upper Malaprabha)	49.00	37.20	11.80	9.00
2. Ramthal Lift Irrigation Scheme	10.00	—	10.00	4.50
3. Minor Irrigation	17.58	4.57	13.01	6.07
TOTAL K-4 SUB-BASIN	76.58	41.77	34.81	19.57
K 5 *Sub-basin*				
1 . Minor Irrigation	1.39	0.02	1.37	0.59
K-6 Sub-basin				
1. Chandrampally	1.87	1.90	—	—
2. Bhima Lift Irrigation Scheme	31.18	—	31.18	10.00
3. Bhima Irrigation Project	37.64	—	37.64	11.0
4. Diksanga Project	0.30	—	0.30	1.00
5. Amarja Project	2.27	—	2.27	2.300
6. Bennithora Project	6.01	—	6.01	6.00
7. Gandhorinala Project	3.46	—	3.46	2.20
8. Upper Mullamari Project	1.30	—	1.30	1.30
9. Lower Mullamari Project	4.38	—	4.38	4.40
10. Kagna Project	12.93	—	12.93	2.00
11. Minor Irrigation	30.77	6.47	24.30	11.40
TOTAL K-6 SUB-BASIN	132.11	8.37	123.77	51.60
K-7 Sub-basin				
1. Minor Irrigation	2.88	0.69	2.19	1.66
K-8 *Sub-basin*				
1. Tungabhadra Project (Left Bank Canal, Right Bank Low Level Canal, Right Bank High Level Canal)	147.50	132.00	15.50	9.30
2. Vijayanagar Channels	13.70	5.71	7.99	8.00
3. Rajolibunda Diversion	1.20	1.20	—	—
4. Tunga Anicut	11.50	11.50	—	—
5. Bhadra Project	62.00	61.70	—	—
6. Bhadra Anicut	3.10	3.10	—	—
7. Gondi Left Bank Canal Extension	2.00	—	2.00	2.00
8. Ambligola	1.40	1.40	—	—
9. Anjanapur	2.50	2.50	—	—
10. Dharma Project & Canals	2.20	2.20	—	—
11. Hagaribommanahalli	2.00	2.00	—	—
12. Upper Tungabhadra	19.00	—	19.00	—
13. Tungabhadra Foreshore Lift	11.85	—	11.85	—
14. Tungabhadra Diversion	20.00	—	20.00	—
15. Upper Tunga Project	40.00	—	40.00	20.00
16. Upper Bhadra Project	36.00	—	36.00	10.00
17. Madagmasur	2.71	—	2.71	—
18. Dandavathy	2.60	—	2.60	—
19. Varada	7.00	—	7.00	—
20. Hirehalla	1.06	...	1.06	—
21 Minor Irrigation	100.92	49.04	51.88	23.59
TOTAL K-8 SUB-BASIN	490.24	272.35	217.59	72.89

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(1) (2)	(3)	(4)	(5)	(6)
K-9 Sub-basin				
1. Vanivilas Sagar	8.20	8.20	—	—
2. Feeder Channel to Ranikere	1.05	—	1.05	1.00
3. Jinigehalla	0.32	—	0.32	1.00
4. Minor Irrigation	38.20	29.87	8.33	4.25
TOTAL OF K-9 SUB-BASIN	47.77	38.07	9.70	6.25
GRAND TOTAL	1432.40	504.55	926.87	367.00

712 We proceed to examine the following projects for which the State of Mysore has claimed water out of the dependable flow :—

1. Dudhganga Project
2. Upper Krishna Project
3. Ghataprabha Project
4. Gokak Canal
5. Markandeya Project
6. Malaprabha Project
7. Upper Malaprabha Project
8. Ramthal Lift Irrigation Project
9. Bhima Lift Irrigation Project
10. Bhima Irrigation Project
11. Diksanga Project
12. Amarja Project
13. Bennithora Project
14. Gandhorinala Project
15. Upper Mullamari Project
16. Lower Mullamari Project
17. Kagna Project
18. Tungabhadra Left Bank Low Level Canal
19. Vijayanagar Channels
20. Gondi Left Bank Canal Extension
21. Upper Tunga Project
22. Upper Bhadra Project
23. Feeder Channel to Ranikere
24. Jinigehalla
25. Minor Irrigation

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DUDHGANGA PROJECT

The Project Report to be referred to in respect of the Dudhganga Project is MRPK-15.

According to the Project Report, this Project will irrigate 32,100 acres in Chikodi Taluk of Belgaum District utilising 10 T.M.C.

June-September rainfall is 389 mm in the commanded area. October-December rainfall is 147.6 mm (MYDK-19, page 39). Mysore and Maharashtra have entered into an agreement that this would be a joint Project utilising 36 T.M.C. (26 T.M.C. in Maharashtra and 10 T.M.C. in Mysore) with a live storage of 29.5 T.M.C. In view of limited quantity of water available for distribution out of dependable flows it is now proposed to reduce suitably the total utilisation under the Project. Hence, Mysore now proposes to utilise only 4 T.M.C. out of the 75 per cent dependable flows (MY Note 17, Appendix III, page 1). The Project is not sanctioned.

In our opinion the demand of 4 T.M.C. for this Project which is a joint project of Maharashtra and Mysore is worth consideration.

714

UPPER KRISHNA PROJECT

The Upper Krishna Project had been conceived to harness the waters of the Krishna river to irrigate the famine-stricken areas of Bijapur, Gulbarga and Raichur Districts of Mysore State. The Project Report as prepared in 1960 envisaged two storage dams and canals (i) at Narayanapur and (ii) at Almatti to irrigate a total area of 12 lakhs of acres utilising 206 T.M.C. of water. The entire project was proposed to be executed in three stages (Ex. APK-344).

On further examination, the above Project was modified during July, 1963. As per the modified proposals, the Upper Krishna Project envisaged construction of two dams with canals, namely :—

(i) Almatti Storage with two canals, one on each side ; and

(ii) Narayanpur Storage with two canals, one on each flank to irrigate a total area of 12.00 lakh acres, and to utilise 226 T.M.C. of water (Ex. APK-345).

It was proposed to be executed in two stages. Stage I consisted of Almatti and Narayanpur Storages and

715 canals to irrigate about 5.33 lakh acres. There was a provision for future expansion to utilise 340 T.M.C.

After a good deal of discussions, the Central Water and Power Commission suggested that the First Stage of the Project may provide about 6 lakh acres for irrigation under the Narayanpur Dam and its two canals and construction of foundation and some other works of the Almatti Dam which are liable to periodical submergence under the Narayanpur Reservoir (Ex. APK-339).

Accordingly, Stage-I of the Project was modified during September, 1963 to utilise 103 T.M.C. under the Narayanpur Dam. The Project sanctioned in November, 1963 envisages the following :—

(i) Storage dam at Narayanpur, Taluk Shorapur, District Gulbarga ;

(ii) The Left Bank Canal from the Narayanpur Reservoir ; and

(iii) The Right Bank Canal from the Narayanpur Reservoir.

Provision for Rs. 30 lakhs also was made in the sanctioned estimate for constructing foundations and some other works of the Almatti Dam which are liable to periodical submergence under the Narayanpur Reservoir (Ex-APK-165).

716 Under the sanctioned Project, it was proposed to irrigate 6.00 lakh acres in Gulbarga and Raichur Districts. But the execution of the Project was not taken up according to the sanction. The Upper Krishna Project has been modified by the State of Mysore to irrigate an area of 20.84 lakh acres (cropped area 36.57 lakh acres) utilising 442 T.M.C., including 41 T.M.C. of releases from the Koyna Reservoir and the new Project Report (MYPK-3) was prepared. The modified proposals are :—

(1) Construction of Narayanpur Dam at the Siddapur site with the Right and the Left Bank Canals to irrigate 10.1 lakh acres on the Left bank and 4.30 lakh acres on the right bank;

(2) Construction of the Almatti Dam with the Right and the Left Bank Canals to irrigate 70,000 acres and 50,000 acres, respectively;

(3) Construction of the Hippargi Weir and the Lift Canals to irrigate 1,34,000 acres ; and

(4) The Lift Irrigation from the Narayanpur Reservoir, the Almatti Reservoir and the Narayanpur Left Bank Canal to irrigate 3,90,000 acres.

717 The Narayanpur Dam and the Left Bank Canal with four branches, namely, Indi Branch, Shahapur Branch, Jewargi Branch and Mudbal Branch to irrigate 10.10 lakh acres utilising 103 T.M.C. in the Districts of Bijapur and Gulbarga, are under construction instead of the sanctioned Stage-I with the Left and the Right Bank Canals from the Narayanpur Reservoir.

Construction of the Almatti Dam to a partial height is also in progress. In the final phase the following constructions are contemplated: —

(1) Construction of a weir at Hippargi and Lift Canals to irrigate 1.34 lakh acres ;

(2) Completion of the Almatti Dam to full height;

(3) The Left and the Right Bank Canals from the Almatti Reservoir to irrigate 1.20 lakh acres ;

(4) Lift Canals from the Narayanpur Reservoir, the Almatti Reservoir and the Narayanpur Left Bank Canal to irrigate 3.9 lakh acres ; and

(5) The Narayanpur Right Bank Canal to irri gate 4.30 lakh acres.

718 In view of limited availability of the 75 per cent. dependable yield, the State has shown a demand of 125 T.M.C. out of the 75 per cent dependable flow over and above the protected use of 103 T.M.C. (MY Note No. 17, Appendix II). The ayacut area and/or the crop pattern is to be adjusted to suit the requirement of 228 T.M.C. It is urged that K-2 sub-basin in which this project is situated is the worst affected area of all the sub-basins in the Krishna basin and is often affected by famines and scarcities and as such it requires special consideration (MY Note No. 13, page 12, para 3.8). It is also urged that due to acute scarcity and drought conditions during 1972-73, work on the Hippargi Weir on the flanks was taken up to provide relief to the people (MY Note No.17, Appendix II, page 3).

The Project serves the following Taluks which are identified as drought-affected by the Indian Irrigation Commission, 1972 :—

Sl. No.	District	Taluk
1	2	3
1.	Bijapur	.Bijapur Jamkhandi Bagewadi Muddebi-hal Sindgi Indi Hungund Bagalkot
2.	Gulbaraga	Shorapur Shahapur Jewargi
3.	Raichur	Lingsugur Deodurg

(Report of the Indian Irrigation Commission, 1972, Vol. I, Page 423)

In addition, the Project also serves Athni Taluk of Belgaum District and Raichur Taluk of Raichur District.

This is a very big Project. Already utilisation to the extent of 103 T.M.C. is protected. In MY Note 17, the State of Mysore has claimed 125 T.M.C. out of the dependable flow over and above the protected demand. It is clear that this Project is to be executed by stages. The execution of this Project was not undertaken according to the sanction accorded by the Planning Commission as the construction of the Right Bank Canal of the Narayanpur Dam was not taken up and the entire 103 T.M.C. is sought to be utilised on the Narayanpur Left Bank Canal. In our opinion water may be provided to irrigate an area of 4.3 lakh acres by the Narayanpur Right Bank Canal, as contemplated under the sanctioned Project. The demand for the Right Bank Canal is 52 T.M.C. The demand of the State of Mysore to the extent of 52 T.M.C. for this Project is worth consideration.

720 GHATAPRABHA PROJECT

The First Stage of the Project, namely the Ghataprabha Left Bank Canal 0-44 miles taking off from the existing Dhupdal Weir, had been sanctioned by the then Government of Bombay in 1949 (Ex. MYK-250, page 20) and the same had been practically completed prior to the States reorganisation during 1956 and irrigation from the run-of-the-river is taken up during monsoon season under this canal. The work on the extension of the Ghataprabha Left Bank Canal miles 45-73 was also in progress prior to the States reorganisation.

The Project Report for the Ghataprabha Stage-II consisting of a storage dam at Hadalga and extension of the Left Bank Canal from miles 45 to 73 had been prepared by the Government of Bombay and sent to the Central Water and Power Commission for clearance (Ex. APK-301). In the meanwhile, Government of Bombay had accorded administrative approval to the storage part during March, 1956 (MYDK-12 page 10, Ex. APK-298) and to the extension of canal during May, 1955 (MYDK-2, page 380, Ex. MYK-122). The Planning Commission had also approved Stage II during February, 1957(MYPK-13, page 37, Ex. MYK-250). **721**

As a result of reorganisation of the States in the year 1956, there has been a change in the outline of the scheme. The area commanded by this Project came to lie in Mysore State while the two storage sites at Hadalga and Ajra remained in Bombay State. In order to avoid undue delay in the implementation of the scheme, it was considered desirable to investigate a site in the Mysore territory. The site at Hidkal on the Ghataprabha river was found to be suitable for the construction of a storage reservoir.

In view of the extensive and comprehensive nature of the scheme, it has been proposed to execute the scheme in three Stages, *viz.*

First Stage :

Construction of the Ghataprabha Left Bank Canal First Section (Miles 0 to 44) and two Branches—commanding an area of about 2,57,900 acres. This canal will function as a monsoon canal till the storage dam is constructed utilising the river flow available at the Dhupdal Weir for irrigating about 1.2 lakh acres.

Second Stage :

(a) Construction of the First Stage of Hidkal Dam on the Ghataprabha river to feed the Ghataprabha Left Bank Canal; **722**

(b) Construction of the Second Section of the Ghataprabha Left Bank Canal (miles 45 to 73 and three Branches) commanding an area of 2.98 lakh acres (including 1.2 lakh acres of Stage-I).

Third Stage :

(a) Construction of the Second Stage of the Hid kal Dam by raising the dam to the final height; and

(b) Construction of the Ghataprabha Right Bank Canal.

The plans and estimates for the Hidkal Dam were sent to the Planning Commission for approval during 1958 (MYDK-12, page 78; Ex. APK-303).

The total live storage provided is 49.5 T.M.C. In the first Stage the dam was proposed to be constructed for a partial height but the foundation was to be laid as required for the full storage.

The Planning Commission approved during 1959 the Ghataprabha Stage-II (Hidkal Dam) for a net storage of 21,500 mcft. with section of the dam, spillway, etc. reduced but width of the foundation kept as required for the assumed ultimate net storage of 49,500 mcft. (MYDK-12, page 113; Ex. APK-311).
723 The Planning Commission hoped that by the time the foundations are constructed, the position regarding availability of water for the final stage would be known and that further construction work on the dam could proceed. Approval was also accorded for the extension of the Ghataprabha Left Bank Canal from miles 45 to 73.

The modified Ghataprabha Project consists of the following :—

(a) A storage dam at Hidkal on the Ghata prabha river with a gross capacity of 51,000 mcft;

(b) Ghataprabha Left Bank Canal;

(c) Ghataprabha Right Bank Canal; and

(d) Ghataprabha Left Bank High Level Canal

(MYPK-13, page 12).

The gross commanded area under the Ghataprabha Left Bank Canal is 4,43,800 acres, out of which area proposed for irrigation as per sanctioned Project is 2,98,000 acres with the following crop patterns:—

Khariff paddy	0.15	lakh acres
Other Khariff	1.35	lakh acres
Rabi	1.25	lakh acres
Hotweathcr	0.15	lakh acres
Perennials	0.08	lakh acres
TOTAL	2.98	lakh acres

724 and this requires 34.78 T.M.C. of water excluding evaporation losses (MYPK-13, pages 11-13).

Assuming the same crop pattern for the Ghataprabha Right Bank Canal and the Left Bank High Level Canal, the State of Mysore has stated that the total ayacut proposed to be provided with irrigation facilities would be 7.46 lakh acres with a utilisation of 86.95 T.M.C. as under :—

Ghataprabha Left Bank Canal	2.98 lakh acres	34.78 T.M.C.
Ghataprabha Right Bank Canal	2.98 lakh acres	34.78 T.M.C.
High Level Canal .	1.50 lakh acres	17.39 T.M.C.
	7.46 lakh acres	86.95 T.M.C.

It is claimed that the requirements of Gokak Mills is 3 T.M.C. and that of the Gokak Canal is 1.4 T.M.C. and evaporation losses in the reservoir is 3 T.M.C. Thus the total water requirements for the Project is 94.35 T.M.C. But 3 T.M.C. of Gokak Mills will return to the river below the Dhupdal Weir. Thus the actual water requirement for the Ghataprabha Valley Development Scheme is 91.30 T.M.C., out of which 36.6 T.M.C. is protected. The balance requirement is 91.30-36.6 = 54.7, say 55 T.M.C.

725 It is claimed that the Ghataprabha Right Bank Canal will irrigate an area of 2.98 lakh acres in the scarcity-affected areas of Gokak, Hukeri, Saundatti and Ramdurg Taluks of Belgaum District and Mudhol, Bagalkot, Badami and Hungund Taluks in Bijapur District. The rainfall during June-September and October-December periods in the various Taluks irrigated by this Project is as under :—

Taluk	Rainfall in mm	
	June-Sept.	Oct-Dec.
Hukeri	399.0	164.6
Gokak	303.0	*164.4*
Saundatti	332.8	165.2
Ramdurg	335.6	141.1
Mudho	342.2	133.4
Bagalkot	345.2	126.3
Hungund	361.2	132.0
Badami	341.6	144.6

(MYDK-19, Pages 39, 40 and 41)

It is claimed that the Ghataprabha High Level Canal will irrigate 1,50,000 acres in the scarcity-affected areas of Gokak, Hukeri, Raibag and Chikodi Taluks of Belgaum District. The rainfall during June-September and October-December periods in these 726 Taluks is as under :—

Taluk	Rainfall in mm	
	June-Sept.	Oct-Dec.
Hukeri	399.0	164.6
Raibag	285.0	141 6
Chikodi	389.0	147.6
Gokak	303.0	164.4

(MYDK-19, Page 39)

Bijapur District is one of the worst drought-affected areas and susceptible to famine conditions (MYPK-IV Appendix I, page 35). This District is also identified as drought-affected by the Indian Irrigation Commission (Report of the Indian Irrigation Commission 1972, Volume I, page 423).

This Project in all its three Stages will irrigate scarcity-affected areas in Gokak, Hukeri, Saundatti, Ramdurg and Chikodi Taluks of Belgaum District and in Modhol, Bagalkot, Badami and Hungund Taluks of Bijapur District. In our opinion, additional demand for 55 T.M.C. for the Ghataprabha Project for all the three Stages is worth consideration.

727

GOKAK CANAL

The Project Report of this Project is MYPK-10, page 3.

The Gokak Canal takes off from the existing Dhupdal Weir on the river Ghataprabha. The weir has a live storage of 0.87 T.M.C. (Krishna Godavari Commission Report Annexure VIII, page 101). In the commanded area the normal rainfall in June to September is about 303 mm and October to December is 164.4 mm (MYDK-19, page 39). The canal irrigates an area of 14,200 acres in Gokak Taluk of Belgaum District. The cropping pattern and the duties are as under —

Crop	Area in acres	Canal Duty cusec)	Head (acres/
Khariff Paddy	Not available	Khariff Rabi	80 100
Light irrigated crops during Khariff and Rabi	Not available	Rabi	100
	14,200		

728 It is claimed that the utilisation of 1.4 T.M.C. has not been protected. The Project has been in existence since 1897.

Demand for this Canal is held by us to be included in the demand for the Ghataprabha Project. No separate provision is necessary for this demand.

729

MARKANDEYA PROJECT

The Project Report of this Project is MYPK-8 pages 130-140.

The Markandeya Project is envisaged to provide irrigation facilities to an area of 72,500 acres in the Taluks of Hukeri, Gokak and Bailhongal of Belgaum District, utilising 12 T.M.C. by means of a live storage of 8.88 T.M.C. There will be two reservoirs; one across the Markandeya river having a live storage of 7.48 T.M.C. and the other across the Ballary Nala having a live storage of 1.40 T.M.C. The cropping pattern is as under:—

Crop	Cropped area in acres
Sugar-cane	6,025
Other Khariff	36,250
Rabi	36,250
Two-seasonals	18,125
TOTAL	96,650

The rainfall in the commanded area is as below :-

Taluk	District	Normal rainfall in mm	
		June-Sept.	Oct-Dec.
Hukeri	Belgaum	399.0	164.6
Gokak	Belgaum	303.0	164.4
Bailhongal . . .	Belgaum	434.5	163.3

(MYDK-19, Page 39)

730 It is claimed that in order to augment the shortfall in rain, it is proposed to provide irrigation facilities to this economically backward area. The Project is not sanctioned.

The technical feasibility of this Project is yet to be investigated. The State of Mysore has submitted only a note on this Project. It is to be examined what will be the effect on the other projects seeking to utilise the flow of the river Ghataprabha, if this Project is sanctioned. The commanded area of this Project is situated between the annual isohyets of 600 mm and 700 mm. The rainfall is not so meagre. In our opinion, the demand for this Project is not worth consideration for the present.

731

MALAPRABHA PROJECT

The Project Report to be referred to in respect of this Project is MYPK-2 and MYPK-5.

The Malaprabha Project was sanctioned in the year 1963 for a gross utilisation of 37.2 T.M.C., vide Planning Commission's letter No. NR-2(54)/60 dated 5th August, 1963 (un-numbered first page of MYPK-2 or MYDK-12, page 7, Ex. APK-313).

The Project is modified in the year 1970 by increasing the utilisation to 44 T.M.C. as under (page 15 and page 17 of MYPK-5).

	Utilisations (T.M.C.)	Area irrigated (Acres)
(i) Malaprabha Right Bank Canal including Nargund Branch	21.70	3,32,300
(ii) Malaprabha Left Bank Canal	11.45	1,17,700
(iii) Extension of existing Kolchi Right Bank Canal	1.95	20,000
(iv) Lift Irrigation Scheme along the periphery of the reservoir	3.90	40,000
(v) Reservoir losses	5.00	—
TOTAL .	44.00	5,10,000

732 The Dam, the Left Bank Canal and the Right Bank Canal are under construction.

The rainfall in the Taluks benefited is as under :—

Taluk	District	Normal rainfall in mm	
		June-Sept.	Oct.-Dec
Saundatti	Belgaum	332.8	165.2
Bailhongal	Belgaum	434.5	163.3
Ramdurg	Belgaum	335.6	141.1
Hubli	Dharwar	383.5	156.3
Gadag	Dharwar	359.9	165.6
Navalgund	Dharwar	334.5	158.8
Ron	Dharwar	378.7	147.7
Nargund	Dharwar	291.5	129.0
Badami	Bijapur	341.6	144.6

(Source : MYDK-19, pages 39, 40 and 42) Irrigated area : 5,10,000 acres.

Out of the total irrigated area of 5,10,000 acres, the area to be irrigated by lift is 40,000 acres (23,400 acres by lift along the periphery of the reservoir plus 16,600 acres by lift along the Right Bank Canal).

733 The following Taluks are identified as drought-affected by the Indian Irrigation Commission :—

(1) Badami (Bijapur District)

(2) Ron (Dharwar District)

(3) Gadag (Dharwar District)

(Report of Indian Irrigation Commission, 1972, Volume I, page 423).

In our opinion the demand for the additional 7 T.M.C. for this Project is worth consideration. Our observations made on the note of the Upper Malaprabha Project may also be seen.

Taluk	District	Rainfall in mm

UPPER MALAPRABHA PROJECT 734

The Project Report of this Project is MYPK-8, pages 52-62.

The proposed Upper Malaprabha Project envisages the construction of a reservoir across the Malaprabha river at Asoga in Khanapur Taluk of Belgaum District with both the Left and the Right Bank Canals. The utilisation proposed is 5 T.M.C. The details of the Project are as under :—

(1) Live storage : 2.16 T.M.C.

(2) Area irrigated : 40,000 acres

(3) The rainfall in the Taluks benefited is as under:—

		June-Sept.	Oct.-Dec.
Khanapur .	Belgaum	1444.7	149.7
Bailhongal .	Belgaum	434.5	163.3
Belgaum	Belgaum	1015.7	163.0

(Source : MYDK-19, page 39)

(4) Utilisation : 5 T.M.C.

The Project is not sanctioned and it does not involve any lift irrigation.

735 It is urged by the State of Mysore that in order to obtain optimum utilisation of the flows of the river Malaprabha, it is necessary to have an integrated operation of the Malaprabha Project and the Upper Malaprabha Project.

In MY Note 17 the State of Mysore has stated that only 9 T.M.C. will be required for the integrated operation of the Malaprabha Project and this Project. If integrated operation can be managed in 9 T.M.C., this Project or a part of it necessary for such integrated operation is worth consideration.

RAMTHAL LIFT IRRIGATION PROJECT 736

The Project Report of this Project is MYPK-14, pages 12-16.

This Project envisages the providing of irrigation facilities to an area of 67,500 acres in Hungund Taluk of Bijapur District and Lingsugur Taluk of Raichur District, utilising 9 T.M.C. of water. The live storage is 3.69 T.M.C.

The rainfall in the commanded area is as below :-

Taluk	District	Normal rainfall in mm	
		June-Sept.	Oct.-Dec .
Hungund	Bijapur	361.2	132.0
Lingsugur	Raichur	361.6	113.7

(Source : MYDK-19 pages 37 and 40)

The area thus receives insufficient rainfall during both the seasons. The claim is now confined to 4.5 T.M.C. (MY Note 17, App. II, item 30). The Project is not sanctioned.

Both the Taluks served by this Project are identified by the Indian Irrigation Commission as drought-affected (Report of the Indian Irrigation Commission, 1972 Vol. I, page 423).

In our opinion the demand of 4.5 T.M.C. for this Project is worth consideration.

737 BHIMA LIFT IRRIGATION PROJECT

The Project Report to be referred to in respect of this Project is MYPK-8, pages 63-74.

The Bhima Lift Irrigation Project envisages the providing of irrigation facilities to the drought-stricken areas of Afzalpur, Gulbarga, Chitapur and Aland Taluks of Gulbarga District to an extent of 2,07,500 acres, utilising 31.18 T.M.C. The live storage is 8.73 T.M.C.

The commanded area receives rainfall as below :—

Taluk	District	Rainfall in mm	
		June-Sept.	Oct.-Dec.
Afzalpur	Gulbarga	Not available	Not available
Chitapur	Gulbarga	559.5	100.09
Gulbarga	Gulbarga	Not available	Not available
Aland			

(Source : MYDK-19, page 37)

The State has now confined its demand to 10 T.M.C. for the Project to serve the drought-stricken areas in the first instance (MY Note 17). This is a lift irrigation scheme and is not sanctioned.

738 All the Taluks proposed to be served by the Project are identified as drought-affected by the Indian Irrigation Commission (Report of the Indian Irrigation Commission, 1972, Vol. I, page 423).

This is a Lift Irrigation Scheme envisaging diversion of the water from the main stream of the river Bhima. Unless a further study is made of the water available in the river Bhima, the demand for this water cannot be considered for the present. The rainfall in the commanded area is not so meagre.

BHIMA IRRIGATION PROJECT 739

The Project Report of this Project is MYPK-S, pages 75-87.

The Bhima Irrigation Project envisages the providing of irrigation facilities to Yadgir, Chitapur and Shahapur Taluks of Gulbarga District to an extent of 2,01,500 acres (including 66,500 acres by lift) utilising 37.64 T.M.C. The live storage is 7.75 T.M.C. The commanded area receives rainfall as below:—

Taluk	District	Rainfall in mm	
		June-Sept	Oct.-Dec.
Yadgir	Gulbarga	505.6	105.2
Chitapur	Galbarga	Not available	Not available
Shahapur			

(Source : MYDK-19, page 37)

It is claimed that the commanded area lies in the scarcity area and to relieve the scarcity conditions to some extent, a minimum quantity of utilisation of 11 T.M.C. is claimed in MY Note No. 17. The Project is not sanctioned.

740 All the Taluks served by this Project are identified by the Indian Irrigation Commission as drought-affected (Report of the Indian Irrigation Commission. 1972, Vol. I, page 423).

This scheme envisages diversion of the main stream of the river Bhima for irrigation in the drought-affected areas. The State of Mysore has reduced its demand to only 11 T.M.C. for this Project. In our opinion, the demand to the extent of 11 T.M.C. for this Project is worth consideration as it will relieve distress in the drought-affected areas.

DIKSANGA PROJECT 741

The Project Report to be referred to in respect of this Project is MYPK-10, page 48.

The original Diksanga Project envisages to provide the irrigation facilities to 1250 acres in Afzalpur Taluk of Gulbarga District utilising 0.3 T.M.C. of

water. The cropping pattern and delta are as under :—

Crop	Area as percentage of 1250 acres	Delta in inches
Sugar-cane	10	132
Paddy	30	54
Light Perennial	4	80
Garden	4	72
Khariff dry	52	24
	100	

In MY Note 17, Appendix II, page 6, item 42 at page 11, it is indicated that the scope of the Project be modified to utilise 1 T.M.C. The rainfall in the commanded area is 545 mm during Khariff and 103 mm during Rabi, distributed unevenly in the crop season (MYDK-19, page 37).

742 It is claimed that the area is frequently experiencing drought conditions. In order to relieve the distress due to drought conditions, it is proposed to provide irrigation facilities utilising 1 T.M.C. of water. The Project is not sanctioned.

The Afzalpur Taluk is identified by the Indian Irrigation Commission as drought-affected (Report of the Irrigation Commission 1972, Vol. I, page 423).

In our opinion the demand for 1 T.M.C. is worth consideration.

AMARJA PROJECT

743

The Project Report to be referred to in respect of this Project is MYPK-10, page 13.

The Project envisages irrigation of 18,000 acres in Aland and Afzalpur Taluks of Gulbarga District, utilising 2.27 T.M.C. The rainfall in the area under the command is 532 mm during June-September period and 103.1 mm during October-December period (MYDK-19, page 37). The crop pattern proposed is 40 per cent Rabi dry, 40 per cent Khariff dry, the balance 20 per cent being under paddy and perennials. It is stated that the commanded area comprises of soils, red to pale brown in colour, sandy to loam, shallow to medium and well drained and, as such, even during Khariff season, irrigation is very necessary. Further, the left bank of the Bhima in Gulbarga District is devoid of any irrigation facility. During the year 1972-73 this area experienced acute famine and the work was taken up as a scarcity relief work (MY Note 17, Appendix III, page 8).

Both the Taluks served by this Project are identified by the Indian Irrigation Commission as drought-affected (Report of the Irrigation Commission, 1972 Volume I, page 423).

In our opinion the demand of 2.27 T.M.C. is worth consideration.

BENNITHORA PROJECT

744

The Project Report to be referred to in respect of this Project is MYPK-8, pages 161-169.

The Project envisages to irrigate 50,000 acres (including 16,400 acres by lift) in Chitapur and Sedam Taluks of Gulbarga District, utilising 6 T.M.C. The live storage is 2.87 T.M.C. The pattern is as under:—

Crop	Area in acres
Sugar-cane	1,680
Light perennials	840
Garden	840
Khariff paddy	3,360
Khariff dry	24,800
Rabi dry	18,480
Total:	50,000

The rainfall in the commanded area is 532.5 mm during June-September and 103.1 mm during October-' December (MYDK-19, page 37). It is stated that even during the Khariff season, the rainfall is unevenly distributed. During 1972-73 this area experienced acute famine conditions and the Project has been taken up as a scarcity relief work (MY Note 17, Appendix III, page 9).

745

Both the Taluks served by this Project are identified by the Indian Irrigation Commission as drought-affected (Report of the Irrigation Commission, 1972, Vol. I, page 423).

The river is being gauged from 1961 onwards near Kurikota Village at about 9 miles upstream of the proposed dam site. According to the Project Report the net dependable yield at the gauge site is 5352.90 Mcft and the proportionate net yield at the dam site works out to 6380 Mcft after allowing for minor irrigation works. In the Report the utilisation contemplated is 6.01 T.M.C. ' In view of the availability of the dependable flow the utilisation should be slightly less than 6.01 T.M.C.

In our opinion the demand for this Project to the extent of 5.43 T.M.C. is worth consideration.

746

GANDHORINALA PROJECT

The Project Report to be referred to in respect of this Project is MYPK-14, pages 6-11.

Gandhorinala Project envisages to irrigate 23,000 acres in Gulbarga and Chitapur Taluks of Gulbarga District, utilising 3.01 T.M.C. In addition, this Project provides for water supply to Gulbarga City utilising 0.45 T.M.C. The live storage capacity of the reservoir is 1.72 T.M.C. The rainfall in the commanded area in Gulbarga Taluk during the Khariff and Rabi seasons is 560 mm and 100 mm respectively.

The cropping pattern is as under :—

Crop	Area in acres
Khariff dry	7,100
Rabi dry	11,300
Paddy	3,450
Garden	690
Sugar-cane	460
	23,000

The overall delta is 3.00 ft. The Project is not sanctioned. There is no lift irrigation scheme under this Project. The area is frequently affected by drought and scarcity conditions and a quantity of
747 2.20 T.M.C. has been claimed for this Project (MY Note 17, Appendix II, page 6).

Both the Taluks of Gulbarga and Chitapur are identified as drought-affected by the Indian Irrigation Commission (Report of the Irrigation Commission 1972, page 423, Volume I).

In our opinion the demand for 2.20 T.M.C. for this Project is worth consideration.

UPPER MULLAMARI PROJECT

748

The Project Report to be referred to in respect of this Project is MYPK-10, page 14.

The Project envisages irrigation of 10,000 acres in Chincholi Taluk of Gulbarga District, Basavakalyan and Humnabad Taluks of Bidar District, utilising 1.30 T.M.C. of water. The live storage capacity of the reservoir is 0.66 T.M.C. The cropping pattern and the delta are as under :—

Crop	Area in acres	Delta in inches
Khariff paddy	2,500	66
Khariff dry	3,500	21
Rabi dry	4,000	24

It is stated that the area is affected by drought conditions and hence relief is to be given to the area. So, a quantity of 1.30 T.M.C. has been proposed for this Project. It is stated that due to the severe famine conditions during the year 1972-73, the work has been taken up as a scarcity relief measure 749
(MY Note 17). There is no lift irrigation scheme involved in this Project. Chincholi Taluk is Identified as drought-affected by the Indian Irrigation Commission (Report of the Irrigation Commission 1972, Volume I, page 423).

In our opinion the demand of 1.30 T.M.C. is worth consideration for this Project.

LOWER MULLAMARI PROJECT 750

The Project Report to be referred to in respect of this Project is MYPK-8, pages 151-160.

The Lower Mullamari Project envisages to provide irrigation facilities to the drought-stricken regions of 32,000 acres in Chincholi Taluk of Gulbarga District utilising 4.37 T.M.C. The live storage capacity of the reservoir is 1.53 T.M.C. The Khariff normal rainfall of Gulbarga District is about 550 mm and the normal rainfall during the Rabi season is about 100 mm (MYDK-19, page 37). The cropping pattern under the Project is as under :—

Crop	Area in acres
Sugar-cane	1,200
Garden	600
Light perennials	600
Khariff Paddy	7,200
Light Khariff	9,600
Rabi dry	4,800
Second crop	8,000

The overall delta is 3.14 feet. There is no lift irrigation scheme involved in this Project.

It is claimed that in order to relieve the drought 751
conditions a quantity of 4.40 T.M.C. is proposed for this Project. Due to the severe drought conditions during the year 1972-73, the work has been taken up as scarcity relief measure (MY Note 17).

Chincholi Taluk is identified as a drought-affected Taluk by the Indian Irrigation Commission (Report of the Irrigation Commission 1972, Volume I, page 423).

In our opinion the demand of 4.40 T.M.C. is worth consideration.

752 KAGNA PROJECT

The Project Report of this Project is MYPK-8, pages 141-150.

The Kagna Project envisages the irrigation of an area of 64,000 acres, including 16,000 acres by lift, in Sedam and Chitapur Taluks of Gulbarga District, utilising 12.93 T.M.C. The live storage capacity of the reservoir is 1.26 T.M.C. The Khariff normal rainfall of Gulbarga District is about 550mm and the Rabi normal rainfall is about 100 mm (MYDK-19, page 37). The cropping pattern is as under:—

Crop	Area in acres
Sugar-cane	2,560
Paddy	51,840
Rabi dry	9,600
	64,000

The overall delta is 4.68 feet. The Project is not sanctioned.

To mitigate the hardship due to shortage of rainfall, the State of Mysore has proposed to provide irrigation facilities by utilising at least 2 T.M.C. Sedam and Chitapur Taluks are identified as drought-affected Taluks by the Indian Irrigation Commission
753 (Report of the Irrigation Commission 1972, Volume I, page 423).

In our opinion the demand for 2 T.M.C. for this Project is worth consideration.

754 **TUNGABHADRA LEFT BANK LOW LEVEL CANAL**

The Project Report to be referred to in respect of this Project is MYPK-8, pages 12-30.

The Tungabhadra Left Bank Low Level Canal was sanctioned by the former Government of Hyderabad during 1951 for irrigating an area of 4.50 lakh acres plus 1.35 lakh acres of forest, pasture and fuel reserves (MYDK-8, page 29). The said sanctioned Project also provides for a High Level Canal on the left side.

The printed Project Report of Ex-Hyderabad Government gives a demand table wherein the withdrawals are shown as 92.25 T.M.C. (excluding evaporation losses Ex. MYK-270, page 44). The cropping pattern was changed to irrigate 5.8 lakh acres by the Hyderabad Government during 1955 (APDK-10, page 134).

In 1956, the Chief Engineer, Tungabhadra Project considered 82 T.M.C. as sufficient to irrigate 5,80,000 acres including 10,000 acres of second crop paddy (see Supplemental Pleadings Volume III, page 95).

92 T.M.C. gross (including 9 T.M.C. evaporation loss) has been allowed as protected use.

The State of Mysore has demanded a total allocation of 101.3 T.M.C. including 9 T.M.C. evaporation losses as against 92 T.M.C. It is claimed by the State of Mysore that sanctioned area of 5.8 lakh acres is already localised and canals and the distribution system have been practically completed (MYPK-8, page 15). 755

AS we have made it clear, unless very necessary, the water in K-8 and K-9 sub-basins should not be further allowed to be depleted. In our opinion, the State of Mysore should manage the irrigation under this Project by utilising 92 T.M.C. The additional demand for 9.3 T.M.C. is not worth consideration.

VIJAYANAGAR CHANNELS 756

These are ancient channels, 18 in number, existing from the 16th Century from the times of the Vijayanagar Empire. They are in the Districts of Bellary and Raichur. The names of the anicuts and channels now in Mysore State are as under :—

Name of Anicut	Name of Channel	District
1. Vallabhapura Anicut	Basavanna Channel	Bellary
2. Hosakote Anicut	Ray a Channel	Bellary
3. Hosur Anicut	Bella Channel	Bellary
4. Turtha Anicut	Turtha Channel	Bellary
5. Ramasagar Anicut	Ramasagar Channel	Bellary
6. Kampli Anicut	Kampli Channel	Bellary
7. Siruguppa Anicut	Siruguppa Channel	Bellary
8. Desanur Anicut	Desanur Channel	Bellary
9.	Kalghatta Channel	Bellary
10.	Belgodhal Channel	Bellary
11. Koregal Anicut	Koregal Channel •	Raichur
12. Hulgi Anicut	Hulgi Channel	Raichur
13. Shivapur Anicut	Shivapur Channel	Raichur
14. Sanapur Anicut	Anegundi Channel	Raichur
15. Upper Gangavathi Anicut	Upper Gangavathi Channel	Raichur
16 Lower Gangavathi Anicut	Lower Gangavathi Channel	Raichur
17 Bennur Anicut	In ruins	Raichur
18 . Bichal Anicut	Bichal Channel	Raichur

757 Out of the above, Vallabhapura, Hosakote and the Koregal Anicuts are submerged under the Tungabhadra Reservoir. The Bennur Anicut is in ruined condition. The Raya and Basavanna Channels are fed from a sluice in the Tungabhadra Reservoir. The sluice for a discharge of about 375 cusecs which is the normal discharge drawn by both the Raya and Basavanna Channels to command about 7,500 acres is provided (APDK-18, page 76). The Koregal Channel has merged with the Tungabhadra Left Bank Canal. The rest of the channels directly take off from the river and there is no storage.

Ayacut under these channels is about 30,000 acres. It is claimed that these channels work at very low duties and they have acquired a right for such low duties on account of long usage and custom (APPK-18, pages 35-36).

The minimum utilisation claimed is 13.7 T.M.C. out of which the protected use is only 5.71 T.M.C- The actual annual withdrawal of Raya Basavanna Channels for the last ten years is about 10 T.M.C. (MYDK-10, pages 3-12). It is stated by the State
758 of Mysore that the State of Andhra Pradesh had indicated as far back as 1956 a utilisation of 29 T.M.C. for all the Pre-Moghul Channels (APDK-VIII, page 26).

These are very old channels and in our opinion the additional demand for water to the extent of 6.35 T.M.C. may be held as worth consideration.

759 GONDI LEFT BANK CANAL EXTENSION

The Project Report of this Project is MYPK-10, page 6.

This is an extension of the existing Bhadra Anicut Left Bank Canal. It envisages irrigation of 9,460 acres in Bhadravathy Taluk of Shimoga District utilising 2 T.M.C. It is stated that the area is particularly suited to grow Khariff paddy for which the normal rainfall during the season is not sufficient. As the canal and the anicut are already existing and functioning, 9,460 acres of Khariff paddy at a duty of 50 acres/cusec can be brought under Khariff irrigation at a very economical cost (MY Note 17 Appendix III, page 12). The Project does not involve any lift. The Project is not sanctioned.

In our opinion the demand for this Project is not worth consideration. This demand may be met by effecting economy in utilisation for the Bhadra Project.

UPPER TUNGA PROJECT 760

The Project Report of this Project is MYPK-8, pages 95—103.

The Upper Tunga Project is proposed to provide irrigation facilities mainly for Ranebennur, Haveri, Shirhatti and Mundargi Taluks of Dharwar District of Ex-Bombay State and Koppal Taluk of Raichur District. The irrigable area under the above Project is 3,20,000 acres including 50,500 acres by lift irrigation, and the cropped area proposed is 4,10,000 acres. June-September period of rainfall in the various Taluks proposed to be served by this Project is given below :—

Area served		Irrigable area in '000 acres	Normal rainfall in mm during June to September
District	Taluk		
Shimoga	Shimoga		526.6
	Honnali		289.1
Dharwar	Hirekerur		498.6
	Ranebennur		332.5
	Haveri	320.00	445.0
	Mundargi		252.9
	Shirhatti /		Not available
	Shiggaon		426.4
	Hangal		628.8
Raichur	Koppal		Not available

Note:— The figures of rainfall are derived from MYDK-19, pages 33, 41 and 42.

The Taluks of Mundargi, Ranebennur and Koppal 761 are identified as drought-affected by the Indian Irrigation Commission, vide Report of Irrigation Commission 1972 (Volume I, page 423).

The major portion of the area proposed for irrigation is in Ex-Bombay Karnatak area. It is now proposed by the State that at least 20 T.M.C. from 75 per cent dependable flows, as against 40 T.M.C. claimed, may be allowed (MY Note 17, Appendix III, page 13).

In our opinion unless a further study is made of the available water in the river Tungabhadra, the demand to the extent of 20 T.M.C. for this Project is not worth consideration for the present.

UPPER BHADRA PROJECT 762

The Project Report to be referred to ragarding this Project is MYPK-8, pages 104—113.

The Upper Bhadra Project is proposed primarily to provide irrigation facilities to the drought-affected

areas of 4,10,000 acres of Chitradurga and Bellary District in the Taluks mentioned below which are chronically drought-affected areas. The Project requires 36 T.M.C. There is no lift involved in this Project. The Project is not sanctioned.

The rainfall during Khariff in the various Taluks of Chitradurga, Bellary, Shimoga and Chikkamagalur Districts for which irrigation facility is proposed is as under:—

Area served		Irrigated area ('000 acres)	Normal rainfall in *mm* during June-September
District	Taluk		
Chikkamagalur	Tankere	33.40	557.0
Shimoga	Channagiri	2.00	454.2
	Bhadravathy	8.10	Not available
Chitradurga	Challakere	161.00	217.4
	Hosadurga	59.50	274.8
	Jagalur	28.00	291.8
	Molakalmuru	38.00	321.8
Bellary	Kudligi	69.40	385.3
	Sandur	10.60	Not available
	Total	410.00	

Note :- (1) irrigated areas are from MYPK-9, pages 109 and 110.
(2) Rainfall figures are derived from MYDK-19, pages 33 to 36.

763 It is submitted that the area in Chitradurga and Bellary Districts is one of the worst affected areas in the basin. The aridity of the area and the economic backwardness of the area justify the implementation of this Project at least for a utilisation of 10 T.M.C. (MY Note 17 Appendix HI, pages 13 and 14).

The whole of Chitradurga and Bellary Districts have been identified as drought-affected by the Indian Irrigation Commission (Report of Irrigation Commission 1972, Volume I, pages 422 and 423).

It cannot be said that the demand for this Project is not worth consideration. But unless a further study is made of the water available in the river Tungabhadra, the Project may be deferred.

764 FEEDER CHANNEL TO RANIKERE

The Project Report to be referred to regarding this Project is MYPK-10, page 18.

This Project will irrigate 10,200 acres in Challakere Taluk of Chitradurga District, utilising 1 T.M.C. of water. June-September rainfall in Challakere Taluk is 217.4 mm only (MYDK-19, page 35). The cropping pattern proposed under this Project is as under:—

Crop	Area in acres	Delta in inches
Khariff paddy	742	66
Semi dry	9,458	21
	10,200	

There is no lift irrigation involved in this Project. The Project is not yet sanctioned.

The area proposed to be served is one of the worst scarcity-affected areas. This Taluk is identified as drought-affected by the Indian Irrigation Commission vide Report of the Indian Irrigation Commission 1972 (page 422 of Volume I).

Unless a further study is made of the waters available in the river Vedavathi, the demand of 1 T.M.C. is not worth consideration.

765 JINIGEHALLA PROJECT

The Project Report to be referred to regarding the Project is MYPK-10, page 63.

This Project will irrigate 8,230 acres in Molakalmuru Taluk of Chitradurga District utilising 1 T.M.C. of water. June-September rainfall in Molakalmuru Taluk is 321.8 mm only (MYDK-19, page 35). The cropping pattern under this Project is as under:—

Crop	Area in acres	Delta in inches
Khariff paddy	5,230	66
Khariff semi dry	3,000	24
	8,230	

The irrigation is by flow only and no lift is involved. The work is not yet sanctioned. The area is affected by scarcity and drought conditions frequently and the Indian Irrigation Commission has identified this Taluk as drought-affected vide Report of the Indian Irrigation Commission 1972 (Volume I, page 422).

Unless a further study is made of the water available in the river Vedavathi, the demand of 1 T.M.C. for this Project is not worth consideration.

766 MINOR IRRIGATION

It is claimed by the State of Mysore that the total utilisation of all the minor irrigation works existing and under construction as on 1969 is 124.26 T.M.C.

(pages 4(a) and 5 of Annexure III to Sheet XXXVIII of MRDK Volume XIV). Against this the protected use is only 94.34 T.M.C. The pub-basinwise details for the balance of 29.92 or say 30 T.M.C. required by the minor irrigation works which came into operation or under construction after 1960 are as under:—

Sub-basin	Requirement in T.M.C. for Minor Irrigation works under operation and under construction from 1960-61.
K-l	0.33
K-2	5.16
K-3	3.20
K-4	1.56
K-5	0.56
K-6	3.77
K-7	1.00
K-8	11.17
K-9	3.25
Total	30.00

767 Statement 6 of Annexure III, MYK Volume-I provides for a utilisation of 98.3 T.M.C. under future minor irrigation works (utilising less than 1 T.M.C. each). However, the State of Mysore states that under the priority only 34.60 T.M.C. is proposed to be utilised under future minor irrigation works. The sub-basinwise details are as under:—

Sub-basin	Requirement in T.M.C.
K-l	0.70
K-2	4.00
K-3	3.65
K-4	4.51
K-5	0.03
K-6	7.63
K-7	0.66
K-8	12.42
K-9	1.00
Total	34.60

(MY Note 17 Appendix-III, pages 14-15)

768 We are of the opinion that 30 T.M.C. may be held as worth consideration for Minor Irrigation as this quantity of water is required to meet the demands of the minor works existing or under construction.

We are, however, of the opinion that it is not possible to treat the demand of 34.60 T.M.C. for Minor Irrigation in future as worth consideration for the present.

769 As a result of examining the projects of the State of Mysore for which water has been claimed from the dependable flow of 2060 T.M.C., we are of the opinion that the demand for the following projects is worth consideration to the extent mentioned against each item:—

	T.M.C
1. Dudhganga Project	4.00
2. Upper Krishna Project	52.00
3. Ghataprabha Project	55.00
4. Malaprabha Project (including Upper Malaprabna Project)	9.00
5. Ramthal Lift Irrigation Scheme	4.50
6. Bhima Irrigation Project	11.00
7. Diksanga Project	1.00
8. Amarja Project	2.27
9. Bennithora Project	5.43
10. Gandhorinala Project	2.20
11. Upper Mullamari Project	1.30
12. Lower Mullatmari Project	4.40
13. Kagna Project	2.00
14. Vijayanagar Channels	6.35
15. Minor Irrigation	30.00
Total	190.45

The State of Mysore in? MY Note No. 17 has further claimed 162 T.M.C. out of the water flowing in excess of the dependable flow of 2060 T.M.C, as follows:— 770

	T.M.C
1. Dudhganga Project	5.00
2. Upper Krishna	100.00
3. Markandeya Project	1.00
4. Malaprabha Project	3.00
5. Upper Tunga	20.00
6. Upper Bhadra	15.00
7. Minor Irrigation	18.00
Total	162.00

On the very face of it, this demand cannot be satisfied as the only flow that is available for distribution in excess of 2060 T.M.C. is that due to the return flow as already mentioned in Part I. We have given a share to the State of Mysore in the return flow. The State of Mysore may utilise the quantity of water allocated to it as its share in the return flow for any of its projects, subject to the conditions and restrictions imposed by us on the utilisation of waters in the various sub-basins.

This completes our discussion so far as the demands of the State of Mysore are concerned.

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CHAPTER XV

The Governments of Maharashtra, Karnataka and Andhra Pradesh shall bear their own costs of appearing before the Tribunal. The expenses of the Tribunal shall be borne and paid by the three States in equal shares. This is in accordance with the practice followed in America as well as the precedent of the Indus Commission Report. The expenses could be assessed only after the final dissolution of the Tribunal.

On April 10, 1971, the Tribunal passed an order in terms of agreed minutes filed by the parties regarding the diversion of the Godavari waters. It was stated by the parties that each of the concerned States "will be at liberty to divert any part of the share of the Godavari waters which may be allocated to it by the Godavari Tribunal from the Godavari Basin to any other Basin". None of the States thereafter asked for a mandatory order from the Tribunal for diversion of the Godavari waters into the Krishna Basin. With effect from that date, the Krishna and Godavari cases got separated from each other. In consequence of the order passed by the Tribunal on 19th April, 1971, the States of Madhya Pradesh and Orissa were discharged from the record of Krishna case and were no longer parties. In our order of 19th April, 1971 we directed the States of Madhya Pradesh and Orissa to pay their own costs.

Our order of 19th April, 1971 as also the order of the 27th July, 1971 modifying the previous order
772 are set forth in Appendix 'U' to this Report.

In order to inform ourselves fully about the projects of the different States, as also to assess their relative importance in the general scheme of allocation and above all to comprehend objectively the site problems presented to us by the different States by having a close look at them, we inspected many places in the Krishna basin. Though this tour took little more than four weeks of the Tribunal's time, the. experience and the results were very rewarding. The visits to Koyna Nagar, Narayanpur, Alamatti, Nagarjunasagar, Vijayawada, Srisailam, Tungabhadra Dam and Suneksela amongst the many places we saw unfolded at a glance the manifold facets of the problems of the projects and structures located there and left little scope for explanation and elaboration which would have been necessary if arguments before the Tribunal had been addressed without the visual aid Provided by these inspections. The States of Maharashtra, Karnataka and Andhra Pradesh extended to us the utmost courtesy and spared no efforts to make our visit extremely useful and instructive. The officials deputed to look after the inspection arrangements of the Tribunal and its staff made a commendable work of it and we give our meed of praise for the unobtrusive efficiency displayed by them.

We would be failing in sincerety, and no less in our 773
duty if we fail to acknowledge our debt of gratitude for the active co-operation extended to us by the eminent counsel of the States and the assistance derived by them as also by us from their respective engineers, scientists and technicians. These experts had to put in hours of hard work and industry and we genuinely felt that sometimes we were a little too exacting in asking for details and technical information on special problems at a very short notice. Not once was their active support or co-operation withheld or delayed. The State Governments were equally keen to render the utmost assistance to the Tribunal in the expeditious disposal of its task in hand. The respective Governments placed the services of *two* Stenographers each at the disposal of the Tribunal during the period when the oral evidence was recorded and arguments heard. These officials did not take long to make themselves familiar with their work and became quite at ease in the shortest possible time with the scientific terms, phrases and formulae used by the witnesses. To them we owe a great deal for saving the time of the Tribunal and the maintenance of a satisfactory record by the Tribunal's officials.

We would add that without the active willingness 774
of the State Governments and their specialist advisers, our task would have assumed stupendous proportions. The Tribunal was called upon to decide on questions involving technical and engineering matters of utmost complexity. At the very beginning we were asked by the counsel for the different States to get along with our work without the assessors whose technical assistance could be made available to us under the Inter-State River Disputes Act. We acceded to the request jointly made by the counsel for all the States. We can now say at the end of our labours that it would have been difficult to arrive at conclusive results unless the willingness of the State Governments, their

counsel and engineers to reach the maximum possible agreements on complex technical points of dispute, was readily forthcoming. We have already made reference to such matters in our report and need not advert to these again. We hope earnestly that the equally important task of implementation of the decisions at which we have reached would receive the ready support and co-operation by the concerned States. For reasons, which we have explained in our report, we are not immediately setting up an authority to maintain watch and supervision over the work of implementation. The amity and goodwill displayed by the parties in the conduct of this long trial lead us to hope that our expectations will be amply fulfilled.

To our own staff, we are indebted for the unstinted efforts and the conscientious discharge of duties in performance of the Tribunal's work at all hours of the day. Mr. M. Prasad, the Secretary of the Tribunal, has been conspicuous in the discharge of his duties with zeal and devotion. It would be invidious to mention individuals from amongst members of the staff but it would be true to say that one and all they have done excellent work in which they evinced great interest and assiduity. **775**

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CHAPTER XVI

Final Order of the Tribunal.

The Tribunal hereby passes the following Order :—

Clause I

This Order shall come into operation on the date of the publication of the decision of this Tribunal in the official Gazette under Section 6 of the Inter-State Water Disputes Act, 1956.

Clause II

The Tribunal hereby declares that the States of Maharashtra, Karnataka and Andhra Pradesh will be free to make use of underground water within their respective State territories in the Krishna river basin.

This declaration shall not be taken to alter in any way the rights, if any, under the law for the time being in force of private individuals, bodies or authorities.

Use of underground water by any State shall not be reckoned as use of the water of the river Krishna.

Clause III

The Tribunal hereby determines that, for the purpose of this case, the 75 per cent dependable flow of the river Krishna up to Vijayawada is 2,060 T.M.C.

777 The Tribunal considers that the entire 2,060 T.M.C. is available for distribution between the States of Maharashtra, Karnataka and Andhra Pradesh.

The Tribunal further considers that additional quantities of water as mentioned in sub-clauses A(ii), A(iii), A(iv), B(ii), B(iii), B(iv), C(ii), C(iii) and C(iv) of Clause V will be added to the 75 per cent dependable flow of the river Krishna up to Vijayawada on account of return flows and will be available for distribution between the States of Maharashtra, Karnataka and Andhra Pradesh.

Clause IV

The Tribunal hereby orders that the waters of the river Krishna be allocated to the three States of Maharashtra, Karnataka and Andhra Pradesh for their beneficial use to the extent provided in Clause V and subject to such conditions and restrictions as are mentioned hereinafter.

Clause V

(A) The State of Maharashtra shall not use in any water year more than the quantity of water of the river Krishna specified hereunder :—

(i) as from the water year commencing on the 1st June next after the date of the publication of the decision of the Tribunal in the official gazette up to the water year 1982-83

565 T.M.C.

(ii) as from the water year 1983-84 up to the water year 1989-90 778

565 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1975-76, 1976-77 and 1977-78 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(iii) as from the water year 1990-91 up to the water year 1997-98

565 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1982-83, 1983-84 and 1984-85 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(iv) as from the water year 1998-99 onwards

565 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1990-91, 1991-92 and 1992-93 from its own 779 projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(B) The State of Karnataka shall not use in any water year more than the quantity of water of the river Krishna specified hereunder :—

(i) as from the water year commencing on the 1st June next after the date of the publication of the decision of the Tribunal in the official gazette up to the water year 1982-83

695 T.M.C.

(ii) as from the water year 1983-84 up to the water year 1989-90

695 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1975-76, 1976-77 and 1977-78 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(iii) as from the water year 1990-91 up to the water year 1997-98

695 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1982-83, 1983-84 and 1984-85 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects. **780**

(iv) as from the water year 1998-99 onwards

695 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1990-91, 1991-92 and 1992-93 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(C) The State of Andhra Pradesh will be at liberty to use in any water year the remaining water that may be flowing in the river Krishna but thereby it shall not acquire any right whatsoever to use in any water year nor be deemed to have been allocated in any water year water of the river Krishna in excess of the quantity specified hereunder :—

(i) as from the water year commencing on the 1st June next after the date of the publication of the decision of the Tribunal in the official gazette up to the water year 1982-83

800 T.M.C.

(ii) as from the water year 1983-84 up to the water year 1989-90 **781**

800 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1975-76, 1976-77 and 1977-78 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(iii) as from the water year 1990-91 up to the water year 1997-98

800 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1982-83, 1983-84 and 1984-85 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects. **782**

(iv) as from the water year 1998-99 onwards

800 T.M.C. plus

a quantity of water equivalent to 7 ½ per cent of the excess of the average of the annual utilisations for irrigation in the Krishna river basin during the water years 1990-91, 1991-92 and 1992-93 from its own projects using 3 T.M.C. or more annually over the utilisations for such irrigation in the water year 1968-69 from such projects.

(D) For the limited purpose of this Clause, it is declared that:—

(i) the utilisations for irrigation in the Krishna river basin in the water year 1968-65 from projects using 3 T.M.C. or more annually were as follows:—

From projects of the State of Maharashtra . . . . . 61.45 T.M.C.
From projects of the State of Karnataka . . . . . 176.05 T.M.C.
From projects of the State of Andhra Pradesh . . . . . 170.00 T.M.C.

(ii) annual utilisations for irrigation in the Krishna river basin in each water year after this Order comes into operation from the projects of any State using 3 T.M.C. or

more annually shall be computed on the basis of the records prepared and maintained by that State under Clause XIII.

Clause VI

Beneficial use shall include any use made by any State of the waters of the river Krishna for domestic, municipal, irrigation, industrial, production of power, navigation, pisciculture, wild life protection and recreation purposes.

783 *Clause VII*

(A) Except as provided hereunder a use shall be measured by the extent of depletion of the waters of the river Krishna in any manner whatsoever including losses of water by evaporation and other natural causes from man-made reservoirs and other works without deducting in the case of use for irrigation the quantity of water that may return after such use to the river.

The water stored in any reservoir across any stream of the Krishna river system shall not of itself be reckoned as depletion of the water of the stream except to the extent of the losses of water from evaporation and other natural causes from such reservoir. The water diverted from such reservoir by any State for its own use in any water year shall be reckoned as use by that State in that water year.

The uses mentioned in column No. 1 below shall be measured in the manner indicated in column No. 2.

Use	Measurement
Domestic and municipal water supply.	By 20 per cent of the quantity of water diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal.
Industrial use.	By 2.5 per cent of the quantity of water diverted or lifted from the river or any of its tributaries or from any reservoir, storage or canal

784 (B) Diversion of the waters of the river Krishna by one State for the benefit of another State shall be treated as diversion by the State for whose benefit the diversion is made.

Clause VIII

(A) If in any water year any State is not able to use any portion of the water allocated to it during that year on account of the non-development of its projects or damage to any of its projects or does not use it for any reason whatsoever, that State will not be entitled to claim the unutilised water in any subsequent water year.

(B) Failure of any State to make use of any portion of the water allocated to it during any water year shall not constitute forfeiture or abandonment of its share of water in any subsequent water year nor shall it increase the share of any other State in any subsequent water year even if such State may have used such water. —

Clause IX

As from the 1st June next after the date of the publication of the decision of the Tribunal in the official gazette.

(A) Out of the water allocated to it, the State of Maharashtra shall not use in any water year :—

(i) more than 7 T.M.C. from the Ghataprabha (K-3) sub-basin.

(ii) more than 90 T.M.C. from the main 785 stream of the river Bhima.

(B) Out of the water allocated to it, the State of Karnataka shall not use in any water year—

(i) more than 295 T.M.C. from the Tungabhadra (K-8) sub-basin and more than 42 T.M.C. from the Vedavathi (K-9) sub-basin.

(ii) more than 15 T.M.C. from the main stream of the river Bhima.

(C) Out of the water allocated to it, the State of Andhra Pradesh shall not use in any water year—

(i) more than 127.5 T.M.C. from the Tungabhadra (K-8) sub-basin more than 12.5 T.M.C. from the Vedavathi (K-9) sub-basin.

(ii) more than 6 T.M.C. from the catchment of the river Kagna in the State of Andhra Pradesh.

(D) (i) The uses mentioned in sub-clauses (A), (B), and (C) aforesaid include evaporation losses.

(ii) The use mentioned in sub-clause (C) (i) does not include use of the water flowing from the Tungabhadra into the river Krishna.

Clause X -

(1) The State of Maharashtra shall not out of the water allocated to it divert or permit the diversion of more than 67.5 T.M.C. of water outside the

786 Krishna river basin in any water year from the river supplies in the Upper Krishna (K-l) sub-basin for the Koyna Hydel Project or any other project.

Provided that the State of Maharashtra will be at liberty to divert outside the Krishna river basin for the Koyna Hydel Project water to the extent of 97 T.M.C. annually during the period of 10 years commencing on the 1st June, 1974 and water to the extent of 87 T.M.C. annually during the next period of 5 years commencing on the 1st June, 1984 and water to the extent of 78 T.M.C. annually during the next succeeding period of 5 years commencing on the 1st June, 1989.

(2) The State of Maharashtra shall not out of the water allocated to it divert or permit diversion outside the Krishna river basin from the river supplies in Upper Bhima (K-5) sub-basin for the Projects collectively known as the Tata Hydel Works or any other project of more than 54.5 T.M.C. annually in any one water year and more than 212 T.M.C. in any period of five consecutive water years commencing on the 1st June, 1974.

(3) Except to the extent mentioned above the State of Maharashtra shall not divert or permit diver sion of any water out of the Krishna river basin.

787 *Clause XI*

(A) This Order will supersede—

(i) the agreement of 1892 between Madras and Mysore so far as it related to the Krishna system;

(ii) the agreement of 1933 between Madras and Mysore so far as it related to the Krishna river system;

(iii) the agreement of June, 1944 between Madras and Hyderabad;

(iv) the agreement of July, 1944 between Madras and Mysore; in so far it related to the Krishna river system;

(v) the supplemental agreement of December, 1945 among Madras, Mysore and Hyderabad;

(vi) the supplemental agreement of 1946 among Madras, Mysore and Hyderabad.

Copies of the aforesaid agreements are appended to the report of the Tribunal.

(B) The regulations set forth in Annexure 'A' to this Order regarding protection to the irrigation works in the respective territories of the States of Karnataka and Andhra Pradesh in the Vedavathi sub-basin be observed and carried out.

(C) The benefits of utilisations under the Rajoli- 788
bunda Diversion Scheme be shared between the States of Karnataka and Andhra Pradesh as mentioned herein below:—

Karnataka	1.2 T.M.C.
Andhra Pradesh	15.9 T.M.C.

(D) The reservoir loss of Tungabhadra reservoir shall be shared equally by the works of the State of Karnataka on the left side and the works on the right side of the reservoir. The half share of the right side in the reservoir loss shall be shared by the States of Andhra Pradesh and Karnataka in the ratio of 5.5 to 3.5.

Clause XII

The regulations set forth in Annexure 'B' to this Order regarding gauging and gauging sites in the Krishna river system be observed and carried out.

Clause XIII

(A) Each State shall prepare and maintain annually for each water year complete detailed and accurate records of—

(a) annual water diversions outside the Krishna river basin.

(b) annual uses for irrigation from irrigation works using less than 1 T.M.C. annually.

(c) annual uses for irrigation from all other 789
projects and works.

(d) annual uses for domestic and municipal water supply.

(e) annual uses for industrial purposes.

(f) annual uses for irrigation within the Krishna river basin from projects using 3 T.M.C. or more annually.

(g) areas irrigated and duties adopted for irrigation from irrigation works using less than 1 T.M.C. annually.

(h) estimated annual evaporation losses from reservoir and storages.

(i) formulae used and co-efficient adopted for measuring discharges at project sites.

Each State shall send annually to the other States a summary abstract of the said records.

The said records shall be open to inspection of the other States through their accredited representatives at all reasonable times and at a reasonable place or places.

(B) The records of gaugings mentioned in Annexure 'B' to this Order shall be open to inspection of all the States through their accredited representatives at all reasonable times and at a reasonable place or places.

790 *Clause XIV*

(A) At any time after the 31st May, 2000, this Order may be reviewed or revised by a competent authority or Tribunal, but such review or revision shall not as far as possible disturb any utilisation that may have been undertaken by any State within the limits of the allocation made to it under the foregoing clauses.

(B) In the event of the augmentation of the waters of the river Krishna by the diversion of the waters of any other river, no State shall be debarred from claiming before the aforesaid reviewing authority or Tribunal that it is entitled to greater share in the waters of the river Krishna on account of such augmentation nor shall any State be debarred from disputing such claim.

Clause XV

Nothing in the Order of this Tribunal shall impair the right or power or authority of any State to regulate within its boundaries the use of water, or to enjoy the benefit of waters within that State in a manner not inconsistent with the Order of this Tribunal.

791 *Clause XVI* In this Order,

(a) Use of the water of the river Krishna by any person or entity of any nature what so ever within the territories of a State shall be reckoned as use by that State.

(b) The expression "water year" shall mean the year commencing on 1st June and ending on 31st May.

(c) The expression "Krishna river" includes the main stream of the Krishna river, all its tributaries and all other streams contributing water directly or indirectly to the Krishna river.

(d) The expression "T.M.C." means thousand million cubic feet of water.

Clause XVII

Nothing contained herein shall prevent the alteration, amendment or modification of all or any of the foregoing clauses by agreement between the parties or by legislation by Parliament.

Clause XVIII

The Government of Maharashtra, Karnataka and Andhra Pradesh shall bear their own costs of appearing before the Tribunal. The expenses of the Tribunal shall be borne and paid by the aforesaid three States in equal shares.

ANNEXURE A 792

Regulations regarding protection to irrigation works in the respective territories of the States of Karnataka and Andhra Pradesh in Vedavathy sub-basin.

The State of Karnataka will not put up any new work on the streams mentioned in Schedule (1) within the limits shown in the said Schedule and marked in the map* appended herewith, without the previous consent" of Andhra Pradesh to protect the irrigation interests under the existing irrigation works in Andhra Pradesh and similarly the State of Andhra Pradesh will not put up any new work on the Streams mentioned in Schedule (2) within the limits shown in the said Schedule and marked in the map* appended herewith, without the previous consent of the State of Karnataka to protect the irrigation interests under the existing irrigation works in the State of Karnataka.

The State of Karnataka will not put up any new construction on Suvarnamukhi river so as to affect the supply of Agali tank in Andhra Pradesh for the irrigation of an ayacut of 884 acres, the supplies for which are drawn from the Agali Anicut in the State of Karnataka.

*See Map II in Volume IV of the Report.

793 SCHEDULE I

List of streams on which no new constructions should be undertaken by the State of Karnataka without the previous consent of Andhra Pradesh.

Sl. No.	Name of the Stream or Catchment	Location in the Map	Limits within which no new construction should be undertaken by Karnataka without the previous consent of Andhra Pradesh
1.	Hagari (Vedavathy)	A	From Vanivilas Sagar in Karnataka upto Bhairavanithippa Dam in Andhra Pradesh.
2.	Dodderi tank halla (Garanihalla)	B	4 1/2 miles upstream of confluence with Hagari.
3.	Talak tank halla (Garanihalla)	C	From the Salem-Bellary road bridge over this stream upto confluence with Hagari.
4.	Chinnahagari	D	Upto 16 miles upstream from Karnataka-Andhra Pradesh boundary.
5.	Amarapuram tank catchment	E	Catchment of Amarapuram tank in the State of Karnataka.
6.	Virapasamudram tank catchment	F	Catchment of Virapasamudram tank in the State of Karnataka.
7.	Yeradkere tank catchment	G	Catchment of Yeradkere tank in the State of Karnataka.
8.	Rangasamudram tank catchment	H	Catchment of Rangasamudram tank in the State of Karanataka.
9	Nagalapuram tank catchment	I	Catchment of Nagalapuram tank in the State of Karnataka.

794 SCHEDULE 2

List of streams on which no new constructions should be undertaken by the State of Andhra Pradesh, without the previous consent of Karnataka.

Sl. No.	Name of the Stream	Location in the Map	Limits within which no new construction should be undertaken by Andhra Pradesh without the previous consent of the State of Karnataka.
1	2	3	4
1.	Madalur Doddakere nala	J	Entire catchment of the nala in Andhra Pradesh.
2.	Madalur Gidaganahalli Kattenala	K	Entire catchment of the nala in Andhra Pradesh.
3.	Doddabanagere Doddakere nala	L	Entire catchment of the nala in Andhra Pradesh.
4.	Dharmapur tank nala	M	Entire catchment of the nala in Andhra Pradesh.
5.	Parasurampur Doddakere nala	N	Entire catchment of the nala in Andhra Pradesh.
6.	Kadehoda Achuvalikere nala	O	Entire catchment of the nala in Andhra Pradesh.
7.	Parasurampur a tank nala	P	Entire catchment of the nala in Andhra Pradesh.
8.	Gowripura Palydakere nala	Q	Entire catchment of the nala in Andhra Pradesh.
9.	Jajur tank nala	R	Entire catchment of the nala in Andhra Pradesh.
9.	Thippareddihally Kyatanakere nala	S	Entire catchment of the nala in Andhra Pradesh.
11.	Oblapur tank nala	T	Entire catchment of the nala in Andhra Pradesh.
16.	Hagari (Vedavathy)	U	Below Bhairavanithippa Dam up to Andhra Pradesh Karnataka border.
13.	Chinnahagari	V	From Karanataka-Andhra Pradesh border up to its confluence with Vedavathy (Hagari).

ANNEXURE B 795

Regulations regarding gaugings and gauging sites in the Krishna River System

The river Krishna and its tributaries should be gauged at the following sites:

1. *At all the dam and wier sites—existing, under construction and future projects—utilising annually* 1 *T.M.C. or more:*

At all such sites the following measurements will be made and recorded three times a day—6 A.M. in the morning, 12 Noon and 6 P.M. in the evening:—

(a) Diversions into canals, penstocks, tunnels etc.

(b) Water let down through the various sluices in the dam, weir or barrage.

(c) Overflow over waste weir or spillways.

(d) Estimated evaporation losses.

(e) Water lifted from the river or reservoirs for irrigation, water supply and for any other purpose. These measurements will be made by the States in which the dams and weirs are situated.

The cost of such measurements will be borne by the States concerned.

II. *Gauging on Inter-State Streams :* 796

Three times daily at 6 A.M., 12 Noon and 6 P.M.

A. *Inter-State streams between Karnataka and Andhra Pradesh* :

1. The Krishna River near	Deosugar (at present a CW& PC gauging site)
2. The Bhima River ... near	Yadgir (CW&PC gauging site).
3. The Tungabhadra River near	Madhwaram bridge site.
4. (a) The Vedavathy .. River near	Bhairavanithippa
(b) The Vedavathy ... River near	Rampur (at present a CW&PC site)
5. The Kagna River ... near	Jiwargi
6. The Chikkahagari River near	Amkundi Bridge or Aqueduct site on High Level Canal.

The location of these stations may be changed from time to time as the river channels and flow conditions of the rivers may require. The river gauging at Deosugar, Yadgir, and Rampur will be continued to be done by the CW&PC as at present, the States bearing the cost as being done now. The river gauging at Madhawaram, Bhairvanithippa, Jiwargi and Amkundi Bridge will be done jointly by the States of Karnataka and Andhra Pradesh or by the CW&PC if willing to do so, and the cost will be shared between all the three States equally.

797 *B. Inter-State Streams between Maharashtra and Karnataka :*

1.	The Krishna river near	Shirti (at present a CW&PC gauging site)
2.	The Bhima river near ...	Takali (do)
3.	/ The Ghataprabha river near ...	Daddi
4.	The Vedganga river near ...	Bastawad
5.	The Dudhganga river near ...	Kagal at the bridge site on N. Highway.
6.	The Panchaganga river near ...	Terwad (at present a CW&PC gauging site)
7.	The Agrani river near ...	Pendagaon
8.	The Hiranyakeshi river near ...	Gotur weir
9.	The Bornala river near ...	Konkangaon
10.	The Borinala near ...	Diksanga site or Railway bridge near Rudewadi
11.	The Doddahalla river near ...	Shivadhan
12.	The Benithora river near ...	Diggi

The location of the said stations may be changed from time to time as the river channels and water flow conditions of the rivers may require.

The river gauging at Shirti, Takali and Terwad will be continued to be done by the CW&PC as at present the States bearing the cost as being done now. The river gauging at Daddi, Bastawad, Kagal, Pendagaon, Gotur, Konkangaon, Diksanga or Rudewadi, Shivadhan, and Diggi will be done jointly by the States of Maharashtra and Karnataka or the CW&PC if willing to do so, and the cost of gauging at these sites will be shared between all the three States equally. 798

C. *CW&PC gauging sites :*

In addition to the CW&PC gauging sites mentioned in A & B above, the CW&PC will continue to do the river gauging as at present at the following sites the cost being borne by the three States as at present.

(a) *On the Krishna river at*

(1) Karad (in Maharashtra)
(2) Almatti (in Karnataka)
(3) Dhannur (in Karnataka)
(4) Yaparla (in Andhra Pradesh)
(5) Moravakonda (in Andhra Pradesh)
(6) Srisailam (in Andhra Pradesh)
(7) Damerapadu (in Andhra Pradesh)
(8) Wadenpalli (in Andhra Pradesh)
(9) Vijayawada (in Andhra Pradesh)

(b) *On the Koyna river at*

(10) Koyna dam (Maharashtra)
(11) Warunji (-do-)

(c) *On the Warna river at* 799

(12) Samdoli (Maharashtra)

(d) *On the Dudhganga river at*

(13) Sadalgi (Maharashtra)

(e) *On the Ghatprabha river at*

(14) Dhupdal weir (in Karnataka)
(15) Bagalkot (-do-)

(f) *On the Malaprabha river at*

(16) Huvanur (in Karnataka)

(g) *On the Bhima river at*

(17) Dhond (in Maharashtra)

(18) Narsingpur (-do-)

(h) *On the Nira river at*

(19) Sarati (in Maharashtra)

(i) *On the Sina river at*

(20) Wadakbal (in Maharashtra)

(j) *On the Tungabhadra river at*

(21) Harlahalli (in Karnataka)

(22) Manuru (-do-)

(23) Mantralayam (-do-)

(24) Bawapuram (in Andhra Pradesh)

(k) *On the Tunga river at*

(25) Shimoga (in Karnataka)

(1) *On the Bhadra river at* **800**

(26) Lakkavali (in Karnataka)

(m) *On the Varada river at*

(27) Marol (in Karnataka)

(n) *On the Musi river at*

(28) Damercherla (in Andhra Pradesh)

(o) *On the Palleru river at*

(29) Palleru bridge (in Andhra Pradesh)

(p) *On the Munneru river at*

(30) Keesra (in Andhra Pradesh)

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