

**No Fear of Unknowns here!**

**Benefits areas are not known, how the water will be taken to benefit area, at what cost, when and how much will be taken is not even mentioned, costs are not estimated, people are opposing, water is not available, but feasibility report is ready!**

**The Proposal** The link project consists of 7 proposed reservoirs viz. Jheri, Mohankavchali & Paikhed on Par River, Chasmandva on Auranga River, Chikkar & Dabdar on Ambica River and Kelwan on Purna river and a 401 km long link canal connecting these reservoirs. The total length of the link canal is subdivided into two reaches viz. Par-Tapi (177 km including 5.5 km. tunnel length), and Tapi - Narmada (224 km). The link from Par to Tapi starts with a tunnel connecting Mohankavchali reservoir to Paikhed weir. The open channel link starts from Paikhed weir and drops into Ukai reservoir. The seven proposed reservoirs in this link would submerge 7 559 ha of which 3 572 ha is forestland. 14,832 people and 9,029 livestock would be affected by the submergence. 75 villages will be affected out of which 24 will be submerged fully and the rest will get partially affected. (This is the Task Force Website information, some at variance with the information given in the feasibility report of 1995.)

The proposal envisages transfer of “surplus” water from west flowing rivers between Par and Tapi to undefined “water deficit” areas in N Gujarat. The scheme is located mainly in S Gujarat but it also covers part of the areas of Maharashtra, North of Mumbai on the Western Ghats. The project area falls under the ‘West Cost Plain’ region. Some part of the project area also falls in Peninsula plateaus and central highlands. The basins of the W flowing rivers from Par to Tapi lies between N latitudes 20°13’ to 21°14’ and E longitudes 72°43’ to 73°58’. The Tapi basin lies between N latitudes 20°5’ to 22°3’ and E longitudes 72°38’ to 78°17’ while the Narmada basin lies between N latitudes 21°20’ to 23°45’ and E longitudes 72°32’ to 81°45’.

**Aims and claims** The main aim of the link is to transfer the surplus water of Par, Auranga, Ambica, Purna and Tapi river basins to Narmada canal command (Miyagam and Vadodara branches) after providing enroute irrigation, so that water saved in Sardar Sarovar Project, as a result of this transfer, could be taken further northwards to benefit Saurashtra and Kutch regions. It is claimed that diverted water will irrigate 0.304 M Ha annually comprising of 0.052 M Ha enroute and 0.252 M Ha in the Narmada command. This link mainly envisage construction of 7 dams, three diversion weirs, 5.5 km long tunnels (two parts), 429.87 km long canal, 6 power houses and a number of cross drainage works. The link is to generate 93 MU through the powerhouses installed at four dam sites at Jheri, Paikhed, Chasmandva and Chikkar and two feeder canals taking off from Dabdar and Kelwan dams. The total installed capacity would be 32.5 MW.

Par-Tapi reach of canal passes through Valsad, Dang and Surat districts of S Gujarat whereas Tapi-Narmada reach of canal passes through Surat, Bharuch and Vadodara districts. The link project connecting the reservoirs is to be carrying water through Ukai reservoir. The total cultivable command area under the link canal is claimed to be 356 843 Ha, of which 17 411 Ha is enroute command in the reach between Par and Tapi, 23 940 Ha enroute command in the reach between Tapi and Narmada and the balance 315 492 Ha lies entirely in the SSP command. The gross command area is claimed 509 776 Ha.

**The Link Canal** The capacity of the Par- Tapi portion of the link varies from 44.13 cumecs to 90.9 cumecs. The canal offtake is at FSL 140.70 m. The Chasmandva weir FSL is 130.37 m. After 13 km, Chikkar feeder at FSL of 124.55 m joins the main canal at RD 98.53 at FSL of 120 m. The Dabdar feeder which offtakes from the main dam at FSL 136.96 m joins the main canal at RD 102.3 km at FSL of 119.82 m and Kelwan feeder, offtaking from main dam at FSL 135.46 m joins the main canal at RD 124.20 km at FSL of 115.55 m. The FRL of the Ukai reservoir is 105.13 m. The canal is to outfall into the Ukai reservoir at FSL of 108.31 m.

The 224.53 km Tapi-Narmada portion of the link starts from Ukai reservoir and crosses Narmada River and after connecting the Miyagam branch it terminates at Vadodara branch of Narmada main canal at RD 22.96 km, the FSL of link canal being 48.68 m. The canal capacity at offtake from Ukai reservoir is 196 cumecs and after meeting enroute target area requirements, the canal capacity at the tail end will be 75 cumecs. The canal offtake from Ukai dam is at FSL 81.79 m. There are 60 aqueducts, 32 cross regulators, 20 head regulators, 96 drainage syphons, 4 canal syphons & 106 road-railway bridges along the main-feeder canals.

The total estimated cost of the project is Rs 34.69 B at 1993-94 prices. The annual cost works out to be Rs 3.98 B. Annual benefits are claimed at Rs 4.51 B and the Benefit-Cost-Ratio is claimed to be 1.134.

There is no mention either in the NCAER report, in the feasibility study or on the Task Force Website as to how the water made surplus in SSP command is to be transferred to which areas, when and what will be the quantity of the water, which areas will benefit, what will be costs and the benefits.

**Basic Data on Par – Tapi – Narmada Link**

SN	1	2	3	4	5	6	7	Total	
Storages Sites	Jheri	Mohankavchali	Paikhed	Chasmandva	Chikkar	Dabdar	Kelwan		
<b>Dam description</b>									
Location (District)	Nasik	Valsad	Valsad	Valsad	Dang	Dang	Dang		
River	Par	Par	Nar	Tan	Ambica	Kapri	Purna		
Max Height of Dam (m)	Concrete	36.5	70.6	90.9	35.4	29.9	62.4	62.4	
	Earthen	76	70	57.4	51	60	51.4	50.1	
Total length of Dam		773.5	947	1306	2837	1656	1046	1284	
Length of Dam (m)	Earthen	515	600	925	2675	1444	830	955	
	Concrete	258.5	347	381	162	212	216	329	
<b>Storage description</b>									
Catchment area at the site		425	206	315	89	323	482	733	<b>2573</b>
Catchment area	Gujarat	—	127	46	27	221	482	675	—
	Maharashtra	425	79	269	62	102	—	58	
Water availability	75% Dep	358	174	244	76	243	289	435	<b>1819</b>
	50% Dep	487	236	327	112	300	397	555	<b>2414</b>
In Basin & d/s needs		115	61	84	18	132	96	202	<b>708</b>
Surplus water at	75% Dep	252	116	164	59	124	203	253	<b>1171</b>
	50% Dep	380	178	247	95	181	311	373	<b>1765</b>
Live storage (MCM)		187	180	218	75	130	205	258	<b>1253</b>
Gross storage (MCM)		203	372	229	82	142	223	284	<b>1535</b>
Divertable Yield (MCM)		242	137	212	76	146	267	270	<b>1350</b>
<b>Details of Submergence Area</b>									
FRL proposed by NWDA (m)		246	158	248	214	210	169	164	—
Water storage cap. FRL (MCM)		202.76	371.65	229.43	82.00	141.91	223.00	284.33	
<b>Submergence Area:</b>									
Forest Land (Ha)		408	743	317	300	300	614	890	<b>3572</b>
Cultivable and other land (Ha)		256	486	589	255	332	482	450	<b>2850</b>
River Portion (Ha)		172	265	88	60	110	153	289	<b>1137</b>
Total area at FRL Ha		836	1494	994	615	742	1249	1629	<b>7559</b>

Note: Nar is a tributary of Par River, Tan is a tributary of Auranga River, Kapri is a tributary of Ambica River.

**Forest area submergence in the reservoir**

(Ha)

SN	Basin	Basin Area	Forest Area	% of Forest Area	Forest Area submerged by proposed reservoirs
1	Par	164800	69733	42.3	1468
2	Auranga	74800	28031	37.5	300
3	Ambica	268500	83688	31.2	914
4	Purna	219300	76245	34.8	890
<b>Total</b>		<b>727400</b>	<b>257697</b>	<b>35.4</b>	<b>3572</b>

**Details of Groundwater Potential**

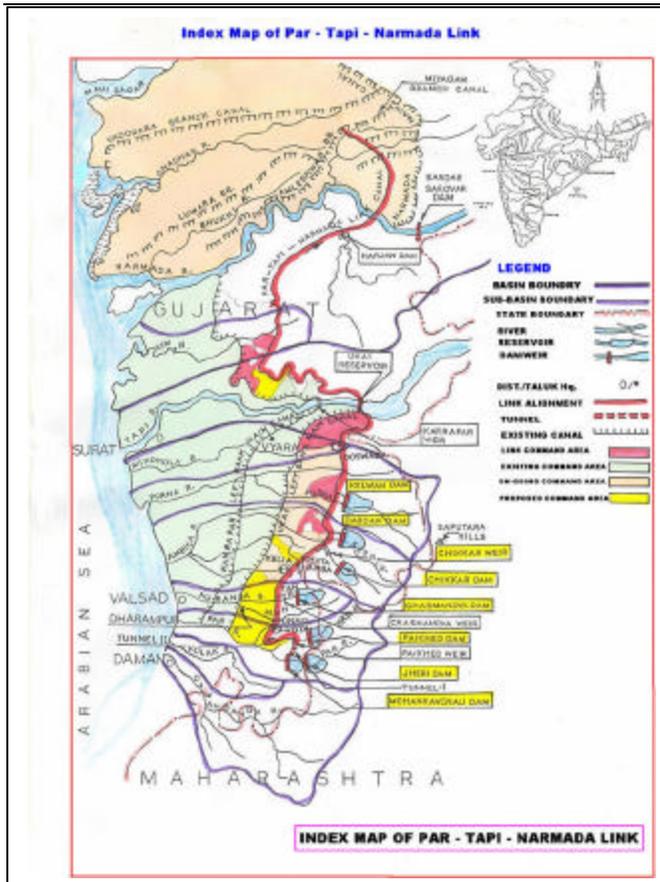
(MCM/year)

SN	Name of District	Total Replenishable Groundwater	Utilisable Groundwater for Irri.	Net Draft	Balance Groundwater Potential available	%Groundwater Development
1	Vadodara	1186.47	1008.49	146.35	862.14	14.5
2	Baruch	840.16	714.13	69.46	644.67	9.7
3	Valsad	1143.18	971.70	136.24	835.46	14.0
4	Dang	144.28	122.64	0.86	121.78	0.7
5	Surat	1960.21	1666.16	162.41	1503.75	9.7
<b>Total</b>		<b>5274.30</b>	<b>4483.12</b>	<b>515.32</b>	<b>3967.80</b>	

Source: Groundwater statistics 1991, CGWB

**Water balance in the basins**

Basin	Par	Auranga	Ambica	Purna	Mindhola	Total	
Catchment Area							
Sq km	1648	748	2685	2193	1056	8330	
Gross Annual Yield at (MCM)	75% Dep	1522	705	1818	1206	427	5678
	50% Dep	2119	962	2390	1585	612	7668
Import (MCM)	71	122	902	578	854	2527	
Export (MCM)	—	—	—	80	—	80	
In basin water requirement (MCM)	691	637	1765	1213	1098	5404	
Regeneration (MCM)	51	60	235	136	185	667	
Water Balance at (MCM)	75% Dep	953	250	1190	627	368	3388
	50% Dep	1550	507	1762	1006	553	5378



It is proposed to take up the project in 3 phases. In Phase-I, the Link canal originating from Ukai Reservoir and terminating at Kundhela branch of Vadodara branch canal will be constructed to allow transfer of 1554 MCM of available “surplus water” from Tapi at Ukai to Narmada command. In Phase-II, it is proposed to extend the canal upto Vadodara branch of Narmada canal and add Chikkar, Dabdar and Kelwan reservoirs and one weir in the downstream of Chikkar and link canal from Chikkar weir to Ukai reservoir. With the construction of the three reservoirs and main canal of 73.54 km, it is claimed that 683 MCM additional water would become available. There will be three feeder canals of total length 30.27 km connecting Chikkar, Dabdar and Kelwan reservoirs to the main canal. In Phase-III, it is proposed to take up the remaining works.

**Ground water** The Utilisable Groundwater Resources for irrigation in Gujarat is 1.9169 M Ha m/ year whereas net draft is 0.6411 M Ha m/ year. Thus leaving 1.2758 M Ha m/ year as available potential for future development. Similarly utilisable groundwater resources in Maharashtra is 3.481 M Ha m/ year whereas net draft is 0.6854 M Ha m/ year, thus leaving 2.7956 M H m/ year as available potential for future development. In this way, it is seen that 33.44% and 19.69% of utilisable resources have been exploited in Gujarat and Maharashtra respectively and groundwater potential is still available for development in both states.

**Reservoir surveys** Based on the toposheet studies, the location of various dam sites were selected for detailed surveys. Survey of three sites, namely Chikkar, Dabdar and Kelwan were earlier got done by Govt of Gujarat through Survey of India. Survey of Mohankavchali and Chasmandva reservoirs were entrusted by NWDA to Survey of India. Survey of remaining two reservoirs namely Jheri and Paikhed were carried out departmentally by NWDA. The survey of Mohankavchali reservoir was abandoned due to resistance from local people.

**People’s Opposition** It is clear from the NWDA reports that there was strong people’s opposition to the link even in early 1990s. Specifically, opposition is expressed against portions of Par Tapi link canal, Mohankavchali-Nar link tunnel, Mohankavchali and Paikhed Dams, among others. NWDA does not mention why people are opposed to the project.

**Incomplete Assessments** The Feasibility reports accepts that it is incomplete in many respects:

- Detailed survey for plant & colony layout not done.
- Detailed surveys in respect of Par-Tapi portion of the link have been carried out for a length of only 196 out of 210 km. The survey work for remaining length could not be done due to opposition by people.
- The link involves a tunnel of 5 km length connecting Mohankavchali reservoir with Nar River upstream of Paikhed weir. The survey for the tunnel could not be conducted due to people’s protests.
- A Geophysical and geotechnical investigation of only five sites namely Jheri, Chasmandva, Chikkar, Dabdar and Kelwan could be completed. Surveys of Mohankavchali and Paikhed dams & the tunnel could not be completed due to resistance from local people.
- All the dams proposed in the link are having composite sections; i.e. part of dam is concrete whereas the remaining part is earthen. For the earthen portion, soil samples taken from trial pits were tested at GERI’s laboratory. However these trial pits were not sufficient to know subsurface geology in respect of concrete portions.
- Studies for the effect on sub-soil water table have not been carried out.
- It is also mentioned that the reservoir will provide flood relief to the people residing in downstream areas, but no details have given in report about existing floods, flood damages and impact of the project on floods.
- It is also claimed that after providing enroute irrigation, the water saved in SSP could be taken further northwards to benefit Saurashtra and Kutch region of Gujarat, but no details are given as to where, how, how much and when this will happen.
- It is also proposed to provide Drinking water to Vadodara Municipal area but no details are given.

**Some other facts:**

- The project area falls under zone-III of the seismic zone of India. The value of horizontal seismic coefficient has been taken as 0.12 g.
- The population was projected to 2025 AD from the population figures as per the 1981 census.
- The per capita daily needs for the urban, rural and livestock populations are considered as 200, 70 and 50 liters. The urban water requirement and 50% of rural water requirement are proposed to be met from surface water sources. The requirement in respect of livestock population and remaining 50% of rural population are proposed to be met from ground water resources.
- Actual data on the existing, ongoing and future industries and their water requirement are not available. While the entire industrial water requirement is proposed to be met from surface water resources.
- Two tunnels are proposed in Par-Tapi portion of the link canal. The first tunnel connecting Mohankavchali reservoir and Paikhed weir has a length of 5 km and the 500 m long second tunnel is on the main canal at RD 21.60 km.
- Three diversion weirs are proposed downstream of Paikhed, Chasmandva and Chikkar dams, as the hilly terrain does not permit the link canal to take off from the dam sites.
- According to the revised survey of forest types, these forests fall under "Sub Group 3-B South Indian Moist Deciduous Forests" in which Teak and Sadad form main species.
- The sediment rate of 715 cu m/sq km/ year adopted for the reservoirs of Par-Tapi-Narmada link. While the sediment rate in similar reservoirs are more than the adopted rate. For example the sedimentation rate in Attaria-II and in Machrewa-II reservoir is 726 cu m/sq km/year.
- The average monthly evaporation in terms of depth observed at Madhuban reservoir has been used for simulation studies of all the seven reservoirs.
- Most of the area lying in the basin between Par and Tapi is already under irrigation by the existing schemes like Ukai left bank canal and Kakrapar left bank canal and other projects.
- The terrain of enroute commands in Par-Tapi reach is undulating at number of places. So such portion will be required to be leveled. The cost of the land leveling is to be borne by the beneficiaries.
- The total cost of rehabilitation and resettlement is assumed to be Rs 446 M.
- A provision of Rs 100.4 M has been made towards the cost of land acquisition along the main canal alignment and at the cross drainage works. The total land to be acquired is 2367 Ha. 113 Ha is forestland and the remaining 2254 Ha is cultivated land.
- Total cost of canal and command area development under Unit-I works out to Rs 13.67 B.

**Interstate Dimensions** As per the study, the utilisable water from Tapi river at Ukai dam site has been

estimated to be 14 500 MCM and the irrigation requirement of Gujarat from Ukai reservoir is of the order of 4546 MCM and the municipal and industrial demand could be of the order of 1000 MCM. Here it seems that the actual demand for municipal and industry have not been estimated. As per the Planning Commission letter of 1961, 7400 MCM of Tapi water should be reserved for utilisation in areas upstream of Ukai project by MP and Maharashtra. Thus NWDA claims that there is 1554 MCM surplus water in Tapi, available for diversion. However, it is not clear if MP and Maharashtra agree to this assessment.

No interstate agreement appears to have been executed on Tapi at Ukai and other rivers.

The entire link canal falls in the territory of Gujarat. However out of seven reservoirs, four reservoirs, Jheri, Mohankavchali, Paikhed and Chasmandva will submerge territory and property of Maharashtra also. Among this Jheri reservoir is completely in Maharashtra whereas other three reservoirs submerge the areas in both the states of Gujarat and Maharashtra. It is not clear if Maharashtra would agree to this.

**Earlier Versions** Earlier the Govt of Gujarat had carried out study in 1973. The study contained proposal to inter-link the rivers of the state. Thereafter the Central Govt requested the Govt of Gujarat to furnish a master plan, incorporating studies regarding the availability of water, its committed and projected utilization and proposals for diversion of surplus waters to the needy areas. Accordingly a Report was prepared by irrigation dept of Gujarat in 1981: "National Perspective for Water Resource Development - Master plan of Gujarat for utilisation of surplus water of west flowing rivers south of Tapi". The proposal envisaged a link canal interconnecting the Damanganga, the Tapi & Narmada Rivers. But that project could not move forward.

**Contradictory Information** The official government website on the river links ([www.riverlinks.nic.in](http://www.riverlinks.nic.in)) gives some information that is at variance with the feasibility report. According to the website, the link will transfer 1 350 MCM of water through a canal of length 401 km by gravity. The total enroute irrigation benefits envisaged are 0.163 M Ha in Gujarat by utilizing 460 MCM and 190 MCM for meeting the transmission losses. In addition to this, about 700 MCM will also be provided to Saurashtra and Kutch areas of Gujarat.

**Sources:**

1. Feasibility Report of Par-Tapi-Narmada Link, Vol. 1, NWDA, June 1995
2. Lok Sabha Questions, March 10, 2003
3. *Agro-economic, Socio-economic and Environmental Survey of Six Link Projects*, Vol. I & II, NCAER Report sponsored by NWDA, Oct 1993
4. [www.riverlinks.nic.in](http://www.riverlinks.nic.in), accessed on 160205

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