

## International Experiences in Inter-basin Water Transfer (IBWT)

### AMERICAS

Country	Water transfer projects			Location in province or region	Water transfer in km <sup>3</sup> /year	Purpose	Status/year of construction	salient features
	Project name	From	To					
1	2	3	4	5	6	7	8	9
<b>Bolivia</b>	Misicuni	Misicuni	Sochabansa	Bolivian Andes	0.2		Proposed	
	Total			Completed Proposed	<u>0.2</u>			
<b>Brazil</b>	Rio-Sao Francisco Transbasin Diversion	Rio-Sao Francisco	North East region of Brazil		1.5		Proposed	
	Total			Completed Proposed	<u>1.5</u>			
<b>Canada</b>		Caniapiscau river and Eastmain river	La Grande river	Quebec	50.14	Hydel Power generation	Now completed	
		Nottaway river and Broadback river	Rupert river	Quebec	31.25	Power	Now completed	
		Churchil river	Nelson river	Manitoba	26.80	Power	1976	
		Yukon river	Taku river	British Columbia	23.21	Power	<u>do</u>	
		Peace river, Smoky river and Lower Athabasca river	North Saskatchewan river	Alberta	23.20	Power	<u>do</u>	
		Assiniboine	Lake Manitoba	Manitoba	22.30	Flood Control	1968	
		Naskaupi river and Canairiktok	Churchill river	New Found Land	10.53	Hydel Power generation	1977	
		Churchill river	Saskatchewan river	Saskatchewan	8.92	Irrigation	<u>do</u>	
		N. Saskatchewan river	S. Saskatchewan river	Saskatchewan	8.92	Irrigation	<u>do</u>	

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		McGregor river	Parsnip river	British Columbia	6.24	Hydel Power generation	___do___	
		Julian	Ashvamipi		6.18	___do___	1971	
		Kootenay river	Columbia river	British Columbia	5.36	___do___	___do___	
		Bridge river	Seton Lake	British Columbia	4.48	___do___	1934	
		Saskatchewan river	Assiniboine	Manitoba	4.45	Irrigation	___do___	
		Ogaki river	Lake Nipigow	Ontario	3.62	Hydel Power generation	1943	
		Upper Athabasca river	North Saskatchewan river	Alberta	3.56	Irrigation	___do___	
		Nechako river	Kemano river	British Columbia	3.12	Hydel Power generation	1952	
		Lake Michigan	Illinois river	Illinois	2.85	Navigation, Sewage and dilution	1848	
		Lake St. Joseph	Winnipeg river	Ontario	2.68	Hydel Power generation	1957	
		N. Saskatchewan river	Red Deer river	Alberta	2.68	Irrigation	___do___	
		Red Deer river	Bow river	Alberta	1.78	___do___	___do___	
		Long Lake	Lake Superior	Ontario	1.22	Hydel Power generation	1939	
		White Bear river	Grey river	Newfound Land	1.18	___do___	1969	
		Missouri river	Souris river and Red river	North Dakota	1.07	Irrigation		
		Victoria river	White Bear river	Newfound Land	1.05	Hydel Power generation	1969	
		Grey river	Saloman river	Newfound	0.97	___do___	1967	

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				Land				
		Tazin Lake	Charlot river	Saskatchewan	0.89	___do___	1958	
		Chamberlain Lake	Penobscot river	Maine	0.50	Log transport and Hydel Power generation	1841	
		N. Saskatchewan river	Battle river	Alberta	0.53	Irrigation	___do___	
		Qu Appelle river	Souris river	Saskatchewan	0.47	___do___	___do___	
		Magiscane river	St. Mourice river	Quebec	0.36	Hydel Power generation	1933	
		Lake Dietenbaker	Qu Appelle river	Saskatchewan	0.35	Drinking Water Supply	1967	
		Waterton river and Belly river	St. Mary river	Alberta	0.35	Irrigation	1964	
		Cheticam river, Indian Brook and McMillan Brook	Wreck Cove Brook	Neve Scotia	0.34	Hydel Power generation	Now completed	
		Ash river	Great Central Lake	British Columbia	0.33	___do___	1958	
		Indian Brook	Hunber river	Newfound Land	0.29	___do___	1963	
		St. Mary river	Milk river	Montana	0.29	Irrigation	1917	
		Lake Michigan, and Chicago river	Wreck Cove Brook		NA	Power, Municipal Water Supply and Navigation	1848	

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1	2	3	4	5	6	7	8	9
	Total			Completed	262.46			
Proposed		Lake Diefenbaker on Saskatchewan river	Du'Appelle river Basin	NA	NA	Hydel Power generation, Irrigation, Municipal water supply	Proposed	Investigated for engineering feasibility. Studies on economic and environmental aspects are in hand.
		Du'Appelle river and Assiniboine	Souris river	NA	NA	___do___	Proposed	
		Assiniboine	Red river	NA	NA	___do___	Proposed	
		Northern Alberta Streams	Southern areas of Alberta		NA	___do___	Proposed	
	Mcgregor diversion	Headwaters of Fraser river	Headwaters of Peace river	British Columbia	6.3	___do___	Proposed	
	Grand Canal Replenishment and Northern Lakes Development	James Bay St. Lawrence river	Great Lake		20.95	Irrigation and Municipal water supply, Hydel Power generation, stabilisation of water levels in Great Lakes	Proposed	Transfer to USA from Canada.
	Canadian Water	Several Canadian rivers like Peace, Athabasca, and Saskatchewan	Various Western States		184.5	Irrigation and municipal W/S Hydel Power generation	Proposed	
	Magnum Plan	Peace, Athabasca, Saskatchewan	Missouri		5.75	___do___	Proposed	Diversion to Souris river and USA.
	Central, North	Mackenzie Churchill Nelson	Great Lakes Western States		184.5	___do___	Proposed	Envisages transfer by diversion through canals, tunnels.

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	American Water Project							
	Smith Plan	Liard Mackenzie	Western United States		61.6	___do___	Proposed	Liard river flow reversal. Water lifted into Rocky Mountain trench for transfer to Western USA.
	Total				463.6			
<b>Chile</b>	Teno-Chimbarongo canal	Teno river sub-basin, tributary of Mataquito river basin	Chimbarongo sub-basin of Rapel river basin	Central zone of Chile	2.05	Irrigation	1970	Water transfer through a canal 13.66 km long into a natural river, joining Chim barrage after travelling 3 km.
	Laja Diguillin	Laja river	Diguillin	Region VIII of Southern Chile	1.10	___do___	1990	Transfer through 100 km long canal.
	Total				3.15			
<b>USA</b>	Los Angeles Aqueduct	Owen Valley	Los Angeles	California	1.8	Municipal water supply	Completed in 1913	Transports from a distance of 440 km (Owen Valley).
	All American Canal	Colorado River	California	California	4.2	Municipal water supply	Completed	
	Transmountain diversion in Colorado	Colorado	South Platte Arkansas	Colorado	0.72		Completed	
		Gunnison San Juan	Arkansas Rio Grande					
	Colorado river aqueduct	Colorado river	California		1.5	M&I and irrigation	Completed in 1941	From Lake Havasu downstream of Parker Dam on Colorado to Lake Mathews, near the city of riverside.
	Central Valley Project	Shasta dam in Sacramento river	Friant Dam on San Joaquin river, on to the Valley.	California	8.4	___do___	1930	Regulated flow from Shasta Dam to Delta of Sacramento. Pick up by a canal to Friant

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								Dam on San Joaquin river. Also to San Francisco Bay. From Friant Dam via a canal to north and south San Joaquin valley.
	State Water Project (1 <sup>st</sup> phase)	Orville on Feather and Sacramento (San Joaquin river)	Intake of California Aqueduct	California	4.0	___do___	1973	California Aqueduct 710 km long transfers 4.9 km <sup>3</sup> /yr. Half of the flow is lifted through a series of lifts.
	Trinity river transbasin diversion	Trinity	Sacramento	California	1.52	Irrigation	Completed in 1963	
	Big Thompson	Colorado river	NA	Colorado	0.3	Irrigation	Completed	
	Central Arizona Project	Colorado	Salt Gila and Santa Cruz river basin	Central and Southern Arizona	2.71	Irrigation	Completed	
	Central Utah Project	Colorado Green sub-basin	Great Basin	North Central Utah	0.17	Irrigation, M&I	Completed in 1965	
	Garrison	Missouri	Red and Soure rivers	Hudson Bay	1.1	___do___	___do___	
	San Juan - Chama	Navajo, Colorado	Chama - Rio Le Grande	New Mexico	0.5	M&I and irrigation	Completed project	
	Frying Pan - Arkansas Project	Colorado river	Arkansas Basin	Colorado	0.2	Irrigation and Municipal water supply	Completed	
	Chicago	Lake Michigan	Chicago	NA	2.9	___do___	___do___	
	Long Lac/Ogoki Project	Long Lake	Lake Superior	Michigan	4.5	Power	___do___	

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	New York Aqueduct	Canadian river	New York Region	New York	2.1	Irrigation, hydel, M&I	___do___	
	Truckee canal	Truckee river	Carson	California, Nevada	0.81	M&I, Irrigation	Completed in 1905	The Truckee canal is part of Truckee Carson project.
	Colorado Springs water supply	Blue river, Frypan Arkansas	Colorado Springs city	Colorado	0.01	Urban water supply	Completed in 1904	
	Union Park Reservoir	Upper Gunnison river	South Platte	Colorado	0.12	__do__	Completed	
	Total			Completed	37.56			
<b>USA (proposed)</b>	Columbia South West	Columbia river	Southwest USA	South-west USA	16.0	Irrigation and Mun. supply	Proposed	
	Snake Colorado	Snake river	Colorado	Colorado	3.0	Irrigation and M&I	Proposed	
	Texas Water Plan	Lower Mississippi; Eastern Texas	West Texas; Rio Grande; Texas Gulf Coast; Eastern New Mexico	Texas, New Mexico	21.0	Irrigation; M&I, estuary improvement	Modification likely due to cost and environmental problems. Need to meet the water shortages.	The schemes is basically meant to solve water shortage problems in the State of Texas and adjoining State of New Mexico. Source will be rivers like Red, Sabine, Sulphur, Neches and Lower Mississippi.
	Lake Superior-Missouri	Superior	Missouri	Michigan	8.9	Irrigation and M&I	Proposed	
	North American Water and Power Alliance (NAWAPA)	North west Canada; Alaska, NW US	South-west USA; Northern Mexico; South-central Canada; Great Lakes	Canada, USA, Mexico	136 - 300	Irrigation, power; M&I navigation	High cost and environmental problems. An international water treaty with Canada	Construction of 240 reservoirs, 112 irrigation systems, 17 navigation channels in Rocky mountains. The trench reservoir will be gigantic. Involves collection of water from major

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							necessary.	rivers in NW North America like Columbia, Yukon, Fraser, Liard Peace for Skeena, and its distribution southward. Initially, 8 km <sup>3</sup> would be diverted to ultimately increase to 300 km <sup>3</sup> .
	California State Water Project	Northern California	San Joaquin Valley; Southern California	California	5.2 (2020) 14.0 (distant future)	Irrigation; M&I	First phase was completed in 1973.	It involved 20 reservoirs, 17 pumping stations, 869 km of canals, pumping stations, siphons, tunnels that carry water to San Joaquin Valley system. Expansion involves a Peripheral Canal around Sacramento-San Joaquin delta involving lift by 1,000 m over and through the Tehachapa mountain in S. California
	High Plains Water Transfer Alternatives	Middle and Lower Missouri; tributaries of lower Mississippi; Sabine river	Central and Western Nebraska; eastern Colorado; Western Kansas; northern Texas; western New Mexico		2.2 to 13.5	Irrigation	Preliminary study completed in 1982. Recommended further studies.	Four alternatives involving canals in the range of 542 km to 1,836 km are under construction. Canal dimensions likely to be 42 m at top, 16 m at bottom and a depth of 8 m. Pumping head of 1000 m.
	Total			Proposed	381.6			
	Grand Total			Completed Proposed	303.17 846.90			



## ASIA

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China	West Route Project	Upper Reaches of Chang Jiang (Yangste)	Huang He (Yellow)	China plain	7.7	Irrigation	Proposed (Likely to start in 2010)	Three major canals across the mountainous areas of South-west China to transfer water from upper reaches of Chang Jiang to north-western region of Huang He.
	Middle Route Project	Middle reaches of Chang Jiang (Yangtse)	___do___	___do___	23.7	Irrigation Municipal water supply	Proposed (Likely to start early)	Two stages. Short term and long term. The 1 <sup>st</sup> stage from Han Jiang, a tributary of Chang Jiang at existing Dangiankou reservoir. The 2 <sup>nd</sup> stage from Chang Jiang off Sanxia Reservoir. The canal would be 1,265 km long, crossing the river Huang He through an aqueduct.
		Lower reaches of Chang Jiang (Yangtse)	Huang He (Yellow) and then to Tiajin	China plains	13.4	Irrigation Municipal water supply	Project launched on 27 Dec. 2002.	Starting at Jiang du pumping station, flowing along old Grand Canal to Tiajin. The canal 1150 km, discharge 1000 m <sup>3</sup> /s. Lift of 65 m through a tunnel below its bed. Flow by gravity. The pumping stations will also utilise drainage water. This link following the ancient Grand Canal, will include 51 pumping stations.
	Total			Completed Proposed	— 44.8			

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<b>India</b>	Sharda Sahayak	Ghaghara	Sharda	Uttar Pradesh	15.16	Irrigation		A canal of 4.81 cumecs capacity.
	Beas - Sutlej link	Beas	Sutlej	Punjab and Himachal Pradesh	4.9	Irrigation and municipal water supply	In operation	A 37.25 km long link with 25.45 km tunnel from Pandoh Dam.
	Madhopur - Beas link	Ravi	Beas	Punjab and Himachal Pradesh	4.5	___do___	In operation, commenced in 1895	The link takes off from Madhopur Barrage on the Ravi river.
	Kurnool Cudappa canal	Krishna	Pennar	South India	2.66	___do___	In operation since 1863	A 304 km long canal from upstream of Kurnool town.
	Periyar Vegai Link	Periyar	Vagai	South India	1.29	___do___	In operation since 1895	Water is carried through a 1,740 m long tunnel to Vagai basin.
	Telgu Ganga	Krishna	Chennai Metropolitan area	South India	0.34	___do___	Completed	Water is conveyed through an open canal from Sri Sailam reservoir
	Total			Completed Proposed	28.85			
<b>Iraq</b>		Tigris (Via Tharathor Lake)	Euphrates		15.8	Irrigation and hydeo power	Completed	From Tigris to Tharthar lake and then to Euphrates through gravity.
	Total			Completed Proposed	15.8			
<b>Japan</b>		Totsukawa river	Kinokawa river		NA		Completed	Integrated system of 4 dams and barrage.
	Total				-			
<b>Malaysia</b>	Kalinchi/Foris Water Tunnel	Upper Muar Basin	Liggi Basin		0.14		Under construction	A 6.2 km long tunnel from Kelinchi reservoir to upper Muar reservoir.
	Total				0.14			

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Pakistan	Chashma - Jhelum link	Indus	Jhelum	Sind/Punjab	19.39			Connects Indus with Jhelum from Chasma barrages. Canal 101 km.
	Tanunsa - Panjnad link	Indus	Chenab	Punjab	12.58			Connects Indus with Chenab from Taunsa barrage. Meets Chenab 24 km upstream of Rly bridge.
	Rasul - Qadirabad link	Jhelum	Chenab	Punjab	16.96	Irrigation	Completed	Transfer of Jhelum Balloki from Rasul barrage Sulemanki link.
	Qadirabad - Balloki link	Chenab	Ravi	Punjab	16.61	Irrigation	Completed	
	Trimmu - Sidhnai link	Chenab	Ravi	Punjab	9.80	Irrigation		From existing Trimmu barrage, meets Ravi u/s of Sidhnai barrage.
	Sidhnai - Mailsi	Ravi	Sutlej with siphon at Mailsi	Punjab	9.01	Irrigation		Takes off from New Sidhani barrage.
	Mailsi - Bahawal link	Sutlej		Punjab	3.62	Irrigation		Supplies water to area in Bahawalpur.
	Balloki - Suleimani link	Ravi	Sutlej		11.98			From Balloki barrage on Ravi to Suleimanki headwater on Sutlej.
Total				Completed	99.95			
	Grand Total			Completed Proposed	145.73 44.94			

## EUROPE

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	Project name	From	To					
1	2	3	4	5	6	7	8	9
(Former) Czechoslovakia		Turiec (Vah)	Hron		0.38	Power and municipal water supply	In operation	
		Hnilee of Hornad river basin from Dedinky - Hinlee reservoir	Slana		0.28	Hydropower	In operation	A 2.8 km long tunnel and pipe line
		Nitra at a point d/s of Nove Zamky	Vah		11.03	Irrigation, Municipal water supply and flood protection	In operation	Transfer through a 7 km long canal of 350 m <sup>3</sup> /s capacity.
		Vazsky Dunaj	Vah		3.46	Irrigation	In operation	Transfer through 9.5 km long canal of 110 m <sup>3</sup> /s capacity.
	Total			Completed	15.15			
Proposed		Vah	Nitra - Zitava basin		0.31	Irrigation	Proposed	
		Hron (Kozmalovec reservoir and Slatinka reservoir)	Zitava		NA	Multipurpose	NA	
		Danube	Vah, Nitra, Hron and Ipet, a diversion dam across Danube.		NA	Irrigation, drinking water supply	Proposed	Project water to 50,000 ha.
		Danube	Oder – Elbe		1.89	Irrigation,	Proposed	Multistage pumping.

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						navigation and drinking water supply		Utilizing the existing Danube - Oder - Elbe channel) and channels of Morava, Beena, Oder, Treburka, Ticha, Orlice rivers, including several existing diversion dams.
	Total			Proposed	2.20			
<b>Finland</b>	Helsinki Metropolitan area	Lake Paijanne	Helsinki area	Helsinki Metropolitan area	0.09	Domestic water supply	1982	Through a 120 km long pipeline with discharge capacity of 20 m <sup>3</sup> /s.
	Total			Completed	0.09			
<b>France</b>		Neste	Gronne		0.567	NA	1963	A 27 km long canal.
		Cap de long river	Gave de pau river basin		-			A 10 km long pressing tunnel for generation of hydel power
		Lys	Lille region		0.365	Urban W/S, Irrigation	Completed	A 40 km long canal.
		Escant river	Lille Roubaix c elais and Dunkerque		0.16	Urban water supply	Completed	Water transfer through navigation canal
		Durance	NA		1.26	Urban water supply	Completed	Schemes completed upto 1963, from Durance river to neighbouring towns. About 120 kms of tunnels and 90 km of open channels used.
	Total			Completed	2.35			
<b>Germany</b>		Danube	Rhine (Kleine Roth Reservoir)		0.47	To ensure water supply to Nurensberg and improve navigation	Completed	Pumping of 0.7 m <sup>3</sup> /s water through Rhine-Main Danube navigation canal. Five stage pumping. By gravity from Altmuhl tributary to Brombad reservoir through tunnel

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		Herz Mountains	West and East regions		N.A.	Municipal W/S, Irrigation	In operation	Water supplied by pipelines from a system of reservoirs.
	Total			Completed Proposed	0.47 —			
<b>Portugal</b>	Multipurpose Alqueva Project	Guadiana river basin	Sado river basin		0.01	Irrigation, M&I, power	Partly constructed	Transfer through reservoirs fed through pumping and gravity canals.
	Total			Completed Proposed	0.01 —			
<b>Romania</b>		Somes river	Crasna, Barcau, Crisuri river basins	Western Romania	NA	Irrigation	Completed	250 km long canal transfers
		Cerna	Motru, Jiu	South west	NA	Irrigation	Completed	Details not available
		Olt river	Vedea basin	Central Romania	NA	Irrigation	Completed	Irrigation area of 100,000 ha.
	Total				-			
<b>Russia and Central Asian Republics</b>	Kara-kum, Karshinsky, Moscow-Volga, Irdish-Karanganda, Nevinnomisky	NA	NA	NA	60	Irrigation, M&I	In operation	
	Total			Completed	60			
Proposed	Northern rivers to Volga Basin	Onega, Upper Sukhna and Pechora	Volga		20	Irrigation, M&I	Proposed	Transfer in 3 stages of 518 km <sup>3</sup> , 3.5 km <sup>3</sup> and 9 km <sup>3</sup> .

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	Partial diversion of Siberian rivers to Urals, West Siberia, Central Asia and Kazakhstan	Ob	Ural, Syr Darya Amu Darya river system		27	Irrigation Power Industrial and domestic	Proposed Implemented in 1988 Status not known	A canal 651 km, 4 dams with pumping stations up to Tobolsk. From Tobolsk to Tegiz reservoir water to be lifted at five pumping stations on a 1500 km stretch. From Tegiz reservoir a canal goes to Syr Darya and then to Amu Darya.
	Total			Proposed	47			
<b>Spain</b>		Tagus	Segura		1.0	W/S	Completed in 1979	From Bolarque reservoir, pumping through tunnel.
		Ebro	Terragonna (Catalonia)		0.1	Irrigation, M&I	Completed	Transfer through pumping
		Zodarra	Bilbao		0.2	do	Completed	Transfer by gravity and tunnel.
	Total			Completed	1.3			
Proposed		Ebro	Catolonia		1.0	Irrigation, M&I	Proposed	
	Total				1.0			
	Grand Total			Completed Proposed	79.37 50.2			

## AFRICA

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<b>Morocco</b>	Beri Boussa project	Oued El Abid river	Tensift river		1.51	NA	Completed	
	Total			Completed Proposed	1.51 —			
<b>South Africa</b>		Vaal	Crocodile		0.615	M&I		
		Vaal	Olifants		0.150	Municipal and industrial water (M&I), power		
		Olifants	Sand		0.030	M&I		
		Crocodile	Limpopo		0.010	M&I		
		Komati	Olifants		0.111	M&I, Power		
		Usutu	Olifants		0.081	M&I		
		Assegaaai	Vaal		0.081	M&I		
		Buffalo	Vaal		0.050	M&I		
		Tugela	Vaal		0.063	M&I		
		Tugela	Mhlatuze		0.004	M&I		
		Mooi	Mgeni		0.006	M&I		
		Fish	Sundays		0.020	M&I		
		Orange	Buffels		0.001	Irrigation		
		Orange	Lower Vaal		0.005	Irrigation, M&I		
		Orange	Riet		0.018	M&I		
		Orange	Fish		0.064	M&I		



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		Caledon (Orange)	Modder		0.004	M&I		
		Lhwpia	Vaal		0.574	M&I		
		Lhwpib (Matsoku)	Vaal		0.060	M&I		
		Lhwpib (Mohale)	Vaal		0.300	M&I		
		Letaba	Sand		0.001	M&I		
		Riviersonderend	Berg		0.100	M&I		
		Kubusie	Buffalo/Nahoon		0.120	M&I		
		Sundays	Swartkops		0.040	M&I		
	Total			Completed Proposed	2.51 —			
<b>Sudan</b>	Jonglei canal project	Bahr el Jabel	Sabat	Sudd region	7.3		Completed	Transfer through a 360 km canal.
	Total			Completed Proposed	7.3 —			
	Grand Total			Completed Proposed	11.32 —			

## OCEANIA

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<b>Australia</b>	Snowy mountain scheme	Eucumbene river	Murrumbidgee through its tributary Tumut		1.13	Hydel-power generation and Irrigation	1974	Diversion of water of Eucumbene river on to the upper reaches of Tumut river. It transfers water from coastal to two inland rivers through six tunnels 135 km in length, 15 large dams, 7 power stations, 2 pumping stations, and 76 km of aqueducts.
	Total			Completed Proposed	1.13			