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The Case Against Kalabagh Dam

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Under the Working Paper Series, the SDPI publishes research papers written either by the regular staff of the Institute or affiliated researchers. These papers present preliminary research findings either directly related to sustainable development or connected with governance, policy–making and other social science issues which affect sustainable and just development. These tentative findings are meant to stimulate discussion and critical comment.

The Case Against Kalabagh Dam

Shaheen Rafi Khan

1. Introduction – The Absence of Good Governance

The Kalabagh Dam project comes at an important confluence of events. It reflects a crisis of governance, where decision-makers are at odds with an increasingly vocal society. Among other things, this stems from a concern that Kalabagh could trigger irreversible degradation of the Indus River Ecosystem. Also, the global and regional context for assessing large dams like Kalabagh is changing, with conventionally described irrigation, flood control and energy benefits being viewed through the prism of sustainable development.

The key imperatives, transparency and good governance, were never a factor in the formulation of the project. Thus, the technical specifications have undergone numerous revisions because of perceived concerns in the NWFP regarding seepage and inundation of surrounding areas, a problem that could have been resolved had affectee communities been consulted. Politically, the dam has been a non-starter as its benefits are viewed as accruing to the Punjab, at the expense of Sind and the NWFP, with both provinces the victims of water deprivation, ecosystem degradation and social displacement. The arbitrary manner in which the Punjab has appropriated water from the Indus River Basin in the past does not set a precedent for credibility. The issue of resettlement and rehabilitation is a contentious one, as there is outright mistrust of the government's offer of compensation. Finally, increasing cost over-runs and mounting donor reluctance to finance a large and environmentally controversial project of this nature, give the lie to the government resolve to press on with building the dam; in particular, the government's present fiscal insolvency precludes an investment of this magnitude.

An important factor in good governance is decentralized and consultative decision making. By contrast, the reality has been the very antithesis of this , with policy decisions being made in a highly centralized, politically coercive -- the belated decision for consensus notwithstanding -- and technically flawed manner. WAPDA, the administrative and technical authority on large water projects, appears bent upon an ex-post vindication of a politically motivated step. Regrettably, when the need is for broad-based stakeholder consultations, as a basis for informed and democratic decision making, the existing trend points towards even greater centralization. For instance, the rotating chairmanship of the Indus River System Authority has recently been converted into a permanent appointment, provincial resolutions against Kalabagh have been given short shrift, the Council of Common Interests (CCI) has consistently ignored the matter and community concerns continue to be met with blatant disregard. Small wonder then that the political leadership in the smaller provinces and civil society are up in arms against Kalabagh.

Section 1 of the paper examines the official water availability claims used to justify the Kalabagh Dam. This is followed by an assessment of the arguments traditionally advanced in favor of large dams. Section 3 assesses the ecological and social displacement concerns, which have acquired center stage in the calculus of aid donors and international bodies such as the World Commission on Dams. Section 4 presents a low-cost alternative to Kalabagh Dam and is followed by the recommendations in the concluding section.

2. Water Availability

The absence of accountability and doctored information are two sides of the same coin – a big brother syndrome many are familiar with. This is evident in the manner in which WAPDA has manipulated water availability figures to justify Kalabagh. The following table shows two sets of data which have originated from the generic source, WAPDA itself. The first column shows the enhanced flows and is based on highly questionable assumptions.

Table 1: Alternative Estimates of Water Availability

(Million Acre Feet)

	Mean Year Flows (Revised (1976–1994) 1	Mean Year Flows (Original (1922-1994) 2	Mean Year Difference (1 – 2)
1. Rim Station Inflows from Western Rivers	143.1	138.7	4.4
2. Eastern River Contribution	4.0	0.0	4.0
3. Excess Above Rim Stations	2.3	0.0	2.3
4. System Losses	10.0	14.7	4.7
5. Authorized Use by India on Western Rivers	2.0	4.8	2.8
6. Outflow to Sea	5.8	10.0	4.2
Available for Utilization (1+2+3-4-5-6)	131.6	109.2	
7. Indus Water Accord Allocation (1991)	117.4	117.4	
8. Net Availability	14.2	-8.2	22.4

First, WAPDA cites two mean yearly flow figures; 138.7 MAF and 143 MAF (SEBCON/SCR, 1998: 2). The first calculation is based on a 64-year period (1922-1996) and includes both wet and dry cycles. The second estimate is based on a much shorter and wet cycle period of 22 years (1977–1994) and appears to have been manipulated to justify Kalabagh. Second, a contribution of 4.0 MAF is assumed from the three eastern rivers, Ravi, Bias, Sutlej. This is surprising as the flow from these rivers were diverted to India under the 1960 Indus Basin Treaty. The only water available to Pakistan from these rivers are canal diversions from the Western rivers and occasional surpluses from the monsoon floods. Third, the availability above rim stations has been increased to 5.3 MAF. The allocation under the 1991 Indus Water Accord was 3.0 MAF, reflecting the utilization capacity of the irrigation network. The excess of 2.3 MAF has been added to inflate the downstream flows. Fourth, the originally estimated system losses of 14.7 MAF are pre-Tarbela. The new estimate, inclusive of Tarbela, reduces these losses to 10 MAF. WAPDA claims these losses will fall even further post-Kalabagh, due to lower down-stream discharges. However, there appears to be no allowance for sheet evaporation and seepage around the dam itself. Fifth, the Water Accord provision for the outflow to the sea is 10 MAF. This has been arbitrarily reduced to 5.8 MAF, clearly violating the terms of the accord. Sixth, the Indus Basin Treaty authorized India to crop 1.34 million acres on the Western rivers. The water requirement for this was estimated at 4.8 MAF, which is greater than the 2.0 MAF that the revised estimates make provision for. Combined water allocations to the four provinces under the Indus Water Accord are 117.4 MAF. The original estimates, after netting out outflows, losses and extractions show a deficit of 5.2 MAF. The revised data, however, indicates a surplus 17.2 MAF, clearly more than enough to justify the 6+ MAF Kalabagh dam.

The claim that about a million hectares is likely to become cultivable, thanks to Kalabagh, will also continue to remain spurious in the face of controversial water availability claims, and in view of the fact that the scope for extensive cultivation has been exhausted (see next section). A more realistic and conservative assessment of water availability has far-reaching implications. Were Kalabagh Dam to be built, the associated irrigation infrastructure (Right and Left Bank canals) would mean increased upstream off-takes at the expense of downstream flows. As it is illegal off-takes are a common practice.it; additional infrastructure would further exacerbate the problem. More important, an all-weather dam yields precedence to carry-over dams which would release stored flood water during lean periods.

3. The Traditional Arguments

Two of the most commonly cited arguments in favor of large dams relate to food security and energy. Such arguments have become increasingly compelling in the light of perceived threats to food security and the recent furor surrounding the private power projects. We examine both of these arguments in turn.

3.1 Food Security

Additional water from Kalabagh can enhance crop production in three ways: by irrigating new land; by enhancing cropping intensity on existing land; or by enhancing yields. The first option appears tenuous upon closer review of the facts. It is claimed that Kalabagh will irrigate close to an additional million hectares of barren land, and bring Pakistan closer to wheat self-sufficiency. However, the evidence in the reports of the National Commission on Agriculture (NCA, 1987) and the National Conservation Strategy (NCS, 1991) suggests otherwise, and appears to have been ignored. According to these reports, " the amount of cultivable land [available] is nearly matched by the amount cultivated, leaving little scope for expansion at the extensive margin. Between 1952 and 1977, about 80% of the increase in total cropped area was due to extensive cultivation. Since then, this proportion has fallen dramatically, with double cropping accounting for the bulk of the increase (NCS, 1991: 24)" These reports suggest that in addition to the water constraint a very tangible land constraint exists as well.

The other two options for increasing crop production are cropping intensity increases and crop yield enhancements. Both are water dependent and establish an a priori justification for Kalabagh. The NCS report states, "at present 12.2 million hectares of land are available for double cropping, as against the 4.38 million hectares that are double cropped – clearly water is the constraining factor." With respect to yield enhancements, water is again required in large quantities by the high yielding seed varieties (wheat, cotton, rice, maize) and for its synergetic effects upon chemical inputs.

However, a critical choice needs to be made here. Does one opt for additional water, or can the same results be achieved through improved water use efficiency? Higher water retention in the system risks aggravating an already massive problem of water logging and salinity. In fact, the controversial and exorbitant ($780 million), 25-year National Drainage Plan project has been launched to mitigate its impacts. Kalabagh is bound to add to the problem, not only in its immediate environs but also where new irrigation infrastructure is to be situated. Furthermore, the incremental land degradation is likely to be most pronounced in Sind reflecting the north-south land gradient, as is evident in the table below.

Table 2: Land with Water-Table Depth of under 0 - 5 Feet (By Province)
(Million hectares)

Province	Punjab	Sind	NWFP	Balochistan	Pakistan
1988					
June	0.54	0.86	0.06	0.04	1.50
October	1.72	3.44	0.06	0.09	5.31
1990					
June	.71	2.34	0.05	0.09	3.20
October	-	-	-	-	-
1992					
June	0.64	2.23	0.05	0.14	3.05
October	1.25	4.08	0.06	0.14	5.53
1993					
June	0.58	1.30	0.04	0.07	1.99
October	0.98	4.06	0.06	0.15	5.25

Source: Compendium of Environmental Statistics of Pakistan, 1994-95

Note that waterlogging is higher in Sindh in comparative terms and that it has been increasing over time, against a declining trend for the Punjab. The numbers for salinity also indicate that its incidence is higher in Sindh than in the Punjab.

Table 3: Extent of Salt Affected Land
(1000 hectares)

	NWFP	Punjab	Sindh	Total Indus Basin
Total CCA	320	7,891	5,351	13,562
Within CCA				
Salt Affected Area	14	1,614	1,532	3,160
Percent	4.3	20.4	28.6	23.3
Outside CCA				
Salt Affected Area	502	1,129	1,019	2,650
Total:	516	2,743	2,551	5,810

Source: Soil Survey of Pakistan (1977-78)
Note: CCA = Canal Command Area

The information is dated and recent data is not available to be able to discern trends. But the old numbers do show that almost 30% of the area within the canal commands in Sind are afflicted by salinity, as compared to 20% for the Punjab.

The upshot is that attempts to increase crop production by tapping new sources of water could be self-defeating, thanks to the soil degradation, which results from it. There is an institutional dimension to this as well. Large farmers are liable to appropriate the bulk of the additional water under the existing supply-based distribution ('warabandi') system. A clearly preferred choice is to use existing water more efficiently, and to focus on making the necessary institutional changes for its equitable distribution. Some of the proposed measures are canal and watercourse rehabilitation, land leveling, improved on-farm water management and, at the policy level, switching to demand based management and water pricing. These are clearly win-win solutions as they are relatively low cost, efficient, equitable and environmentally friendly.

As a rule, vested interests tend to prevail when there are expectations of reaping construction or irrigation benefits. And such benefits are garnered within the framework of loose and inequitable governance, at considerable cost to the national economy, the people and the environment. Thus, a degree of policy and institutional flexibility becomes imperative under the current circumstances.

While waterlogging and salinity are immediate problems associated with increased water diversions, the longer term implications of additional water use merit consideration as well. There is increasing reason to believe that the one-to-one, water use to crop production ratio can not be sustained indefinitely. High water application is an integral part of the monocropping syndrome based on high doses of chemical fertilizers, pesticides and weedicides. The consequent loss of soil fertility and water pollution can ultimately reverse initial high yields; a situation referred to as the "paradox of malnutrition". However, while indirect evidence of water quality deterioration exists, it is not definitive enough. There is also a need to examine historical crop yield performance and soil quality deterioration in greater detail.

Ultimately, however, food security is likely to become a demand driven problem rather than a supply constrained one, engendered by a growing population and rising per capita incomes. The scenario presented below is a probable outcome based on current demographic and economic trends.

Table 4: Projected Demand-Supply Balances of Major Agricultural Commodities

(Million tonnes)

Commodities	Years								
		1995			2020			2050	
	S	D	G	S	D	G	S	D	G
Wheat	17.0	17.9	- 0.9	27.5	32.4	- 4.9	35.7	43.0	- 7.3
Rice	3.5	2.5	1.0	6.2	5.5	-0.70	7.9	10.0	- 2.1
Sugarcane	47.2	41.6	5.60	50.0	75.3	-25.3	60.0	100.0	-40.0
Cotton (million bales)	8.7	10.6	- 1.9	18.0	19.4	- 1.4	25.00	25.9	- 0.9
Fruits & Vegetables	9.8	9.6	0.2	26.0	26.0	0.0	35.0	34.5	0.5
Meat	2.1	2.1	0.0	5.7	5.7	0.0	7.6	7.6	0.0
Milk	15.3	15.3	0.0	41.5	41.5	0.0	55.0	55.0	0.0

Source: In-house projections, Sustainable Development Policy Institute, 1997

Note: S = Supply, D = Demand, G = Gap

The crop production scenario is based on a two-fold productivity increase, which is rather optimistic. Despite this, significant shortfalls appear in most commodities by the year 2020. The time may be opportune to re-evaluate the preoccupation with food self-sufficiency and focus instead on cash and high value added crops. The emerging constraints relating to land and water availability and quality suggests there are inherent risks in remaining locked onto a 'more-of-the-same'mindset.

3.2 Cheap Energy

After the recent commotion over private power, the government began to hype up Kalabagh as an alternative source of cheap and clean energy. In the process, it switched adroitly from its earlier position that energy demand had been overstated to one where it now posits a deficiency in supply[1]. However, recent economic performance does not appear to presage the kind of energy-guzzling, hyper growth enjoyed earlier by South East Asian countries. On the other hand, a longer-term rationale for more energy clearly does exist, given Pakistan's low per capita energy consumption, its rapidly depleting biomass stocks and the need for rural electrification.

Additional energy requirements notwithstanding, the claims for cheap hydel energy are becoming untenable on two counts. First, the cost calculus has changed with respect to both capital as well as recurring outlays.

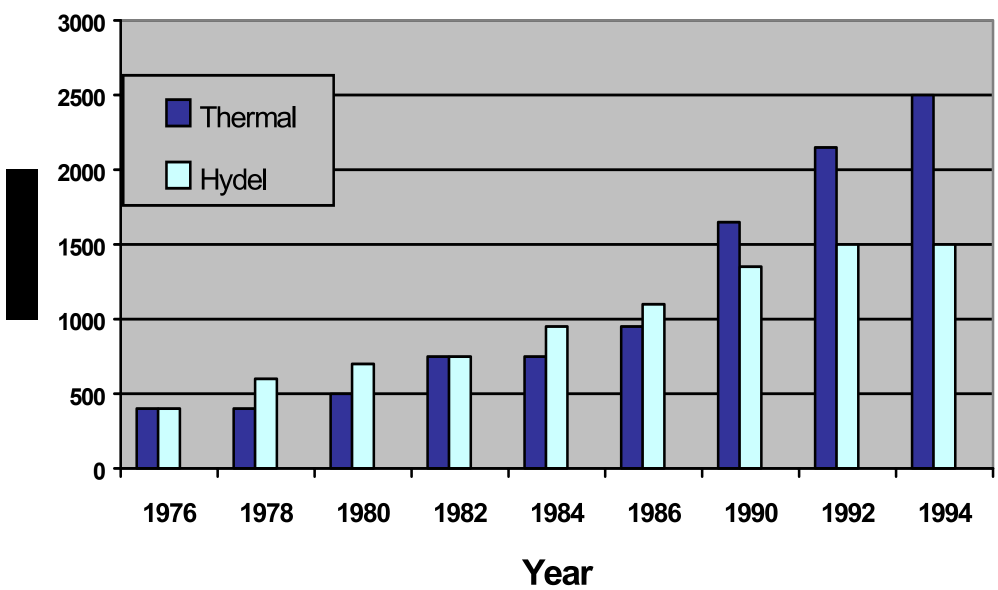
1 This argument may yet become tenuous if the private power projects do eventually go through.

Up-front capital costs need to factor in social displacement and environmental degradation. While this would result in cost escalation, it is only one aspect of the problem; the willingness or ability to finance such costs is another. The World Bank has drawn its share of criticism for getting embroiled in projects with negative environmental and resettlement outcomes. Resultantly, it is in the process of revising its investment approval criteria[2]. With regard to social factors, affected communities are becoming more vociferous in demanding their pound of flesh. Resettlement claims for Ghazi Barotha have been reassessed from Rs.2.0 billion to Rs.5.0 billion. Kalabagh's project managers, in the kind of 'paper-deference' traditionally employed to leverage donor funding, propose to construct 20 model and 27 extended villages, with a projected cost of Rs.20.0 – Rs.25.0 billion. In view of the government's defense and debt servicing obligations and limited fiscal prospects, this is a transparently hollow proposition.

With regard to recurring costs (low interest credit), a combination of economic sanctions and the recent commotion over private power makes short-to-medium-term funding prospects remote. Donors such as the World Bank and the Asian Development Bank are unlikely to provide concessional funding for Kalabagh, reflecting their commitment to the thermal based private power projects and annoyance over the government's threat to renege on them. Also, if funds are available, it is not clear that they will be of the low interest variety, in which case it is not clear that hydel unit costs will be lower if interest recurring costs are high. Furthermore, Pakistan's lowered credit rating makes it an unlikely candidate for private sector funding.

The second aspect relates to WAPDA's inability to pass cost savings through to the ultimate beneficiaries, the consumers. Even if one assumes that Kalabagh has a demonstrated cost advantage, this is not likely to translate into cheap energy for consumers. There are two reasons for this. The first reflects changing patterns of energy production. The second reason is a more generic one, reflecting an ongoing institutional failure.

Figure 1: Electricity Generation by Type



2 The recently established World Commission on Dams (WCD) will develop a set of criteria, based on case and thematic studies, over the next two years or so.

If Kalabagh were to represent a discrete and substantive addition to the energy grid this could, theoretically, mean lower unit costs. But the secular trends shown in the figure below suggest otherwise. The rising share of thermal power is likely to become more pronounced in the foreseeable future and, as a result, the impact of hydel power on overall energy unit costs will be reduced.

However, the real problem is that WAPDA and KESC are chronically inefficient, reflected in T&D losses of, respectively, 28% and 40% and debt prone. So any cost savings derived from switching to hydel power are likely to be absorbed by WAPDA's perpetual state of insolvency, rather than being passed on to consumers.

WAPDA's institutional and financial paralysis also inhibits the scope for energy conservation, efficiency improvements and diversification. The options have been identified often enough: on the supply side these are reduction of transmission and distribution (T&D) losses and renewable energy development technologies (solar, wind, biomass). On the demand side, both technical and economic options exist for energy conservation. While these have been employed to some extent (tariff increases, energy efficient lighting), the efforts are a far cry from the kind of sustained initiatives launched in some South Asian countries, such as Thailand, where revamped energy supply systems are part of a larger network, with linkages to R&D, the private sector and trade facilities. A related concern is with energy distribution. Traditionally, rural areas in the proximity of large dams -- including the sub-set of affectees, are either excluded entirely from the national grid or low down in the beneficiary list. In this respect, Kalabagh's energy output is as likely to be at the service of rural communities as that from the other dams, which preceded it.

3.3 Flood Control

Another myth firmly embedded in the minds of our planners is that large dams are the perfect flood prevention devices. The evidence for Pakistan shows otherwise; that its large dams not withstanding, there has been no reduction in the incidence and intensity of floods nor in the associated losses in lives, crops, livestock and infrastructure. The table below is illustrative.

Table 5: Flood Damages in Pakistan

Year	Monetary Losses (Billion Rs. In 1955 prices)	Lives Lost (No.)	Villages Affected (Nos.)	Area Flooded (Sq. miles)
1950	9.08	2,910	10,000	7,000
1955	7.04	679	6,945	8,000
1956	5.92	160	11,609	29,065
1973	5.52	474	9,719	16,200
1975	12.72	126	8,628	13,645
1976	64.84	425	18,390	32,000
1978	41.44	393	9,199	11,952
1981	N/A	82	2,071	N/A
1982	N/A	350	7,545	N/A
1988	15.96	508	100	4,400
1992	56.00	1,008	13,208	15,140
1995	7.00	591	6,852	6,518

Source: Water Sector Report, Climate Change Impact Assessment and Adaptation Strategies, July 1997

There is no seeming pattern to the floods other than the fact that they could have coincided with wet cycles. In actual fact, the severity of flood impacts appears more prevalent after the two major dams, Tarbela and Mangla, were constructed.

It has been long known that river systems have a natural capacity for dealing with the threat of floods and the natural processes embodied in them provide many benefits. Flood plains, wetlands, backwaters are commonly referred to as nature's sponges; they absorb excess water, purify it and can be tapped during lean periods. They act as spawning grounds for fish and wildfowl. The floods themselves replenish agricultural soils. Communities living around these areas adapt to this natural rhythm and use its bounty to ensure reliable and sustainable livelihoods. As Bayley (Abramovitz, 1996: 11) has so aptly put it; the 'flood pulse' is not a disturbance, flood prevention is. And that is exactly what large dams like Tarbela and Mangla have contributed to; disturbances on a large scale, which also supports the view that dams don't prevent floods, they merely create 'flood threat transfer mechanisms.' (op cit, 1996: 15). The solution is to work with communities, rely on their knowledge and to supplement their flood mitigation and coping strategies.

4. The Environmental and Social Perspective

In the earlier section we examined the traditional rationale for Kalabagh. In this section, we critique large dams from a sustainable development perspective. In particular, we assess the social displacement and environmental implications of constructing yet another large dam on the Indus River ecosystem. A catalogue of existing degradation provides the context for future environmental impacts of dams like Kalabagh.

4.1 Ecosystem Degradation

4.1.1 Indus Delta Ecosystem

Degradation of the Indus delta ecosystem as a result of reduced water outflows is already a highly visible phenomenon. The present level of silt discharge, estimated at 100 million tons per year, is a four-fold reduction from the original level before the rivers were dammed. The combination of salt-water intrusion (some reports show this as 30 km inland), and reduced silt and nutrient flows has changed the geomorphology of the delta considerably. The area of active growth of the delta has reduced from an original estimate of 2600 sq. km (growing at 34metres per year) to about 260 sq. km. Freshwater reaches only a few of the creeks and others have become blocked. The delta is being transformed by strong wave erosion, an increasing dominance of sand at the delta front and an increase in wind-blown sand deposits as a result of losses in vegetation.

The consequent ravages to the ecosystem have been exceptionally severe, in particular to the mangroves which are its mainstay. They sustain its fisheries, act as natural barriers against sea and storm surges, keep bank erosion in check and are a source of fuelwood, timber, fodder and forest products, a refuge for wildlife and a potential source of tourism. Without mangroves and the nutrients they recycle and the protection they provide, other components of the ecosystem would not survive.

The direct and indirect benefits of mangroves are enormous. In 1988, Pakistan earned Rs.2.24 billion from fish exports, of which shrimps and prawns constituted 72%. The collective imputed income from fuelwood, fodder and forest products was another Rs.100/- million. These are broad orders of magnitude, which are threatened by mangrove degradation. Even where numbers are absent, the functions are, in themselves, indicative. For instance, substituting natural with physical barriers (dykes, walls, dredgers) would entail enormously high capital and maintenance costs. In addition, the wild life and tourism potential of the mangrove swamps has not been exploited yet and is, potentially, an additional source of income.

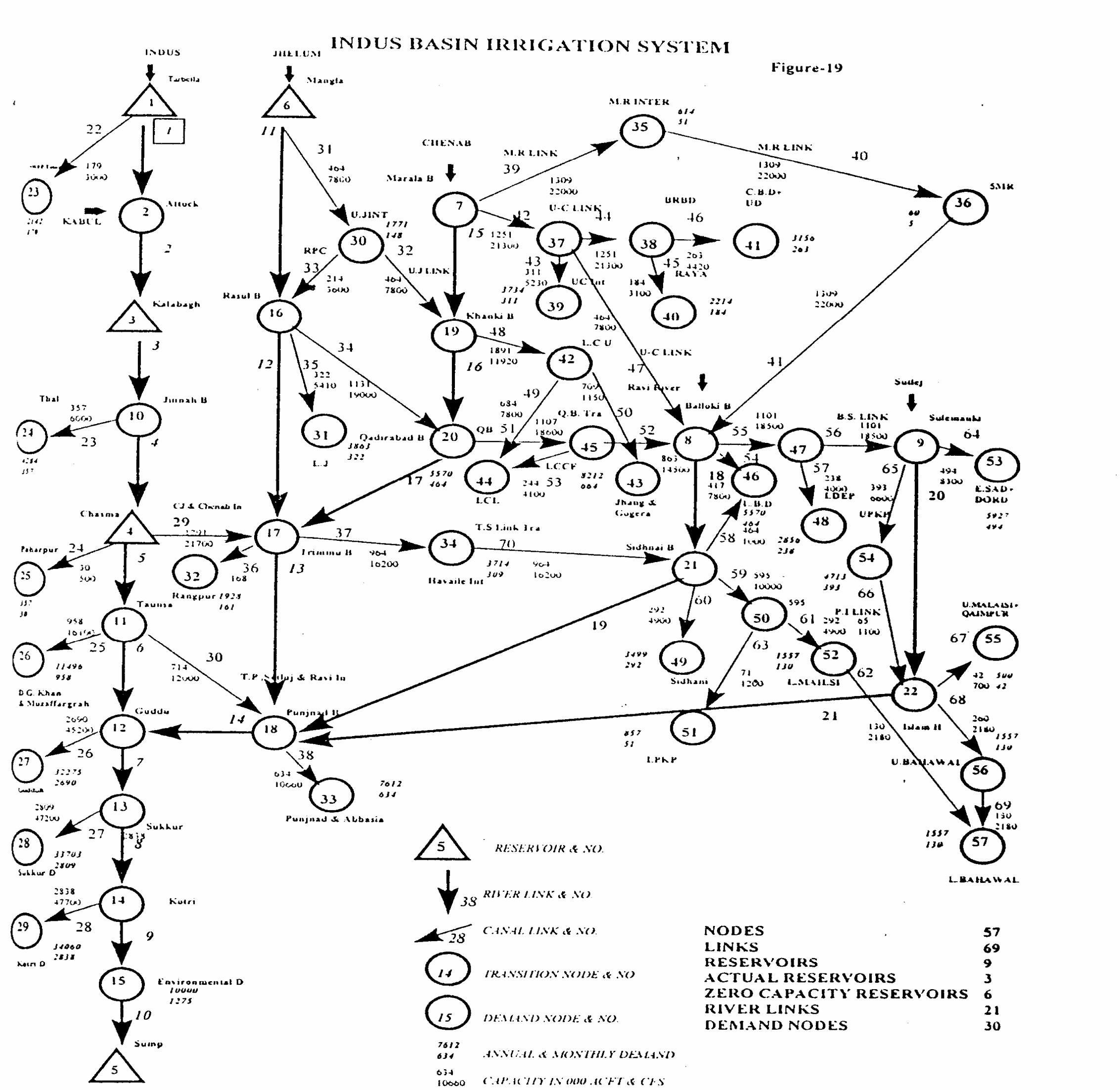
The health of mangroves is directly linked to fresh water outflows. Releases below Kotri barrage average 34 MAF. Of this, about 20 MAF actually reaches the mangroves, and that, too, between the kharif months of July and September. The rest is lost due to evaporation or diversions. According to the Sindh Forestry Department, about 27 MAF is required to maintain the existing 260,000 ha. of mangroves in reasonably healthy condition. This is 7 MAF more than currently available, a situation which has contributed to ecosystem instability and mangrove loss. Within the framework of the Indus Water Accord, the intent is to divert an additional 11 MAF for upstream dam construction – including Kalabagh, to meet agricultural and hydropower needs. This would result in a further reduction in existing sub-optimal flows and aggravate an already critical situation.

A community of about 100,000 people resides in coastal villages in the northern side of the Indus Delta. The mangroves are a vital source of livelihood for them; both direct (fuel, fodder, grazing) and indirect (fish, amenity values). The prevailing view is that being under priveleged, such communities are prone to degrade their environment. However, it is difficult to fathom why poor communities should endanger the very basis of their existence. The more likely explanation is that community practices have not changed, but they appear unsustainable because the resource base has begun to degrade. Communities are more often the victims than the agents of such degradation. The real culprits are water diversion, biological and chemical water contamination and large-scale commercial practices, compounded both by institutional ignorance and complicity in such practices.

4.1.2 Other Ecosystem Effects

Degradation of the Indus Delta ecosystem is not the only manifestation of "biodiversity deficits" which are emerging along the entire length of the Indus river ecosystem. The ecosystem has been severely fragmented over time by its extensive network of canals, dams and barrages, resulting in threats to a variety of species and organisms (see Figure 2). For instance, two species facing extinction in the lower reaches of the Indus River are the Indus dolphin and the 'palla' fish. Both can be classified as indicator species, as their impending loss represents the loss of a way of life, characterized by interdependence between communities and their environment. To all intents and purposes most stretches of the river Indus have been nationalized. This has led to the denial of fishing rights of riverine communities and the wanton exploitation of river resources through contractual arrangements. The emergence of new eco-equations and habitats or of planned captive breeding programs is poor substitutes for genetic resilience and livelihoods lost.

Figure 2:



Anthropogenic activity that degrades the Indus Basin system's ecological integrity is an on-going process and a culmination of many factors. It is instigated and sustained by development and demographic pressures. It reflects the imposed dominance of technology over nature. It is an outcome of weak institutions, which succumb to vested interests. It represents a failure to exploit the traditional synergies, practices and interactions between communities and their environment. In the final analysis, such degradation is a symptom of the piecemeal and extractive manner in which ecosystem resources are utilized, and which contrasts with the common sense embodied in Abramovitz's remark that, " freshwater ecosystems are the critical link between land and sea, in effect forming the planet's circulatory system; virtually every human action is eventually reflected in them." (op cit, 1996: 10). This holistic view, which integrates spatial, biophysical and human dimensions, should form the core of all efforts to manage ecosystem resources sustainably.

An encouraging development is the proliferation of global and national movements dedicated to ecosystem protection and management. The recently established World Commission on Dams embodies and typifies their concerns. It has a mandate to scrutinize large dam projects from a more holistic perspective, taking into account social displacement concerns and environmental impacts. In general, resistance to large dams is rapidly gathering momentum. For instance, the government of Malaysia recently halted construction of the massive Bakun Dam, the U.S. Export-Import Bank has refused to guarantee American contracts for China's Three Gorges Dam and Germany has withdraw financing for a major dam project in Nepal.[3]

The United States is spearheading the movement for ecosystem restoration. The federal Energy Regulatory Commission recently approved for the first time the removal of an operating hydroelectric dam on Maine's Kennebec River. Other dam removal projects being considered are the Edwards Dam in Maine, two dams blocking salmon passage on the Elwha river, four dams on the Snake river in Washington and the massive Glen Canyon dam in Northern Arizona, which has been likened to a 'bathtub' that has never been drained.

4.2 Rehabilitation and Resettlement

From their very inception the construction of large dams in Pakistan has given rise to major problems in land acquisition, resettlement, rehabilitation and compensation. With regard to each of these issues, the initial attitude towards affected communities was one of dismissal and neglect. However, as more large dams were built (Tarbela, Mangla, Ghazi-Barotha, Chotiari), rising community disaffection, coupled with donor pressure, ostensibly elicited a measure of response. The formal expression of such response is donor inspired resettlement action plans, operational guidelines on involuntary resettlement, environmental impact assessments and environmental monitoring systems. But experience has shown such elaborate fiats to be more honored in the breach than in the observance.

There are two related categories of omission. In the first place, the generic need for consultative planning and decision making continues to be disregarded, despite the fact that decisions regarding use of community resources affect them vitally. This is the negative context in which donor injunctions and guidelines are embedded and, hence, predisposed to failure. The evidence validates this premise. Efforts to compensate communities have ended up being diverted to the more powerful and affluent groups who use confidential information for profitable speculation. By the same token, resettlement decisions are arbitrary, giving rise to cultural disorientation and psychological disorders. Also, the government's fiscal constraints preclude the full payments promised. These are some of the signals which detract from recent claims by WAPDA that it plans to construct 20 model and 27 extended villages at an estimated cost of Rs.20 – Rs.25 billion.

5. Alternative to Kalabagh Dam

The title of a recent study "Tarbela Dam Sedimentation Management", carried out by TAMS-Wallingford (March 1998) is self-explanatory. It shows that a de-silted Tarbela would yield the same irrigation benefits as Kalabagh, but at one-seventh the cost in net present value terms. Additionally, even if a thermal power plant of equivalent capacity to Kalabagh were constructed, the cost would

3 WAPDA's rejoinder is that there are now more large dams being built than ever before in history (50 in Turkey alone) and that multilateral funding are available for most. In response to this, it may be stated that in September 1996 the World Bank completed an internal desk study of 50 large dams. It concluded that while 90% of the dams reviewed met the standards applicable at the time of approval, only about one-quarter were implemented so as to comply with the World Bank's current, more demanding policies [the failure was primarily on environmental and social grounds]. (IUCN, 1997: 5). This is a telling admission as the World Bank is a late runner when it comes to sensitivity over environmental – or for that matter – social issues.

still be lower by one-third. The study states that, "replacement of [irrigation and energy] benefits by constructing a new dam and reservoir down stream is feasible, but will be expensive, environmentally damaging and socially harmful. One alternative option is to construct new outlets at the Tarbela Dam that will enable sediment to be flushed from the reservoir."

The proposed Tarbela Action Plan is based on computer simulations of sediment flows. These simulations were designed to: a) determine whether flushing was technically feasible and could be used to estimate storage capacity that could be sustained in the long run and; b) to analyze reservoir survey results and predict future sedimentation. Based on the simulations, three phased components of the action plan are proposed:

- *Reservoir Operating Strategy:* Raise the minimum reservoir level to 1,365 feet by the year 1998 and by 4 feet each year thereafter. Second, limit the drawdown period to a maximum of 15 days. This would ensure security of power tunnel intakes for the next 10 years, long enough to complete construction of the underwater rockfill dike, and minimize the inevitable reduction in live storage.[4]
- *Underwater Dike:* Construct a rockfill underwater dike to protect the intakes of tunnels 1 – 4 from inundation by sediments. The dike would require some 8 Mcm of rockfill, have a crest level of 1380 feet, with an overspill section at 1340 feet.
- *Flushing Bypass:* Construct a low-level high-capacity bypass to flush sediments. This should be on the left abutment, between the main and auxiliary spillways. Flushing should be carried out over a 30-day period.

The implementation of this plan would ensure long term and sustainable storage with only a small annual reduction in capacity. The estimated retention at 6 MAF is exactly what Kalabagh is designed to hold. However, flushing would reduce energy benefits because reservoir levels would need to be held down in June and July. On the other hand, the long-term energy producing potential of Ghazi Barotha clearly depends on Tarbela not silting up.

Abstracting from social and environmental considerations, purely financial and economic cost comparisons also unequivocally favor Tarbela rehabilitation over Kalabagh.

Table 5: Kalabagh Dam Comparison – Net Present Values

Description	With Kalabagh (US $ million)	Tarbela Action Plan (US $ million)
P.V. construction cost of Kalabagh	2,234	0
P.V. construction cost of project	0	343
P.V. construction cost of thermal plant	0	918
P.V. incremental thermal operating cost	0	20
Total P.V. Cost:	2,234	1,461

Source: Tarbela Dam Sediment Management Study, TAMS-Wallingford, March 1998

As indicated earlier, the construction costs of the civil works for the alternative project are about one-seventh of what it would cost to construct Kalabagh. Building additional thermal capacity to offset energy generation foregone reduces this difference but the project still retains a substantial cost advantage. This cost advantage increases if the Ghazi Barotha linkage is factored in. Also, the cost of

4 Raising the minimum reservoir level slows down the rate at which the sediment delta advances towards the tunnel intakes but results in increased deposition in the upper reservoir and in a reduction in live storage capacity.

additional thermal capacity added to the project cost should net out energy lost if the project were not to go ahead. In other words, the energy produced by Kalabagh would not be a pure gain; a substantial proportion would be offset by energy losses resulting from shelving the Tarbela project.

6. Conclusion

To recap, Kalabagh dam is not the clear winner it is projected to be. First, its viability is premised on water availability figures that are highly questionable. Second, the land constraint precludes substantive increases in cultivable area, additional water notwithstanding. Third, crop yield increases based on additional water do not account for the aggravated water logging and salinity that would result; furthermore, higher doses of water are associated with high input use, which degrades both soil, and water quality. Using existing water more efficiently is clearly a better option on both environmental and equity grounds. Fourth, hydel energy is not unequivocally cheaper, given the growing propensity to factor in displacement and environmental costs. Also, borrowing costs are likely to be higher as donors have indicated a clear preference for thermal power projects. Fifth, Kalabagh would further exacerbate ecosystem degradation, adding to mangrove and species loss and impoverishing communities, which depend on the ecosystem's resources. Also, as an instrument of flood control Kalabagh is poorly supported by the historical evidence. In view of these facts, the option of implementing a sedimentation management project on Tarbela appears a clear winner on all grounds – financial, economic, social and environmental.

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