

APPENDIX 13 DATA TABLES IDENTIFYING BASINS AT RISK

Table A13.1 Basins With High Population Density

BASIN	RIPARIAN COUNTRIES	Pop./ Sq. Km.
Han	North Korea, South Korea	512.27
Schelde	Belgium, France, Netherlands	438.87
Nahir el Kebir	Syria, Turkey	387.13
Ganges	India, Bangladesh, China, Bhutan, Myanmar, Nepal	311.16
Rhine	Austria, Belgium, France, Germany, Italy, Liechtenstein, Luxembourg, Netherlands, Switzerland	309.87
Song Vam Co Dong	Cambodia, Vietnam	286.64
Lempa	El Salvador, Guatemala, Honduras	219.55
Saigon	Cambodia, Vietnam	215.26
Tijuana	Mexico, USA	191.58
Elbe	Austria, Czech Republic, Germany, Poland	176.12
Indus	Afghanistan, China, India, [Kashmir], Pakistan	175.69
Red	China, Laos, Vietnam	172.84
Fenney	Bangladesh, India	171.78
Cross	Cameroon, Nigeria	157.07
Karnaphuli	Bangladesh, India	154.45
Jordan	Israel, Jordan, Lebanon, [Palestinians], Syria	151.0
Umbeluzi	Mozambique, South Africa, Swaziland	142.4
Oder	Czech Republic, Germany, Poland, Slovakia	137.9
Zarumilla	Ecuador, Peru	131.5
Yalu	China, North Korea	125.5
Asi	Lebanon, Syria, Turkey	123.86
Vistula	Byelarus, Czech Republic, Poland, Slovakia, Ukraine	123.78
Ca	Laos, Vietnam	118.43
Tagus	Portugal, Spain	117.64
Vardar	Greece, Macedonia, Turkey, Serbia & Montenegro	108.43
Drin	Albania, Macedonia, Serbia & Montenegro	105.86
Dniester	Moldova, Poland, Ukraine	104.17

In terms of per capita GDP, the World Bank defines the lowest income countries as those with a capita GDP of \$765 or less (World Bank Report 1997). Countries with low per capita GDP, 1998 data (WRI 1998), include the following:

Table A13.2 Basins With Low Per Capita GDP

COUNTRY	BASIN	PC GDP
Afghanistan	Aral Sea	n/a
	Hari (Harirud)	
	Helmand	
	Indus	
	Kowl-E-Namaksar	
	Murgab	
Bosnia and Herzegovina	Danube	n/a
	Krka	
	Neretva	
Burma	Ganges	n/a
	Irrawaddy	
	Kaladan	
	Mekong	
	Pakchan	
	Salween	
Eritrea	Baraka	n/a
	Gash	
	Nile	
Iran	Astara Chay	n/a
	Atrak	
	Dasht	
	Hari (Harirud)	
	Helmand	
	Kowl-E-Namaksar	
	Kura-Araks	
	Rudkhaneh-ye (BahuKalat)	
	Tigris & Euphrates	
	Tigris & Euphrates	
Iraq	Amur	n/a
	Han	
	Tumen	
	Yalu	
Liberia	Cavally	n/a

COUNTRY	BASIN	PC GDP
	Cestos	
	Loffa	
	Mana-Morro	
	Moa	
	St. John (Africa)	
	St. Paul	
Somalia	Awash	n/a
	Juba-Shibeli	
Sudan	Baraka	n/a
	Gash	
	Lake Chad	
	Lake Turkana	
	Lotagipi Swamp	
	Nile	
Congo (Kinshasa)	Chiloango	36.44
	Congo/Zaire	
	Nile	
	Zambezi	

Table A13.2 Basins With Low Per Capita GDP (cont.)

COUNTRY	BASIN	PC GDP
Mozambique	Buzi	72.90
	Incomati	
	Limpopo	
	Maputo	
	Niger	
	Ruvuma	
	Sabi	
	Umbeluzi	
	Zambezi	
Ethiopia	Awash	98.120
	Gash	
	Juba-Shibeli	
	Lake Turkana	
	Lotagipi Swamp	
	Nile	
Tanzania	Congo/Zaire	121.76
	Lake Natron	
	Nile	
	Ruvuma	
	Umba	
	Zambezi	
Rwanda	Congo/Zaire	140.97
	Nile	
Bhutan	Ganges	155.67
Chad	Lake Chad	155.79
Malawi	Congo/Zaire	165.63
	Ruvuma	
	Zambezi	
Burundi	Congo/Zaire	174.32
	Nile	
Nepal	Ganges	183.86
Niger	Lake Chad	204.18
	Niger	
Uganda	Lake Turkana	210.05
	Lotagipi Swamp	

COUNTRY	BASIN	PC GDP
	Nile	
Burkina Faso	Komoe	215.38
	Niger	
	Volta	
Bangladesh	Fenney	225.02
	Ganges	
	Karnaphuli	
Guinea-Bissau	Corubal	225.47
	Geba	
Vietnam	Beilun	237.10
	Ca (Song-Koi)	
	Hsi (Bei Jiang)	
	Ma	
	Mekong	
	Red (Song Hong)	
	Saigon	
	Song Vam Co Dong	
Mali	Komoe	237.98
	Niger	
	Senegal	
	Volta	
Cambodia	Mekong	241.17
	Saigon	
	Song Vam Co Dong	
Nigeria	Akpa	259.13
	Cross	
	Lake Chad	
	Niger	
	Oueme	

Table A13.2 Basins With Low Per Capita GDP (cont.)

COUNTRY	BASIN	PC GDP
Togo	Mono	259.46
	Oueme	
India	Fenney	326.10
	Ganges	
	Indus	
	Irrawaddy	
	Kaladan	
	Karnaphuli	
Tajikistan	Aral Sea	326.83
	Tarim	
Benin	Mono	331.98
	Niger	
	Oueme	
	Volta	
Nicaragua	Choluteca	352.74
	Coco (Segovia)	
	Negro	
	San Juan	
Central African Republic	Congo/Zaire	354.93
	Lake Chad	
Ghana	Bia	355.82
	Komoe	
	Tano	
	Volta	
Zambia	Congo/Zaire	378.89
	Zambezi	
Mauritania	Atui	419.45
	Senegal	
Angola	Chiloango	422.59
	Congo/Zaire	
	Etosha/Cuvela i	
	Kunene	
	Okavango	
	Zambezi	
Pakistan	Dasht	444.62

COUNTRY	BASIN	PC GDP
	Helmand	
	Indus	
	Rudkhaneh-ye (BahuKalat)	
	Tarim	
Azerbaijan	Astara Chay	460.49
	Kura-Araks	
	Samur	
	Sulak	
Georgia	Coruh	470.73
	Kura-Araks	
	Sulak	
	Terek	
Guinea	Cavally	521.07
	Cestos	
	Corubal	
	Gambia	
	Geba	
	Great Scarcies	
	Little Scarcies	
	Loffa	
	Moa	
	Niger	
	Sassandra	
	Senegal	
	St. John (Africa)	
	St. Paul	
Zimbabwe	Buzi	537.36
	Limpopo	
	Okavango	
	Sabi	
	Zambezi	
	Volta	

Table A13.2 Basins With Low Per Capita GDP (cont.)

COUNTRY	BASIN	PC GDP	
Kenya	Juba-Shibeli	267.27	
	Lake Natron		
	Lake Turkana		
	Lotagipi Swamp		
	Nile		
	Umba		
	Gambia	Gambia	292.24
Mongolia	Amur	304.02	
	Har Us Nur		
	Lake Ubsa-Nur		
	Pu-Lun-T'o		
	Yenisey (Jenisej)		
	Laos	Ca (Song-Koi)	319
		Ma	
Mekong			
Red (Song Hong)			
Cameroon	Akpa	576.69	
	Benito/Ntem		
	Congo/Zaire		
	Cross		
	Lake Chad		
	Niger		
	Ogooue		
Senegal	Gambia	578	
	Geba		
	Senegal		
China	Amur	602.94	
	Aral Sea		
	Beilun		
	Ganges		
	Har Us Nur		
	Hsi (Bei Jiang)		

COUNTRY	BASIN	PC GDP
	Ili (Kunes He)	
	Indus	
	Irrawaddy	
	Mekong	
	Ob	
	Pu-Lun-T'o	
	Red (Song Hong)	
	Salween	
	Sujfun	
	Tarim	
	Tumen	
	Yalu	
Ivory Coast	Bia	615.34
	Cavally	
	Cestos	
	Komoe	
	Niger	
	Sassandra	
	St. John (Africa)	
	Tano	
	Volta	
Honduras	Choluteca	623.20
	Coco (Segovia)	
	Goascoran	
	Lempa	
	Motaqua	
	Negro	
Albania	Danube	667.40
	Drin	
	Lake Prespa	
	Vijose	

A third exacerbating influence is the presence of overall hostile relations between dyads sharing a basin. The historically (1948-1994) most conflictive pairs of countries (BAR Scale ≤ -1.0) and the basins they share are:

Table A13.3 Basins With Unfriendly Riparian Relations

COUNTRY	COUNTRY	BASIN	BAR SCALE
Ivory Coast	Guinea	Niger	-10.05
		Sassandra	
		St. John (Africa)	
		Cestos	
		Cavally	
Cambodia	Vietnam	Song Vam Co Dong	-5.26
		Mekong	
		Saigon	
Armenia	Azerbaijan	Kura-Araks	-4.54
North Korea	South Korea	Han	-4.21
Laos	Vietnam	Ca (Song-Koi)	-4.17
		Mekong	
		Ma	
		Red (Song Hong)	
China	North Korea	Yalu	-4.10
		Amur	
		Tumen	
Iran	Iraq	Tigris & Euphrates	-3.80
Israel	Syria	Jordan	-3.65
Israel	Lebanon	Wadi Al Izziyah	-3.62
		Jordan	
Israel	Jordan	Jordan	-3.58
Switzerland	Liechtenstein	Rhine	-3.49
Egypt	Israel	Jordan	-3.48
Eritrea	Ethiopia	Nile	-3.45
		Gash	

Table A13.3 Basins With Unfriendly Riparian Relations (cont)

COUNTRY	COUNTRY	BASIN	BAR SCALE
Ethiopia	Somalia	Juba-Shibeli	-3.34
		Awash	
Guinea-Bissau	Senegal	Geba	-3.34
Azerbaijan	Georgia	Kura-Araks	-3.31
		Sulak	
Mozambique	Zimbabwe	Sabi	-3.13
		Limpopo	
		Buzi	
		Zambezi	
Bosnia & Herzegovina	Hungary	Danube	-3.00
Austria	Slovenia	Danube	-3.00
Namibia	South Africa	Orange	-2.85
India	Pakistan	Indus	-2.80
Cambodia	Thailand	Mekong	-2.72
China	India	Irrawaddy	-2.71
		Indus	
		Ganges	
Zambia	Zimbabwe	Zambezi	-2.66
Angola	Namibia	Kunene	-2.39
		Etosha/Cuvelai	
		Zambezi	
		Okavango	
Myanmar (Burma)	Thailand	Salween	-2.37
		Pakchan	
		Mekong	
Iraq	Saudi Arabia	Tigris & Euphrates	-2.26
Syria	Turkey	Asi (Orontes)	-2.15
		Tigris & Euphrates	
		Nahr El Kebir	
Tanzania	Uganda	Nile	-2.11
Libya	Chad	Lake Chad	-2.10
Botswana	Zimbabwe	Limpopo	-2.10
		Okavango	

Table A13.3 Basins With Unfriendly Riparian Relations (cont)

COUNTRY	COUNTRY	BASIN	BAR SCALE
		Zambezi	
Afghanistan	Tajikistan	Aral Sea	-2.07
Mozambique	South Africa	Maputo	-2.04
		Limpopo	
		Umbeluzi	
		Incomati	
Lebanon	Turkey	Asi (Orontes)	-2.00
Dominican Republic	Haiti	Artibonite	-1.88
		Massacre	
		Pedernales	
Angola	Congo (Kinshasa)	Congo/Zaire	-1.86
		Chiloango	
		Zambezi	
Botswana	South Africa	Orange	-1.71
		Limpopo	
Afghanistan	Pakistan	Helmand	-1.55
		Indus	
Latvia	Russia	Daugava	-1.55
		Neman	
		Narva	
Swaziland	South Africa	Umbeluzi	-1.52
		Incomati	
		Maputo	
Algeria	Morocco	Dra	-1.51
		Daoura	
		Oued Bon Naima	
		Guir	
		Tafna	
Bangladesh	Myanmar (Burma)	Ganges	-1.39
Honduras	El Salvador	Goascoran	-1.38
		Lempa	
Georgia	Russia	Terek	-1.38
		Sulak	
Lesotho	South Africa	Orange	-1.32

Table A13.3 Basins With Unfriendly Riparian Relations (cont)

COUNTRY	COUNTRY	BASIN	BAR SCALE
Armenia	Georgia	Kura-Araks	-1.26
Albania	Greece	Vijose	-1.24
		Lake Prespa	
Switzerland	Czech Republic	Danube	-1.19
Bulgaria	Turkey	Maritsa	-1.18
		Rezvaya	
		Velaka	
Greece	Turkey	Maritsa	-1.07
		Vardar	
Kenya	Somalia	Juba-Shibeli	-1.03
Bosnia & Herzegovina	Slovenia	Danube	-1.00
Byelarus	Lithuania	Neman	-1.00
		Daugava	

Table A13.4 Basins Negotiating Current Conflicts (Category 1)

Basin	Riparians
<i>Aral Sea</i>	Afghanistan, China, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan
<i>Jordan</i>	Israel, Jordan, Lebanon, Palestinians, Syria
<i>Nile</i>	Burundi, Congo (Kinshasa), Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda
<i>Tigris-Euphrates</i>	Iran, Iraq, Jordan, Saudi Arabia, Syria, Turkey

Table A13.5 Basins At Risk – Categories 2 and 3

Basin	Riparians	Existing Water Tensions	Development Project(s)	Treaty	Treaty Includes all Riparians	Un-friendly Relations	Low Per Capita GDP	High Population Density	Nationalist Minority Groups	Other
CATEGORY 2										
<i>Asi-Orontes</i>	Lebanon, Syria, Turkey	Y	Y	Y – Syria, Lebanon	N	Y		Y		
<i>Ganges-Brahmaputra-Meghna</i>	Bangladesh, Bhutan, Burma, China, India, Nepal	Y	Y	Y	N – upstream riparians not included	Y	Y	Y	Y	Chittagong Hill peoples
<i>Han</i>	North and South Korea	Y	Y	N		Y	Y	Y		Dam as weapon; food shortages

Table A13.5 Basins At Risk – Categories 2 and 3 (cont.)

Basin	Riparians	Existing Water Tensions	Development Project(s)	Treaty	Treaty Includes all Riparians	Un-friendly Relations	Low Per Capita GDP	High Population Density	Nationalist Minority Groups	Other
<i>Indus</i>	Afghanistan, China, India, Pakistan	N	Y	Y – India, Pakistan	N	Y	Y	Y	Y	Kashmir, internal water pressures
<i>Kune</i>	Angola, Namibia		Y – joint projects	Y – lacks specific water-sharing provisions		Y	Y			Internal protests of proposed joint dam projects by indigenous groups
<i>Lake Chad</i>	Algeria, Cameroon, Central African Republic, Chad, Libya, Niger, Nigeria, Sudan	Y		Y	N	Y	Y			Weak treaty - dysfunctional basin commission. Degrading water quality.
<i>Okavango</i>	Angola, Botswana, Namibia, Zimbabwe	Y	Y	Y – treaty lacks specific water-sharing provisions		Y	Y			Protections of Okavango Delta
<i>Mekong</i>	Burma, Cambodia, China, Laos, Thailand, Vietnam		Y	Y	N – upstream riparian not included	Y	Y	Y		

Table A13.5 Basins At Risk – Categories 2 and 3 (cont.)

Basin	Riparians	Existing Water Tensions	Development Project(s)	Treaty	Treaty Includes all Riparians	Un-friendly Relations	Low Per Capita GDP	High Population Density	Nationalist Minority Groups	Other
<i>Senegal</i>	Guinea, Mali, Mauritania, Senegal	Y	Y	N		Y	Y			Communal water clashes along border
<i>Salween</i>	China, Burma, Thailand		Y	N		Y	Y	N		High population density in neighboring basins. Out-of-basin water transfers planned.
CATEGORY 3										
<i>Ca</i>	Laos and Vietnam			N		Y	Y	Y		General technical coop. agreements on irrigation and socio-econ. dev
<i>Chiloango</i>	Angola, Congo (Kinshasa), Congo (Brazzaville)			Y – general SADC protocol		Y – Angola and Congo (Kinshasa)	Y		Y	Cabindan nationalists in Angola; No specific water treaty
<i>Cross</i>	Cameroon, Nigeria			N			Y	Y		deforestation in Nigerian portion of basin
<i>Drin</i>	Albania, Macedonia, Serbia & Montenegro			N			Y	Y	Y	Pollution of Shkoder Lake is issue, discussions proposed.

Table A13.5 Basins At Risk – Categories 2 and 3 (cont.)

Basin	Riparians	Existing Water Tensions	Development Project(s)	Treaty	Treaty Includes all Riparians	Un-friendly Relations	Low Per Capita GDP	High Population Density	Nationalist Minority Groups	Other
<i>Irrawaddy</i>	Burma, China, India			N		Y	Y	Y	possible presence	
<i>Kura-Araks</i>	Armenia, Azerbaijan, Georgia, Iran, Turkey		Y – project status unclear	Y – Iran, USSR	N	Y	Y		Y	Nagorno-Karabakh, Water as weapon
<i>La Plata</i>	Argentina, Bolivia, Brazil, Paraguay, Uruguay	Y	Y	Y – multiple, project-specific treaties	N	N	N	N	N	
<i>Lempa</i>	El Salvador, Guatemala, Honduras			N		Y	Y	Y		
<i>Limpopo</i>	Botswana, Mozambique, South Africa, Zimbabwe			Y	N – except for general SADC protocols	Y	Y			Identified by SADC as requiring basin commission.
<i>Ob</i>	China, Kazakhstan, Russia	Y – internal tensions re. international projects	Y	Y – agreement to discuss border river issues			Y			Development projects under consideration include out-of-basin transfer to Aral. Also, China considering other out-of-basin water transfer.
<i>Song Vam Co Dong</i>	Cambodia, Vietnam		Y	N		Y	Y	Y		Only general water agreement

Table A13.5 Basins At Risk – Categories 2 and 3 (cont.)

Basin	Riparians	Existing Water Tensions	Development Project(s)	Treaty	Treaty Includes all Riparians	Un-friendly Relations	Low Per Capita GDP	High Population Density	Nationalist Minority Groups	Other
<i>Red</i>	China, Laos, Vietnam			N		Y – Laos, Vietnam	Y	Y		Technical coop. agreements between Laos and Vietnam.
<i>Saigon</i>	Cambodia, Vietnam			N		Y	Y	Y		General conservancy coop. agreement
<i>Yalu</i>	China, North Korea			N		Y	Y	Y		Joint China-Korea hydropower projects under discussion since 1980's
<i>Zambezi</i>	Angola, Botswana, Congo (Kinshasa), Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe		Y – unclear if unilateral or not	Y	N – except for general SADC protocols	Y	Y			Existing joint hydro-electricity projects issue of conflict in past (not necessarily water specific conflicts)

These other basins contain factors that would imply the potential for conflict, however other factors, such as overall friendly relations, the presence of freshwater treaties, or indications of ongoing cooperative water discussions made them less likely candidates for potential conflict than the basins listed above. It should be noted that, for many of these basins, the author lacks detailed, qualitative information about the political, socio-economic, or bio-physical conditions unique to that basin. Experts on particular regions may be aware of conditions that would change the listing of basins in this chapter.

Table A13.6 Other Basins Considered

Basin	Riparians	Indicators	Comments
<i>Fenney</i>	India, Bangladesh	Low per capita GDP; High population density	Agreements between India & Bangladesh on sharing waters of common rivers.
<i>Ili</i>	China, Kazakhstan, Kyrgyzstan	Low per capita GDP; Uighers in northwest China, who want separate East Turkestan State	Agreements for joint projects under discussion, diplomatic approaches actively in use.
<i>Incomati</i>	Mozambique, South Africa, Swaziland	Low per capita GDP (Mozambique); Unfriendly relations (South Africa, Swaziland)	Treaty between South Africa and Swaziland. Also SADC protocol signed by all riparians. Mozambique,, the downstream riparian, has complained about. South Africa's use of the water resources, however disputes likely to be solved diplomatically.
<i>Karnaphuli</i>	Bangladesh, India	Low per capita GDP; High population density	Agreements between India & Bangladesh on sharing waters of common rivers.
<i>Niger</i>	Algeria, Benin, Burkina Faso, Cameroon, Chad, Guinea, Ivory Coast, Mali, Niger, Nigeria, Sierra Leone	Development projects planned; Low per capita GDP; Unfriendly relations between Ivory Coast and Guinea;	Treaties, but only from the 1960's. No recent treaties signed. Impact of planned development projects on riparians unclear. Disagreements in past solved through diplomacy.

Table A13.6 Other Basins Considered (cont.)

Basin	Riparians	Indicators	Comments
<i>Orange</i>	Botswana, Lesotho, Namibia, South Africa	Unfriendly relations; Development project planned/underway	Lesotho highlands project, but there is a Treaty between South Africa and Lesotho. Namibia and South Africa have water commission. SADC protocols signed by all riparians. Although South Africa & Botswana sent troops into Lesotho, it is unclear that issue was water-related.
<i>Orinoco-Caroppi</i>	Columbia, Venezuela	Development project planned; No treaty	Existing cooperation on trade of hydroelectricity
<i>Po</i>	Austria, France Italy, Switzerland	High population density; No treaties; Development project(s) planned	Countries have friendly relations and high per capita GDP. Disputes unlikely to escalate into violent conflict.
<i>Tarim</i>	China, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan	Low per capita GDP; High population density; Uighers in northwest China, who want separate East Turkestan State	No treaties, but joint projects under discussion.
<i>Tumen</i>	China, North Korea, Russia	Low per capita GDP; Unfriendly relations	Agreements on border rivers. Agreements on joint economic development of the Tumen basin.
<i>Volta</i>	Benin, Burkina Faso, Ghana, Ivory Coast, Mali, Togo	Development projects planned; Low per capita GDP	Treaty signed recently by all riparians on integrated basin management.