

RURAL WATER AND POVERTY ELIMINATION

This article is based on a talk by Phillip Kirpich at the Water Staff Luncheon of the 1818 Society, June 9, 2006

I'm delighted to have this occasion to meet old hands--retired water resource colleagues of the Bank. I'm living in Florida which enjoys rainfall about a third higher than here in Washington. Yet we face serious water shortage brought on by invasions of developers into the Everglades and by large sugar plantations that consume water and cause pollution. The Everglades are the concern not only of the environmentalists but also major urban concentrations (Miami, Fort Lauderdale and the Palm Beaches) whose water source is the aquifer underlying the Everglades.

Am I defending urban vs. rural users? Yes, I am in this case since the rural user is primarily a large sugar plantation of about 100,000 hectares that enjoys taxpayers' subsidies though direct payments, through high tariffs on imported sugar and through free water impounded in Lake Okeechobee by a large dike (earthen dam) built at taxpayer expense.

To reduce gasoline prices, Governor Jeb Bush is currently advocating further support to the growers to increase outputs so that much of the crop could go to produce ethanol. But why not use cheaper, imported sugar and not further endanger the Everglades?

Globally, the quantity of fresh water is limited by the evaporative powers of the sun's rays on the planet. Energy production, on the other hand, is not limited, considering alternatives such as wind and nuclear. Ethanol in my view is not an alternative since to grow corn or sugarcane for gasoline also requires scarce water, as in the Midwest where corn is irrigated during drought periods by pumping from the Ogallala aquifer whose level is steadily dropping.

Global water is limited. But is that serious? Yes it is. Rainfed agriculture is close to reaching a limit. To feed the world, irrigated agriculture must make up the deficiency. UNESCO, in its triennial United Nations World Water Development report, states that the world will need 55 percent more food by 2030 and that this translates into an increasing demand for irrigation.

But with water running short in several key regions, how can irrigation fulfill the requirement? The answer is that all sectors must conserve water, not only rural but urban and industrial as well.

Irrigation now consumes 70 percent of global water or about three times urban. There is considerable scope in the irrigation sector to reduce wastage but, as I will discuss later, changes in governance at both local and national levels are required. Why can't more modern methods be introduced such as drip systems that are used extensively in Israel and other countries including Portugal and Egypt? These are indeed much more efficient but they are sophisticated and costly and therefore not available to poor farmers with very small holdings, as is prevalent in South Asia, Sub-Saharan Africa and parts of Latin America.

Why not more dams that impound flood waters otherwise wasted to the seas? The trouble is that the economically feasible sites are already developed. This brings to mind the Sardar Sarovar dam on the Narmada River in western India whose planning the Bank assisted but then gave up because environmentalists objected to the resettlement of farmers in the reservoir that had to be relocated. This was a mistake as the Bank should have stayed with the development to assist it in other ways.

Mega—call them rather desperate—solutions are being proposed that indeed may ultimately have to be considered including diversions from South to North China, and from Canada via the Great Lakes to Midwest United States. These solutions of course involve very large expenditures and raise complex political issues. So in the short and medium term, the only realistic solution is to conserve both urban and rural uses.

Conserving Rural Demands

To reduce wastage in irrigation will require imposition of water charges and establishment of effective Water User Associations (WUAs), both of which I discuss later.

To conserve water in arid or semiarid regions, especially in China and India, cultivation of rice and sugarcane should be curtailed in favor of lower-consumptive-use crops like vegetables and fruits that not only save water but also provide employment and lead to higher farm incomes.. The resulting shortfalls in grain, which would then have to be imported, could be paid for by profits from the high-value exports. Developed countries would of course

have to eliminate subsidies on these crops while facilitating their importation. That may seem idyllic under current circumstances but international organizations like the Bank must press for such a reform.

Poverty: Should it worry us?

The high incidence of poverty, mainly in the developing countries, is morally wrong since measures could be taken to eliminate it. The developed countries, where poverty is less serious, suffer nevertheless from the poverty in the developing countries that causes violence, instability and environmental damage to the planet :from cutting of rain forests and damage to fisheries and wildlife.

Where Is Poverty Mmost Prevalent?

First, look at Exhibits 1 and 2 showing world population forecasts and grain shortfalls predicted for China. Note how the global population, now 6 billion will rise by 2050 to 9 billion, with all of the increase in the developing countries. Second, China, now barely producing 300 million tons of grain annually--enough for its requirements--will suffer a shortfall of 400 million tons by 2050.

Exhibit 3 gives figures for several items that are measures of poverty in leading countries in South Asia and Latin America. Seven, other than the U.S., populous countries are listed; all have GDPs and ppp's (purchasing power parity) much less than the U.S., and all ,except Mexico and Brazil, have high percentages of the population in agriculture—a common measure of poverty. All. Except China and the U.S. have high birth rates.

I'll concentrate first on the big areas in South Asia and then a bit on the Middle East, especially Egypt, and then a bit on Sub-Saharan Africa and\Latin America, i.e., Brazil and Mexico.

First a few statistics gleaned from *The Economist's "t Pocket World in Figures."* For five key countries, China, India, Pakistan, Indonesia, Bangladesh, populations are from 150 to 1,300 million; . GDP in ppp terms as a percentage of the U.S. is 5% (Bangladesh and Pakistan) to 13% (China); percent employed in agriculture: Bangladesh 63. India 60, China 49; U.S. 1! The birth rate in Pakistan is alarmingly high—36 per thousand, China and U.S. 15. Egypt, Mexico and Brazil : 26.6, 22.4 and 19.7. In terms of numbers of people affected, South and East Asia come first but there are serious pockets also in Africa and Latin America.

Poverty results in malnutrition and is a vicious-circle contributory cause of other deficiencies including:

- Health clinics
- Family planning
- Schools. Educated women have fewer children
- Rural roads
- Credit and marketing support
- Lack of systems for establishing and registering land ownership titles. If available, such systems would help small farmers sell the land they farm. If, concurrently, they could enjoy minimal education, they could leave the land for the cities and the curse of tiny land ownership would be mitigated.

Rapid urbanization as in North China is intensifying rural water shortage and therefore rural poverty. California similarly hurts agriculture through rise in urbanization and environmental needs like fisheries.

Water Charges *en bloc*: need case-by-case study with cooperation from local users. A primary obstacle is that in most developing countries the landholdings are very small, in most cases averaging about 0.5 hectares. An irrigation agency (or irrigation district), by means of tertiary canals and/or pumping can supply water to turnouts that it constructs and manages. As it is impractical for turnouts to supply water to units smaller than 50 hectares and since the typical farm size in South Asia and elsewhere in the developing countries is half a hectare, this means that water charges must be imposed *en bloc* to a group of up to about a hundred individual farmers. This situation requires the formation of a Water User Association for the distribution of water downstream of the turnout. The WUA must maintain the farm ditches downstream of the turnout and collect money from individual farmers to pay the *en bloc* charge.

Effective Water User Associations—the Crux of the matter

A typical WUA embraces a single village or perhaps one or two adjacent villages. If properly formed and supported, the WUA can act as a powerful catalyst to overcome the other deficiencies mentioned.

A program for training of WUA leaders, preferably drawn from the local village populations, is needed. The irrigation district, for its own self

interest, should support the formation of WUAs and the effort also needs support of pertinent governmental agencies.

Valuable support to such a program could also be obtained from NGOs and from the U.S. Peace Corps. International agencies, especially the UN, the World Bank and the regional development banks, should also give support. In any case, planners of the program should spend adequate time in the villages to gain adequate understanding of local social and economic factors,

The Chandpur Project, Bangladesh

Bangladesh lies in the flood plain formed by two major rivers: the Ganges and the Brahmaputra, both emanating from India. Heavy monsoon rainfall causes the rivers to overflow every year. The Bangladeshis have adapted to the monsoon flooding by placing their villages on mounds and by planting a variety of long-stem (although low-yielding) rice that grows slightly faster than the rise of the monsoon floods. There are however periods when the monsoon rainfall is low so that the rice needs irrigation. Irrigation is also required in order to benefit from dry-season crops.

In the 1960s and early 1970s, the Bank was heavily engaged in assisting Pakistan in preparing a Water Master Plan for East Pakistan, which in 1971 declared itself independent and became Bangladesh. The Bank had already financed two major flood-embankment projects, one on the west bank of the Brahmaputra and the other to protect Dhaka, the country's main city and capital. The Bank engaged experts from the U.S. and the Netherlands to determine whether further embanking of the rivers was desirable. The answer was in the negative.

Bangladesh's only major irrigation project was Ganges-Kobadak, a conventional canal-type project similar to those in (West) Pakistan previously constructed by the British colonial authority. However, the climate in (West) Pakistan is much drier than in Bangladesh and there are other major differences including the annual monsoon flooding, soils of much higher fertility and the very small size of landholdings, generally less than half a hectare.

The GK project had further serious drawbacks caused by siltation of its pumping-station intake on the Ganges River, by major displacement of

farmers due to land taking for building the primary supply canal and by settlement of the embankments forming the primary canal. Although climatically three rice crops can be harvested in Bangladesh, in the GK project only one or two are being realized owing to physical difficulties with the primary canals.

The canal-type of irrigation was strongly supported by the Bangladesh Water Development Board (BWD) but challenged by another agency, the Bangladesh Agricultural Development Corporation (ADC) whose strategy was to place thousands low-lift portable pumps adjacent either to perennial streams or to hand-dug wells. (In the latter case, the pumps were placed at ground surface with suction hose tapping shallow groundwater. Static lifts provided by the low-lift pumps do not exceed 10 feet; their use resembles the *sakias* of Egypt that utilize animal power.) Published reports in the early 1990s stated that ADC's program achieved an irrigated area of a million hectares as compared with BWDB's 100,000.

ADC's program did reach a limit as additional sites suitable for diversion of water from perennial streams or from shallow groundwater became exhausted. (Some groundwater sites suffered contamination from arsenic but was probably not serious considering the large area of shallow groundwater that was not affected.)

However, this did not mean that canal-type irrigation should be reintroduced. Instead, with the Bank's cooperation a workable compromise was worked out (see Exhibit 4) whereby a large permanent pumping station was built by BWDB on the left bank of the Dakatia River that discharges into natural drainage courses and then relifted by ADC's low-lift portable pumps—a scheme known as double lifting. The excessive land taking for a canal-type system was thereby avoided and it became possible to harvest three crops a year.

The history of irrigation in Bangladesh points to the caution needed in transferring technology without giving adequate weight to differences in physical, economic and social factors

Cali, Colombia Land Reclamation

Exhibit 5 illustrates how a flood embankment on the west bank of the Cauca River, supplemented by diversions of tributary streams and drainage, provided space for this rapidly growing city. This was not a Bank project

and was financed entirely by the Colombians. Concurrently, overall planning for the upper Cauca River was carried out with assistance from two U.S. consulting firms and a Colombian consulting firm. I was Project Manager for the three firms and later assisted in negotiations for a Bank loan for a major hydroelectric and transmission-line project.

Sub-Saharan Africa suffers from poor governance and corruption. An article in *The Economist*, 04.29.06, describes the UN's *Minimum Development Goals* directed by Jeffrey Sachs, a prominent macro-economist. A comprehensive bottom-up (starting at village level) approach is being used for 12 pilot projects in selected villages in 10 African countries. Water for domestic use and for irrigation are being included as vital parts.

Egypt

Population is 72 million and growing at the rapid rate of 2% a year. Egypt is exhausting its allotted portion of Nile water shared with Sudan and with Ethiopia that is now waking up to the looming shortage that it faces. A recent article in *Water International* by Robert O. Collins describes the difficult negotiations that lie ahead in which the Bank is involved.

Macro-Economic Guidance

To shift away from rice and go to high-value export crops will need this kind of guidance. Land tenure issues, like gross inequality (Brazil and Mexico), and seizure of land for urban development. As previously mentioned, lack of land titles can be a serious impediment. In the case of China, lack of property rights has caused serious violence (see *The Economist* 03.11.06 and 03.25.06).

Actions on a Global Scale Up To Now have largely consisted of mega-conferences, the first of which, at Mar del Plata, Argentina in 1972 (colleague John Kalbermatten and I attended), that have concluded with developed-country ministerial declarations but little follow-up action.

Some water-resource specialists have concluded that the mega conferences, besides being non productive, may even have been harmful. For example, Asit K. Biswas, a recent recipient of a prestigious prize from the Stockholm Water Congress. has been a lead author of a paper reaching this conclusion. that was prepared by the Sasakawa Peace Foundation of the USA and Japan.

An article sharing this view, in *Water International*, September 2005, was by Peter H. Gleick, President of the Pacific Institute for Development.

Exhibit 6 gives a listing of leading International agencies and NGOs that deal with water management. These are numerous, lack coordination with each other and often cause confusion. To correct the situation, leadership by the UN is required with active support of the World Bank and the regional development banks. Whether such steps can be undertaken in the near future appears doubtful since the UN is undertaking reform of its administrative setup. Support would moreover be needed from political leaders of leading countries, especially the U.S.

Al Gore, who narrowly lost the U.S. 2000 election for president, is an example of a politician that could exert such leadership; he is currently starring in a movie “An Inconvenient Truth” that pleads for more attention to the well being of the global environment including of course water.

Clearing up the existing confusion with respect to the numerous international agencies dealing with water need not however delay the actions I described regarding establishment of WUAs and training programs for leaders of WUAs.

The Bank’s Water Resource Management Group

From the Bank’s website, this group consists of 16 staff members drawn from various departments. The 16 members include Salah Darghouth, Advisor (Water for Food) Agricultural Development; and David Grey, Senior Water Adviser, Nile Basin Coordination Unit and Salman M. A. Salman who has written extensively on the legal aspects water-conflict resolution. As the Collins article on the Nile, cited above, states, social and political realities will probably supersede legal considerations.

A 91-page report describing a recent noteworthy study by the International Water Management Institute with financial support of the Asian Development Bank that I downloaded from the 1818 Society’s web site where it had been placed there by Salah Darghouth.. It is entitled “Pro-Poor Intervention Strategies in Irrigated Agriculture in Asia, May 2005, Covering Bangladesh, China, India, Indonesia, Pakistan and Viet Nam, the report is comprehensive and gives strong support to further growth and development of WUAs. I find the report timely and welcome but feel that it has three deficiencies:

- Analyses covered irrigation projects using canals. No consideration was given to projects based on groundwater or on use of low-lift portable pumps; such projects have been widespread in Bangladesh and India. Use of such pumps is not dissimilar to the animal-driven *sakias* of Egypt.
- With respect to the WUAs, there is no call for follow-up actions such as training of village leaders. Support for such a program from NGOs and from the U.S. Peace Corps would be helpful.
- There has been severe rioting by peasants in China over their lack of property rights caused by communist ideology that forbid such rights for land ownership; see *The Economist* March 11 and 25, 2006.

Topics for Future Water Staff Luncheons

David Grey could speak on the Nile initiative.

There are several ongoing and potential International Water Conflicts besides the Nile, an outstanding one being the Tigris/Euphrates.

Talks by informed retirees or staff on China and India, both suffering severe water stress, would be very interesting. In the Punjab, India's bread basket, the Green Revolution was due not just to the improved seeds of the breeders but also to the availability of groundwater and a power grid that facilitated pumping. But now the water table is dropping.

EXHIBITS

All except Exhibit 3 were copied from the book "Water Planning for Food Production in Developing Countries." Phillip Z. Kirpich, University Press of America, Lanham, MD 20706, 1999. Exhibit 3 was derived from tables in *Pocket World in Figures, the Economist, 2005*.

1. World Population.
2. Grains in China.
3. Statistics for Seven Countries and the United States.
4. The Chandpur Project, Bangladesh.
5. The Cali, Colombia Land Reclamation Project.
6. International organizations Concerned with I & D in Developing Countries.

EXHIBIT 1 WORLD POPULATION

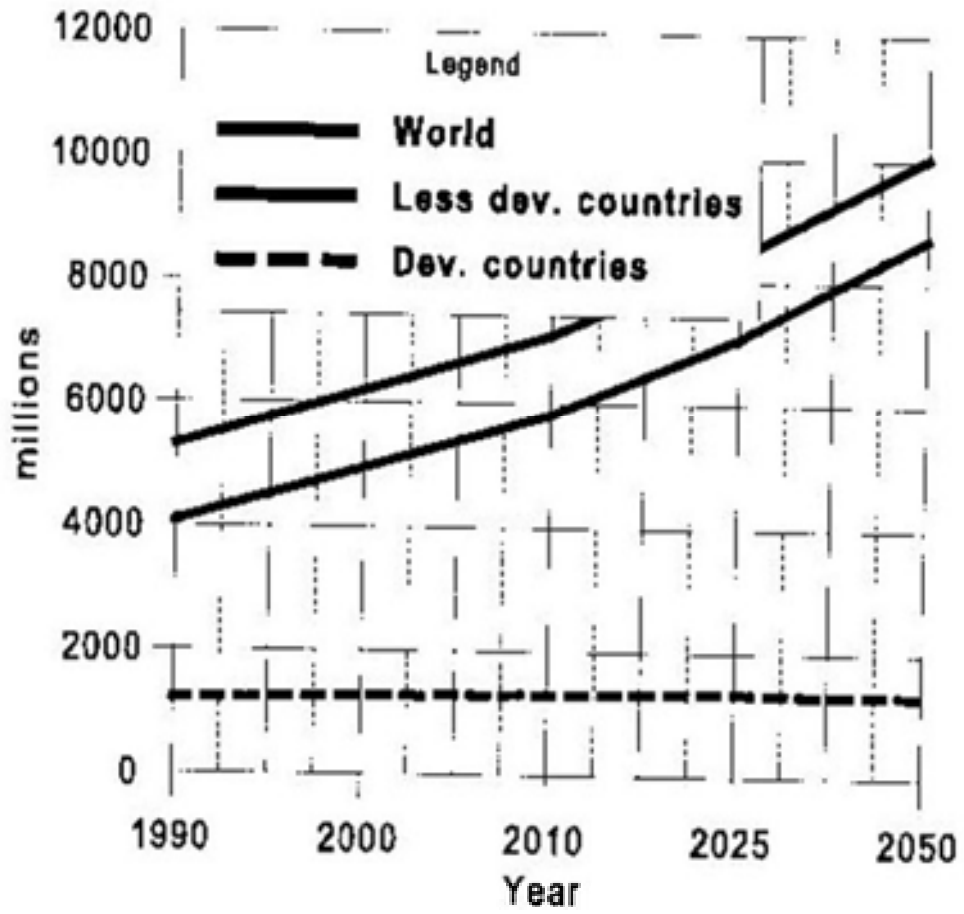


EXHIBIT 2 GRAINS IN CHINA

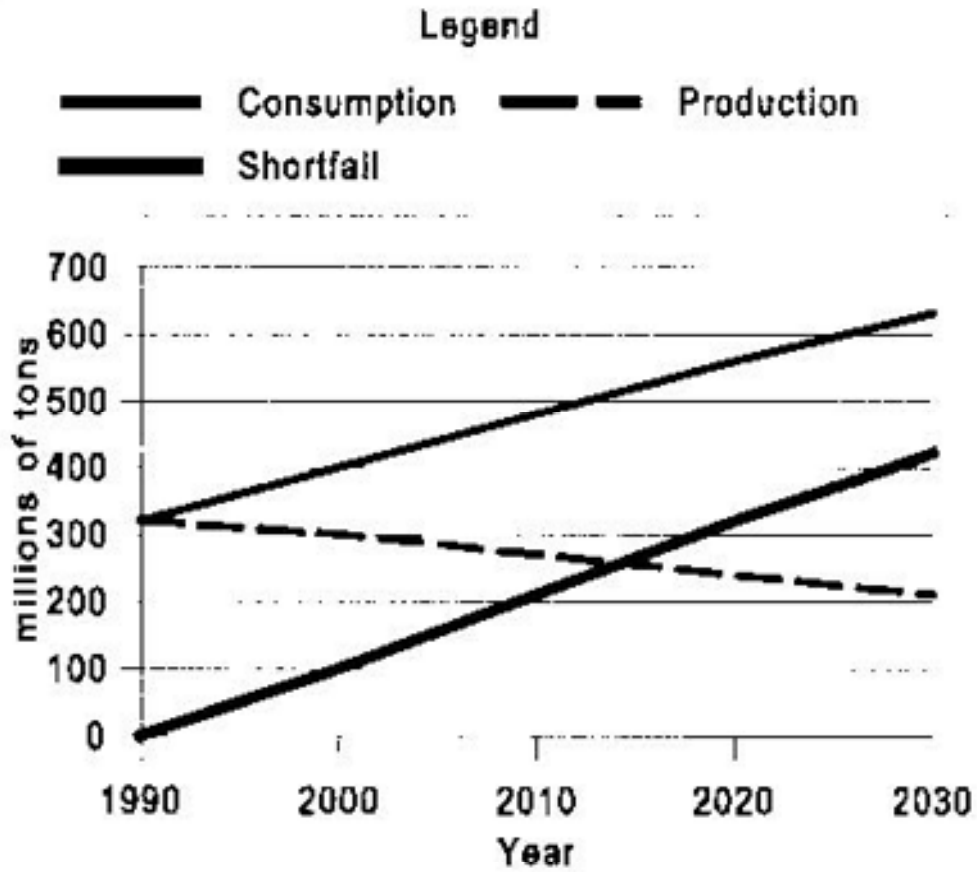


EXHIBIT 3

STATISTICS FOR SEVEN DEVELOPING COUNTRIES COMPARED WITH THE U.S.

	Popula- tion (m)	GDP per head	GDP ppp US = 100	Percent urban	Percent in agric.	Birth rate per 1000
China	1,304	1,090	13.2	38.6	49	14.5
India	1,065	560	7.6	28.3	60	23.8
Indonesia	220	950	8.5	45.6	45	20.7
Pakistan	154	540	5.4	34.1	42	35.9
Bangladesh	147	350	5.0	24.2	63	28.9
Mexico	104	6,050	23.8	75.5	18	22.4
Brazil	179	2,700	19.9	83.1	20	19.7
United States	294	37,240	100	80.1	1	14.5

EXHIBIT 4

THE CHANDPUR PROJECT, BANGLADESH

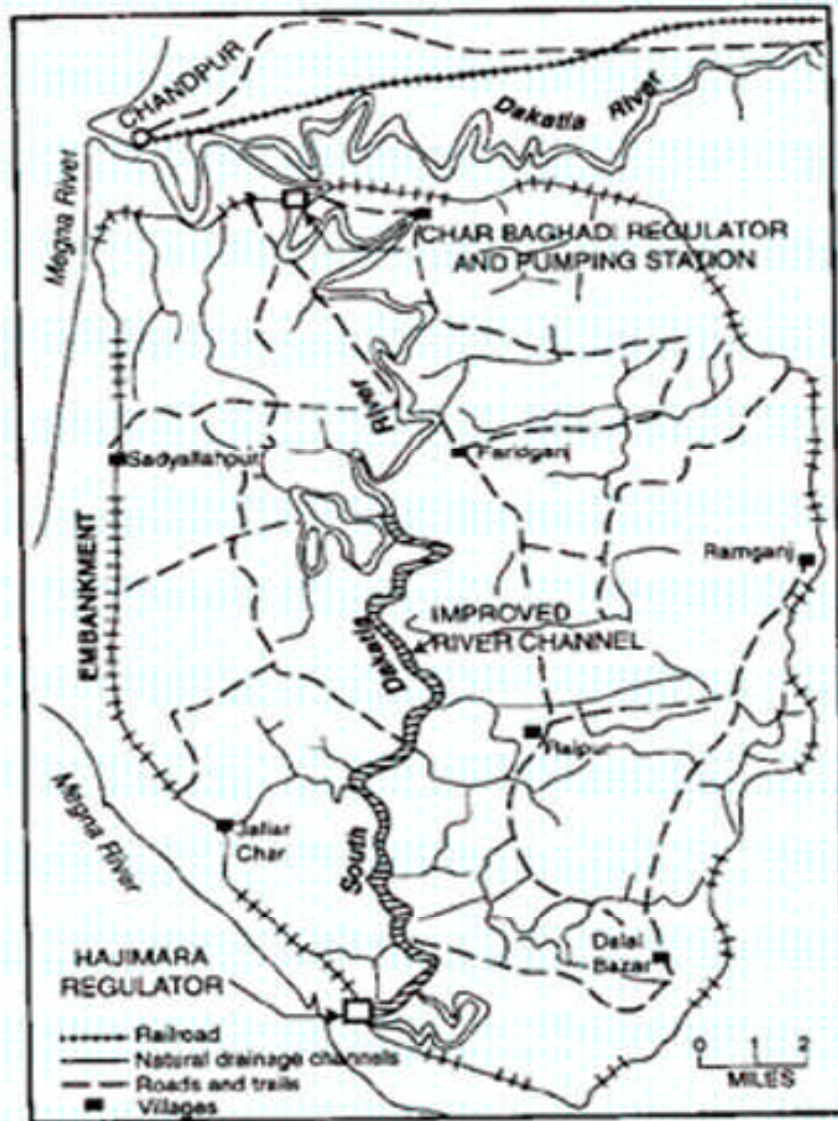


EXHIBIT 5

THE CALI, COLOMBIA LAND RECLAMATION PROJECT

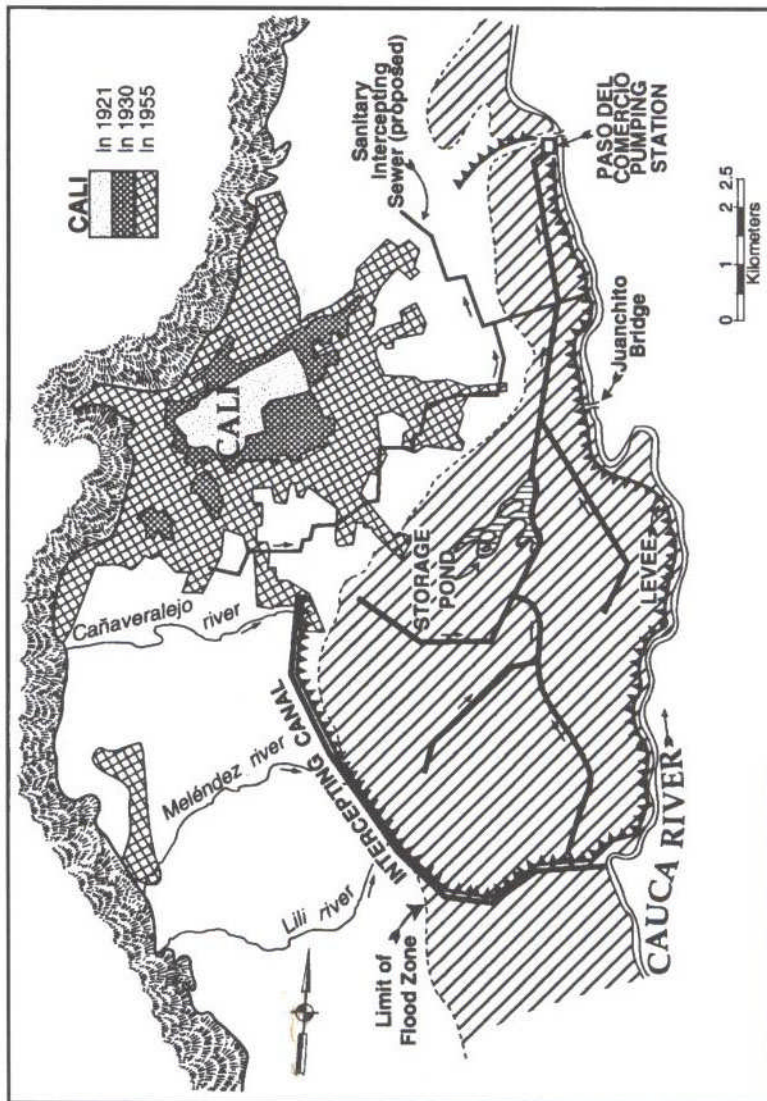


EXHIBIT 6

INTERNATIONAL ORGANIZATIONS CONCERNED WITH I & D IN DEVELOPING COUNTRIES

International Organizations Concerned with I&D in Developing Countries	Finance	Tech. Assistance	Tech. Publications
ADB – Asian Development Bank	•	•	•
ASCE – American Society of Civil Engrs.			•
AGU – American Geophysical Union			•
AWRA – American Water Resources Assn.			•
FAO – Food & Agriculture Organisation, UN		•	•
GWP – Global Water Partnership, Stockholm		•	
IADB – Interamerican Development Bank	•	•	•
IBRD – Intl. Bank for Reconstruction and Development (World Bank)	•	•	•
ICID – Intl. Commission in Irrig. & Drainage		•	
IDRC – Intl. Devt. Research Centre, Ottawa	•		
IFAD – Intl. Fund for Agric. Devt., Rome	•		
IFPRI – Intl. Food Policy Research Institute, Washington		•	•
IIMI – Intl. Irrigation Management Institute, Colombo, Sri Lanka (now IWMI)		•	•
ILRI – Intl. Institute For Land Reclamation, Netherlands		•	•
IPTRID – Intl. Program for Technical Research In Irrigation and Drainage, Washington		•	
IWMI – Intl. Water Management Institute, Sri Lanka (see IIMI)			
IWRA – Intl. Water Resources Association			•
MEWIN – Middle East Water Information Network, Philadelphia			•
OAS – Organization of American States		•	
UNDP – United Nations Development Programme		•	
USAID – U.S. Agency for Intl. Development		•	
USCID – U.S. Committee on Irrigation and Drainage			•