

Lead Piece



Climate Change is Here – when will we wake up?

There is increasing evidence that shows that climate change is already here. It is already affecting the rainfall, floods, droughts, sea-levels, land erosion and so on.

The frequency of extreme weather incidents is clearly increasing, the unprecedented floods in Mumbai and Gujarat in 2005 and 2006, the unprecedented floods in Barmer this year the unusual rainfall deficit in Bihar and Assam this year are only a few of the recent incidents. 2005 has already been declared the warmest year in recent times.

A recent study at the School of Oceanographic Studies of Jadavpur University (The Hindustan Times 011106) says that 70 000 people would be affected in the eastern and western part of the Sunderbans due to rising sea levels. This is also the home of Royal Bengal Tigers. The Oceanographers blame this on global warming and continuous coastal erosion due to frequent disruptions in the flow of Bhagirathi (due to dams like Farakka in the upstream). The resultant sea erosion would also put pressure on the tidal mangrove ecosystem. Sunderbans lost two of its islands, Lohamara and Suparidanga 22 years ago. The Sunderbans have lost around 100 sq kms of land in the last 30 years. The most vulnerable areas now are Choramara and Sagar Island.

A recent report by the former Chief Economist of the World Bank Nicholas Stern (BBC 31x06) shows that global warming could shrink the global economy by 20% if no action is taken now. The report that British Prime Minister called “the final word” says, “Climate change will affect the basic elements of life for people around the world... access to water, food production, health and the environment. Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms.” The study predicts that due to climate change:

- Floods from rising sea levels could displace up to 100 million people
- Melting glaciers could cause water shortages for 1 in 6 of the world's population
- Wildlife will be harmed; at worst up to 40% of species could become extinct
- Droughts may create tens or even hundreds of millions of "climate refugees."

Another recent report, titled *Feeling the Heat* from the Christian development agency *Tearfund* predicts that Climate change threatens supplies of water for millions of people in poorer countries. By 2050, five times as much land is likely to be under "extreme" drought as now. "It's the extremes of water which are going to provide the biggest threat to the developing world from climate change... droughts will tend to be longer, and that's very bad news. Extreme droughts currently cover about 2% of the world's land area, and that is going to spread to about 10% by 2050." it said. The positive side of the *Tearfund* report is that simple measures to "climate-proof" water problems, both drought and flood, have proven to be very effective in some areas. In Niger, the charity says that building low, stone dykes across contours has helped prevent runoff and get more water into the soil.

In the first week of Oct '06 Friends of the Earth published the report (ZNet Commentary 09x06) it had commissioned from the Tyndall Centre for Climate Change Research, which laid out the case for a 90% reduction in carbon emissions by 2050. But other calculations, using the same sources, show that even this ambitious target is two decades too late.

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An Introduction to Rivers

We are giving here an article that helps our understanding of Rivers. We are thankful to Devashis Chatterjee for drawing our attention to the source: AN INTRODUCTION TO RIVERS — THE CONCEPTUAL BASIS FOR THE MICHIGAN RIVERS INVENTORY (MRI) PROJECT, Dec 1997, Michigan Dept of Natural Resources, Michigan, USA. We have edited it to suit our requirements.

What is a river? Most of us would agree that a river is a wonderful place. A soothing spot, with magically running waters. A home to swarming mayflies, fishes, herons, and otters. A place for commerce and industry, as well as recreation and relaxation. Most of us get to know rivers at particular sites: bridges, bends near the road, rapids, and the old swimming hole. Not surprisingly, the perspective of the river as “a place” is embedded in our popular culture and language. Stream, creek, river, brook, ditch, spring, run... we have a lexicon of names for what seem to us to be clearly different kinds of places. The technical literature on river management also largely comes from this perspective of the river as a place. Much of what we know today about the ecology of rivers we owe to biologists who have focused on certain populations of this or that species of fish, invertebrate, or plant; that live in specific habitats within rivers. In this context it has sometimes been useful to think of a whole river system as being essentially a large collection of unique places. Each with its own local properties (depth, velocity, substrate, water quality, etc.) and each potentially serving as a home to some unique set of discriminating organisms.

Like the fable of the seven blind men who were each able only to touch and perceive one small part of the elephant, what we perceive at the river bank tends to be heavily biased by our limited vision.

There is an alternate perspective, one perhaps more attuned to the ecological reality faced by modern river managers. It is that the river is not so much a place, as it is a thing. Like the fish that lives in it, the river itself is an entity with a unique structure and function, with a specific history, and capable of self-generated dynamic behavior. Protecting the many values of the river as place requires a thorough understanding of the nature of the river as a thing. What kind of thing is a river? We can recognize four fundamental characteristics which are essential to understanding the nature of river systems: A river is:

- ⇒ A landscape-scale system because of its immense physical extent.
- ⇒ A hydrologic system because it participates in regional water cycling.
- ⇒ A geomorphic system because it shapes the landscape it occurs on and its own channel.
- ⇒ An ecological system because it supports a diverse and highly adapted biota.

Rivers as landscape-scale systems In contrast to oceans and even lakes, people usually experience river channels as relatively small, intimate, geographic

features. This is likely a part of their inherent attractiveness to us. You can always see across a river; frequently you can wade across it, and many streams can be easily hopped over by a reasonably energetic adult. This small size, however, is an illusion. Our sensory capabilities are effective over only a very short radius; river systems, on the other hand, are immense but essentially linear objects. In fact, rivers are among the largest landscape elements known. Rivers operate at scales of hundreds to thousands of square miles.

This characteristically large scale by itself has important implications for river science and management. Most fundamental is the fact that rivers are always strongly influenced by both the regional composition of the landscape (e.g. geology) and by regional climatic characteristics. This means that every specific place on

a river is affected by two distinct sets of variables and processes.

Local (site-specific) variables include the characteristics of the site which can be observed and measured (potentially at least) at that place in the river. Large-scale regional processes and variables affect the site via the watershed (catchment) area which contributes water and material loads to that location. Determining the extent to which a problem of interest is a local (site management) issue or a systemic (watershed management) issue is necessarily one of the first steps in scientific river management. And since all rivers are by nature landscape-scale systems, even when the objective is narrowly defined as management for specific site characteristics, attention must be paid to larger landscape management issues.

Finally, the large size of river systems guarantees that every river presents a complex mosaic of interactions and relationships involving the many smaller landscape elements in its catchment. These include diverse terrestrial ecosystems as well as various human political and economic units. Indeed the primary challenges in managing rivers stem from the often competing, multiple values that these large systems offer (water supply, transportation, power, recreation) as they wind their way across great expanses of land. River management is therefore intrinsically a matter of ecosystem management. Resource scientists and managers are now recognizing the importance of developing larger-

scale, integrated strategies for managing natural resources. For river systems, there is no alternative. The scale, integration, and very nature of rivers require it.

Rivers as hydrologic systems Rivers carry water across the landscape, participating in the larger regional cycling of water between the oceans, the atmosphere, and the landscape. A river's hydrologic properties are inseparably intertwined with its geomorphic, chemical, and biological characteristics. The amount and timing of water transport through a river channel network is the end result of a complex interaction between landscape elements and the climate. To understand the hydrologic behavior of a river, we have to understand the key hydrologic processes that generate stream flow and govern its distribution in time and space. These processes include: precipitation, evaporation, transpiration, depression storage, infiltration, overland flow, and groundwater flow. Together these hydrologic processes link the river to the larger landscape it is a part of. The catchment area is the basic landscape unit in river hydrology. Every site on a river network has a unique catchment area, that is, an area of the landscape that contributes water to the flow at that site.

Because water is chemically conservative, in every watershed there is an approximate balance (called a water balance) between inputs, outputs, and storage of water in the landscape per unit time. Balance equations are useful summarizations that help us think about the relationship between river discharge and various hydrologic processes on the landscape.

Writing out the balance equation, we get a statement about how hydrologic processes on the landscape are related to flows observed in the river (Q).

$$Q = P - [ET + \Delta GW + (\Delta S_s + \Delta S_{sm} + \Delta S_{gw})]$$

EQ 1

Precipitation (P) and evapotranspiration (ET) depend on climate patterns and vegetation cover. The term (dGW) represents net groundwater flux in the catchment basin and is principally a feature of the geology. The term (dS_s + dS_{sm} + dS_{gw}) represents change in water storage on and in the landscape and depends primarily upon the topography and soil characteristics. It is then clear that ultimately three primary factors control the catchment water balance and therefore river flow (Q): landscape, climate, and geology.

In most watersheds the path water takes to the channel controls the way that stream flow responds to precipitation in the watershed.

Runoff reaches the channel rapidly, throughflow reaches the channel after a moderate (hours to days) lag time, and groundwater flow after a long (months to years) lag time.

Sources of streamflow When it rains there are three possible pathways precipitation can take to get to a river channel.

Runoff—rain arriving at the soil surface infiltrates at a rate set by capillary action and permeability. When (1) precipitation rate exceeds infiltration rate or (2) the soil surface becomes saturated because of lateral throughflow, water accumulates at the surface and flows overland and down slope.

Throughflow—water that infiltrates the soil surface must percolate vertically through lower layers of soils. If there are differences in the percolation rates of these

layers, water can accumulate at horizon interfaces and generate sub-surface flows down slope.

Groundwater flow—water that infiltrates may eventually reach the local water table (a zone of more or less permanently water-saturated soils). This groundwater [GW] also moves down slope albeit at very low rates. Groundwater can eventually reach the river channel by several means including (1) channel incision of the water table, (2) seepage and/or artesian flows to spring and wetlands that drain to the channel, and (3) artesian feeds to drainage lakes. The extent to which groundwater contributes to the flow of a given river depends heavily on the geology of the catchment (particularly infiltration characteristics) and the rate at which groundwater can flow down slope.

Groundwater velocities can vary by 5-8 orders of magnitude depending on geological composition of the saturated layers and the hydrostatic pressures involved. Hydraulic conductivity (K) is related to porosity and, together with hydraulic slope (usually water table slope DH) and flow length (l), governs groundwater flow velocity (V_{gw}) according to Darcy's Law:

$$V_{gw} = K * (DH / l) \tag{EQ 2}$$

Darcy's Law is also sometimes expressed as a

function of the area of a particular aquifer (A), with the dependent variable being groundwater volume discharge (Q_{gw}):

$$Q_{gw} = K * (DH / l) * A \tag{EQ 3}$$

Practically speaking Darcy's Law indicates that watersheds with extensive areas of porous (eg. sand or gravel) substrates and large elevation changes (hills) are most likely to have high rates of groundwater input to river channels. Rivers draining flat terrains and/or with

finer soils are least likely to have substantial groundwater supply.

Why hydrologic source is important Runoff reaches the channel rapidly, throughflow reaches the channel after a moderate (hours to days) lag time, and groundwater flow after a long (months to years) lag time. Storage (surface or sub-surface) can also create substantial lags in delivery time.

The more complex the flow path is, the longer a pulse of precipitation takes to reach the channel, the more attenuated its peak becomes, and the more its effects on flow are spread out in time.

As a result the flow characteristics of a river depend to a large extent on the nature of its hydrologic source.

Rivers supplied primarily by runoff respond dramatically to rain, rapidly generating high peak discharges and quickly passing water downstream. In between rain events these rivers experience rapid & severe declines in discharge since most excess water in the basin has already been transported away. These rivers are sometimes referred to as being hydrologically "flashy".

Rivers supplied primarily by groundwater respond weakly to precipitation events. Discharge increases just a little because most precipitation is captured by infiltration.

This water slowly makes its way to the channel, and the resultant lag time ensures an ample and continuous supply of groundwater to the river between rain events. Groundwater Rivers are hydrologically-stable systems, with lower peak flows but higher base flows than in runoff-driven rivers of comparable size.

Most rivers receive some water from runoff, throughflow, and groundwater sources. As might be expected, rivers with a relatively balanced mix of sources have intermediate hydrologic properties. Their specific flow characteristics vary substantially depending on their particular position along the continuum between predominantly runoff and predominantly groundwater sources. Other factors, including the size and shape of the stream network, and the amount of hydrologic storage available in floodplains and reservoirs, can also have significant influences on delivery times and attenuation of discharge peaks. For example round, funnel-shaped basins deliver water more rapidly than long, narrow basins. Likewise, well-developed drainage networks deliver larger volumes of water more rapidly than low-density networks.

As geomorphic systems, rivers employ energy (generated by moving large masses of water down slope to accomplish the work of erosion, sediment transport, and channel building. This is the same power we use to generate electricity from the artificially-steep gradients engineered into spillways of hydropower facilities.

Rivers as geomorphic systems As naturally as river channels carry water across the landscape, they also carry sediment and dissolved materials, transforming this landscape by erosion, dissolution, and deposition. This landscape-shaping function of rivers has been a key focus of geologists interested in geomorphology for at least a century (geomorphology, from the Greek, geo = earth, morph = form). Building on the foundation of the Davis (1899) model of landscape evolution, geologists have played a leading role in studying rivers from a whole-system perspective. Davis (1899) considered the observed landscape to be the result of cycles of geologic uplift and erosion. Rivers were viewed as the principle agent of continental erosion, and between episodic uplifts continually reduce landform elevations towards a base level set by the elevation of the river mouth.

A simplified but useful model of the overall geomorphic structure of a river divides the fluvial system into three major zones. Each zone is distinctive in terms of material processing. The upper river network comprises the zone of production where most of the sediment, dissolved mineral and nutrient, and water loads of the system are acquired. The zone of transfer consists of the middle to lower reaches of the river system in which transport and channel building processes dominate. Finally, the zone of deposition is found near and at the mouth where loads are deposited or delivered to the receiving

system. This viewpoint clearly emphasises the geomorphological function of rivers: moving material across the landscape.

The amount of power available for geomorphic work is proportional to both the amount (mass) of water being moved in the channel (and therefore to river flow, Q) and to the slope of the channel. High slopes and/or large Q result in high-power rivers with massive potential for erosive work and channel building. Small Q and/or mild slopes generate little power and produce a reduced capacity for erosive work and material transport.

Since power is proportional to Q , the geomorphic potential of a river is intimately bound up with its hydrologic character. Runoff Rivers, with their flashy and high peak flows, do geomorphic work in short, extremely powerful bursts. Groundwater Rivers seldom have as powerful peak flows, but maintain more powerful base flows and can accomplish lighter geomorphic work for most of the year. Slope (which helps determine stream power) is a characteristic of both the landscape and of the river channel itself. The Davis model implies that catchment slope varies over time as erosion of the

landscape progresses. This is, of course, a very long-term process that typically occurs in a geological time frame of thousands to millions of years. The slope of channel, however, can be adjusted by the river itself (within the constraints of the catchment slope by) in a much shorter time frame (years to decades) by meandering and altering channel length.

The balance between hydrologic driving variables, available power, and channel morphology (e.g. width, depth, slope, shape, and sinuosity) has been a central focus of river geomorphologists. From their perspective the resulting "fluvial system" is a physical, landscape-scale system that tends over time to move toward a dynamic equilibrium where available stream power and sediment load are balanced against channel resistance, and sediment transport and deposition. That is to say, within constraints imposed by local landscape features, the river continuously builds and shapes its own channel to accommodate the water and sediment loads generated by its watershed. A river that approaches this dynamic equilibrium is said to be "in grade". This dynamic behavior of a fluvial system can be thought of as being both (1) self-generating (endogenous) and (2) directional (moving towards an equilibrium balance of power and work).

Rivers as ecological systems In addition to being fascinating physical systems, rivers are full of interesting biology. Modern rivers contain myriad species of plants, animals, and micro-organisms that have evolved over the last 2.5 billion years to make their living and find a home in fluvial systems. Continental rivers pre-date the evolution of life on this planet, and were undoubtedly among the first habitats on the continental land masses penetrated by an originally marine biota. Since that time numerous lineages have colonized rivers both from the sea and from the land. Given millions of years and the periodic hydrologic isolation of distinct river basins, evolution has produced numerous species highly adapted to specific fluvial environments.

The biota found in any given place in a river today reflects the balance between two important zoo-geographic processes: (1) additions of species

(immigration) from the pool of populations available in the region, which have had an opportunity to colonize a particular river segment; and (2) losses of species (local extinctions) through ecological processes like competition, predation, or excessive environmental disturbance (including pollution). In modern times humans have increased the rate of introduction of new species to specific river environments, homogenizing the biological communities of the world's rivers to a greater and greater extent. We have also increased the severity of environmental stresses and disturbances in most river ecosystems. The unfortunate result has generally been a significant increase in the rate of local extinctions and the loss of many unique populations. The ecological richness of natural river systems is in danger of being replaced with a significantly less-diverse array of biological forms more tolerant of the physical changes we impose on river systems.

Human modifications of water or sediment loads, or of local channel constraints create conditions requiring a new equilibrium relationship. A river will tend to respond to such modifications by adjusting its channel through erosional or depositional processes. Practical management and planning with respect to rivers is impossible without a basic appreciation for this intrinsic behavior of fluvial systems.

Structure and function of river ecosystems Fluvial ecosystems share with all ecosystems the property of being both physically and biologically controlled in

terms of energy and nutrient cycling. As in other ecosystems, the presence of complex biological communities comprised of interacting populations can give rise to new and additional elements of dynamical behavior at the ecosystem level. Biological dynamics arise from specific interactions between competitors, predators and prey, pathogens and hosts, etc. These interactions in turn can have important consequences for the chemical and even physical organization of river environments.

On the other hand, there are several important ways in which rivers are distinct from most other more familiar, and well-studied, ecosystems. Key differences include:

⇒ Rivers have a large-scale directional organization (upstream-downstream).

⇒ Rivers are dominated by active rather than diffusive material transport.

⇒ rivers have exceptionally high rates of energy and material throughput

⇒ rivers always 'contain' many other imbedded ecosystems (both terrestrial and aquatic)

Attempts by stream ecologists to explicitly recognize this

longitudinal structuring has led to several distinct theoretical paradigms over the past century including longitudinal zonation schemes, the river-continuum concept, and various modifications and derivatives. Biologists have long recognized that communities in rivers change progressive in a downstream direction.

Attempts to provide a functional explanation for this zonation gave rise to the River Continuum Concept which suggested that longitudinal changes in community structure reflects longitudinal changes in the availability of various forms of organic carbon during its transport through the channel system. For example, headwater

streams in forested areas are likely to transport large amount of leaf material and may be expected to have a fauna adapted to feeding on decaying leaf material (leaf shredders in the ecologists' lingo). In large downstream segments of rivers fine particulate carbon will be deposited and the RCC predicts an abundance of animals that feed by collecting small organic particles (*collector-gatherers*).

The physical power inherent in a river leads to an ecosystem in which active transport of materials predominates. This is true not only of the transport of sediment (of interest to the geomorphologists) but also of almost all biologically-relevant materials including particulate organic carbon, nutrients, dissolved gases, pollutants, and even organisms themselves. In rivers rates of material flux are predictably high and directional. This is in contrast to most other aquatic and terrestrial ecosystems in which multi-directional, slow, diffusion or diffusion-like transport processes prevail. One of many interesting results is the so-called *physiological richness* of river habitats which allows organisms to access nutrients and other essential inputs like oxygen, and even food, with relatively lower energy investments than would be required in still-water or terrestrial environments. In a sense organisms allow the river to subsidize their energy

needs. Evolutionarily, many river organisms have a reduced ability do certain things themselves (e.g. find food or ventilate gills). This is one reason that river animals (for example trout) are frequently dependent upon a relatively narrow range of habitat conditions.

Rivers are also unique in that they are relatively small-volume, but open, ecosystems with high rates of energy throughput. As a result, turnover rates of biologically-

relevant materials are extraordinarily high. This leads on the one hand to an enhanced sensitivity to changes in inputs. At the same time, the high turnover rates of rivers give them an extraordinary resilience, recovering rapidly to pre-disturbance configurations when inputs are returned to normal. Making use of the self-cleansing

ability of rivers is a conscious feature of our society's waste-water handling systems (termed *assimilation capacity* by civil engineers). Our long history of polluting and degrading rivers is eloquent testimony to the sensitivity of these ecosystems to changes in nutrient, carbon, and sediment loading. The fact that many (if not most) rivers are today (or till recently

were) in reasonably-good shape biologically, despite a legacy of abuse, is a testimony to their ecological resilience.

Functionally, river ecosystems contain many other smaller types of ecosystems, including many that do not lie within the open-water channel. Upland catchment areas that recharge groundwater; or provide overland flow, nutrients, and sediments, are important parts of the fluvial system. So also are riparian ecosystems, such as floodplain forests and crenel wetlands, especially in the zones of production and deposition. These, and other hydrologically-linked wetlands lie at the land-water interface and influence the deliveries of water, sediment, nutrients, organic matter, and solar energy to the channel system; they also place important structural constraints on channel development and provide habitat for many species. The interface zone (between surface water and groundwater ecosystems) has a characteristic biota that responds to thermal and oxygen gradients driven by flow patterns in both the overlying river and in the local groundwater table. It is often an important processing location for fluvial dissolved carbon and nutrients.

River fishes The fish fauna of river systems provides a convenient and useful basis for generalizing about the biological communities of

fluvial ecosystems. Each kind of fish requires a specific set of hydraulic, thermal and nutritional conditions to flourish. River fishes, like the systems they inhabit, can travel considerable distances during their life cycles. The spawning, feeding and growing, and winter refuge habitat requirements of a species may be met at very different locations within the river system it inhabits. Anadromous (river-spawning ocean species) and catadromous (ocean spawning river species) are

Likewise many species rely on the downstream transport of young fishes and the upstream movements of juveniles and adults, to "re-seed" potential habitats recovering from local spates or other disturbances. This is one reason that the fragmentation of river systems by dams and impoundments is seen to be such a threat to natural fish populations.

Our society has a long history of both commercial and recreational exploitation of riverine fisheries, and fish remain the central focus of much of our current investment in river management.

extreme examples of this large-scale mobility of riverine fishes. Most river fish populations do utilize in some way the large-scale nature of the rivers they inhabit. The ability to freely transit the river network allows many species to succeed in what is often naturally a very physically demanding & unpredictable environment. For example, many river fishes extend spawning habitats by migrating into temporarily useful tributary systems during the spring.

The same basic hydrologic processes that shape the river channels and water budgets also control specific habitat conditions relevant to fishes at various points in the life cycle. Spawning and hatching success for many riverine fishes are related to the occurrence of moderate flows during specific time windows. Fall and spring spates can frequently and unpredictably disturb important periods of reproduction. Stable-flow Rivers, on the other hand, are relatively free of such disturbances. The nature of a river's summer growing environment is very closely tied to hydrology. A river's channel dimensions of width and depth are usually set to accommodate annual peak flows.

Characteristics of runoff-fed rivers In summer, runoff rivers are wide and shallow (small low flows filling wide and incised channels), as a result water velocities are low (at the extreme, some rivers are reduced to a series of barely-connected pools). These low velocities allow the accumulation of fine silt and sand substrates. Water temperatures in such channels are strongly influenced by ambient air temperatures, typically very warm during the day but cool at night. Similarly, winter water temperatures make for harsh winter conditions and often substantial mortalities. Hydrologic sources also help define both the natural productivity of a river and its response to human additions of pollutants. Storm water moving overland carries nutrients, and other dissolved materials derived at the ground surface, directly to the river channel. Nutrient deliveries are high from impermeable, nutrient-rich clayey and loamy soils (and alternatively, very low from nutrient poor bedrock landscapes). In agricultural and urban areas, storm flows carry high amounts of nutrients and frequently toxic pollutants to rivers.

Fishes of flashy, runoff rivers are diverse, but specially adapted to warm, slow water, and harsh, variable conditions. They are habitat generalists, with tolerances

for a relatively wide range of temperature and oxygen conditions. Reproduction of any given species is unpredictable and poor in many years. Fish populations in such systems tend to have a "boom-bust" quality about them.

Characteristics of groundwater-fed rivers In contrast, groundwater-fed rivers have deeper channels and faster flows during the summer. Substrates are coarser. Through flow and groundwater temperatures, modified by the temperature of the soils through which they pass, help keep streams temperatures cool and fairly constant. Stable groundwater temperatures also help warm these rivers during winter. Fishes of stable, Groundwater Rivers (e.g. trouts and sculpins) are

habitat specialists, adapted to a rather narrowly-defined constant, cold, swift-water environment. Reproduction is predictably high each year.

Characteristics of mixed-source rivers In these systems, not surprisingly, the fish fauna can be quite mixed with differing combinations of warm-water, cool-water, and cold-water species reflecting the relative importance of the three main hydrologic sources of stream flow as it varies from location to location within in the river network.

Understanding river ecosystems is clearly a challenging and complicated task. Fluvial ecology is an appropriate name for this enterprise. However, it is important to recognize that the study of rivers has historically been fragmented into a number of distinct disciplines, each of which carry on relatively isolated discussions and generate publications in separate, disciplinary journals.

The proper study of rivers is then an authentically *inter-disciplinary* experience. Perhaps *supra-disciplinary* is an even more appropriate term since what is essential is a basic grasp of the perspectives of a number of disciplines.

Studying rivers
Understanding river ecosystems is clearly a challenging and complicated task. Fluvial ecology is an appropriate name for this enterprise. However, it is important to recognize that

the study of rivers has historically been fragmented into a number of distinct disciplines, each of which carry on relatively isolated discussions and generate publications in separate, disciplinary journals. Biologists studying rivers have variously organized themselves under rubrics that include Stream Ecology, Limnology (in the broad sense), Fisheries Science, Aquatic Entomology, Benthic Ecology, Aquatic Toxicology, and most recently Landscape Ecology. Relevant physical disciplines are likewise numerous and include Fluvial Geomorphology, Quaternary Geology, Civil Engineering, Hydrology, Hydrodynamics, and Hydraulics. Some of this scientific infrastructure is a logistical necessity but much is an historical artifact of the way various groups of people became interested in rivers. For the student of rivers an awareness of this plethora of heritages is a necessary evil, since much terminology and many useful models are still associated with specific disciplines. ~~~

DAMS**Bhakra floods villages**

An alert has been sounded in Ropar district about possibility of flash floods even as hundreds acres of standing crops was damaged as rising water of Sutlej entered agriculture fields of several villages located on banks of the river in Ananpudr Sahib Sub division of Ropar district.

Flood waters have entered the fields in village Chandpur Bela, Laudhipur, Burj, Hariwal, Shahpur Bela, Nikkuwal, Ballawal, Gajpur Bela, Amarpur Bela. Floodwater had also washed away a stretch of link road connecting several villages to the main Ropar-Nangal highway as a result of the residents of these villages lost their link with the highway. The water level in Bhakra dam had reached 1675.22 feet on Aug 27. (<http://www.punjabnewslines.com> 280806)

Bhakra disabled Tulshi Ram

Tulshi Ram from Bilaspur district, a labourer at Bahkra Nangal dam, had lost his both arms and an eye in the early 1960s due to an accident involving a dynamite blast at the time of construction work of the dam, still have not received disabled certificate from Himachal Pradesh govt. As a result he is not eligible for a monthly pension of Rs.200 from the govt. How callous the dam builders and agencies like BBMB can get? (<http://news.monstersandcritics.com> 010806)

Protest against diversion of Hirakud water About 25 000 farmers formed an 18 km long human chain around Bula town near Sambalpur in Orissa to protest against the Orissa govt's decision to provide water from the Hirakud dam to industries. The human chain began from the Gandhi Minar on a hill top at one end of the Hirakud dam and continued through Hirakud town, NH-6 crossing, Mahanadi river bridge, Burla town and Sambalpur University, culminating at the Nehru Minar on another hill top at the other end of the dam. Farmers from the districts of Sambalpur, Bargarh, Balangir, Jharusuguda and Subarnapur joined the rally under the leadership of Sambalpur district Krushak Sangathan. They fear that diversion of water could deprive irrigation to over 47 800 acres. (Financial Express 30x06)

WB project on Dam Rehabilitation The objective of the US\$ 350.0 (IBRD) project is to improve the safety and optimal sustainable performance of selected existing dams and associated appurtenances. Appraisal was scheduled for June 2006. (World Bank Monthly Operational Review May 06)

Taraka Dam Crest gate collapses Standing crops in hundreds of acres were lost and more than 20 villages in low lying area and parts of the HD Kote town was inundated as crest gate on the Taraka reservoir near Mysore collapsed on Oct 6 when the reservoir was full. No casualty has been reported. (The Indian Express 08x06)

Kabrai Dam under threat Kabrai Dam in Mahoba district is again under threat due to blasting for illegal mining of graphite stones in the nearby areas. Due to a crack in the dam, over 40 000 people in the downstream areas are now under threat. The Irrigation Dept dam constructed in 1950 supplies drinking water for Kabrai town and irrigation to about 100 villages. In 1978 there was a deep crack in the wall which lead to washing away of the dam wall. Since 1995, mining has been completely prohibited in the area. (*Rajasthan Patrika* 07x06)

Upper Krishna inaugurated 42 years after Lal Bahadur Shastri, the then union minister laid the foundation stone, the Upper Krishna Project on Krishna River was dedicated to the nation by the President on Aug 21, '06. President at the dedication ceremony said that the delay has cost the nation Rs 33,000 crore of which Rs 25,000 crore due to delay in achieving irrigation and Rs 8,000 crore in terms of loss of power generation. The cost of the project had gone up from 120 crore to Rs 9 479 crore. Krishna Bhagya Jala Nigam Ltd has already spent Rs 8 750 crore. The project comprises Almatti and Narayanpur dams (60 km down stream from Almatti), two canal systems and a 290 MW HEP. Narayanpur and Almatti dams are located in Bijapur and Bagalkot district respectively. Gulbarga district will get the maximum benefits (3.8 lakh ha to be irrigated). 201 villages are affected by the reservoir and out of that 136 villages are completely submerged. 80,000 families are displaced. Karnataka CM said that 5.42 lakh ha irrigation potential has been created out of target of 6.22 lakh ha. (THE HINDU 210806, 220806)

Bansagar inauguration Former Prime Minister Vajpayee inaugurated the interstate Bansagar Project in Shahdol district in MP amidst controversy. Union Water Resources Minister is the Chairman of the Bansagar Control Board, but the inauguration was done without his consent. The foundation stone of the project with 425 MW installed capacity and projected command area of over 2 lakh ha was laid 28 years ago by the then Prime Minister Morarjee Desai. (Indian Express 270906)

Protest by Ranjit Sagar dam oustees The Ranjit Sagar Dam Ousteers Association has planned to stage a protest as Punjab Govt has fails to provide jobs to one member each of the left-out 215 ousted families belonging to the border villages falling in Dalhousie tehsil of Chamba district in Himachal Pradesh within three months as per agreement of July 13, 1998. (THE TRIBUNE 140806)

Shahpur Kandi dam work started for the 3rd time The 168 MW Shahpur Kandi dam, a part of the Ranjit Sagar Dam Project was to generate power while releasing water from the Shahpur Kandi dam into the Upper Bari Doab Canal system. The Punjab govt has now sanctioned Rs 25 crore for starting work on the project. Previous SAD-BJP govt had also started the work and later they abandoned it. (THE TRIBUNE 100806)

Survey for Sharda-Yamuna-Sabarmati link The Geological Survey of India has started survey for the Sharda-Yamuna-Rajasthan-Sabarmati link, which is part of the Himalayan Component of the Interlinking of Rivers Plan. The link will be taken up in three phases. The first phase would be from Sharda River to Panipat in Haryana. The phase-2 would be from Yamuna to Barmer in Rajasthan. The third phase will be from Barmer to Sabarmati river in Gujarat. In Rajasthan, the link canal would be about 50 km east of the IGC in Rajasthan and Narmada Main Canal in Gujarat. The link canal will carry about 8 BCM water per annum, of which about 5 BCM will be for Rajasthan. The link canal is also to benefit Haryana, Delhi and Gujarat. (*Rashtriya Sahara* 011106)

(Continued from p 1)

However, the latest UN data shows that the emission of Greenhouse gases is increasing. The western economies (US being the chief culprit) and bodies like the World Bank & the Asian Development Bank are either taking no action or are taking actions based on wrong assessments. Such actions are likely to do more harm than good.

For example, UN Framework Convention on Climate Change, that certifies the clean projects under its CDM (Clean Development Mechanism) umbrella, has certified or is in the process of certifying projects under CDM whose claims are pure fictional in terms of the social and environmental impacts, consultation with the affected communities and option assessment. Some such hydropower projects from India that we have reviewed include the following: 192 MW Allain Duhangan HEP in HP, 34 MW Bhandardara HEP in Maharashtra, 70 MW Budhil HEP in HP, 22.5 MW Bhilangana HEP in Uttaranchal, 96 MW Jorethang Loop HEP in Sikkim, 9 MW Kaldigad SHP in Uttaranchal, 10 MW Kaliganga HEP in Uttaranchal, 10 MW Madhyamaheshwar SHP in Uttaranchal. If such projects are going to be pushed in the name of addressing climate change, than there is no hope that we will address climate change issues at all. The World Bank is doing worse: it is inviting projects that cannot be passed by UNFCCC's rather lax CDM criteria.

Indian govt does not seem to have woken up to that reality as yet. We recently, under Right to Information Act, asked Govt of India's two highest policy making and technical bodies, namely Central Electricity Authority and Central Water Commission if they have done any assessment as to how the climate change would affect the performance of India's hydropower and other dams. We were shocked to learn that neither of the organisation has done any such study. Here we should remind ourselves that the greatest impact of climate change is going to be in water sector. Is it not high time we wake up our govt from the slumber? Should not the govt address the issue of trying to get optimum benefits from the existing projects rather than indulge in misleading and wasteful advocacy for more large dams?

~SANDRP~

News From the Narmada Valley

Narmada satyagraha Over 3000 farmers and Adivasis launched the Satyagraha against unjust submergence and displacement on August 5 at Rajghat, near Badwani, Madhya Pradesh. The Satyagraha was launched in Bhitada (Aug 6) and in Chimalkhedi (Aug 7). Supporters and fraternal organizations from various states including Gujarat, Tamil Nadu, Kerala, U.P., West Bengal, Delhi and other states participated in the satyagraha. Satyagraha is against increase the height of the dam which will impose the submergence for over 20 000 families during the monsoon. At least 35,000 families need to be resettled as per land for land policy as legally required. Leading jurists, academicians, journalists and social-political activists including Dr Mohini Giri, Kamla Bhasin, Shabnam Hashmi, Dr L.C. Jain, Swami Agnivesh, Kamal Mitra-Chenoy, Yogendra Yadav, Kuldip Nayar, Thomas Kocherry, Prashant Bhushan, Anand Patwardhan and others extended support to the Satyagraha and expressed concern over the increasing violation of human rights in the Narmada valley, due to the construction of Sardar Sarovar dam. Hundreds of farmers, tribals and fisher people vowed to intensify their struggle for their right to life, in a spirited boat rally on Sunday, Sept 23, marking the conclusion of the Satyagraha. (PR NBA 050806, 240906)

Promise again violated: Narmada Water to Rajasthan

The promise of ensuring that Narmada water will reach Rajasthan by Oct 31 has been broken again. The Gujarat govt officials said that due to heavy rains during 2006 monsoon, work had to be stopped and now the new date promised is Feb 2007. This is the second time that Sardar Sarovar authorities have failed to keep their word. Earlier the water was supposed to reach by July 20, which was not kept. (*Dainik Bhaskar* 31x06)

Maan Project completed

Maan Dam on Maan River, a tributary of Narmada, near Jeerabad in Dhar district in Madhya Pradesh has been dedicated to the nation on Oct 4. The Rs 176.75 crore project for irrigating 15 000 ha of land has a 53 m high concrete gravity dam with 9 radial gates. The project affects thousands of adivasi people who have been agitating for years for just resettlement. (*Dainik Bhaskar* 05x06)

Narmada Sagar: Jal Samadhi agitation

People displaced by the Narmada Sagar project had to resort to *Jal Samadhi* from Sept 22 at Karanpura in Harda district in Madhya Pradesh when they did not get the compensation due to them. The condition of the agitating women sitting in water for days had already become serious by Sept 27, when the agitation was withdrawn only when proof of cheques deposited in the bank accounts of affected people was shown. Narmada Hydropower Development Corp (a joint venture between NHPC and MP govt) also agreed to hold a meeting on Sept 29 to listen to the issues affected people wanted to raise. (*Nai Duniya* 250906, 290906)

ANDHRA PRADESH DAMS**OPEN LETTER TO AP GOVT ON POLAVARM PROJECT**

From: E. A. S. Sarma (Former Secretary, Govt of India), Visakhapatnam eassarma@gmail.com
Oct 26, 2006

To
Shri J. Harinarayana, Chief Secretary, Govt. of A.P.

Dear Shri Harinarayana,

Deccan Chronicle has carried a report today that the State Govt has "decided to construct 43.86 km flood bank along the Godavari river to prevent the likely submergence of Bhadrachalam and girijan hamlets of Chintoor mandal in Khammam district after the Polavaram dam is constructed". Corroborating this, the Hindu has also stated that the proposed "flood bank" will have a height of 189 feet. The State Irrigation Minister has even gone to the extent of proudly describing the structure as "China Wall-like"!

I am sure that you, as a former Union Water Resources Secretary, must be wondering what all this is about! As far as I am concerned, I am not only amused but also aghast at the cavalier manner in which such large projects are being dealt with and the motives that underlie them. In fact, this latest statement of the govt questions the credibility of the Polavaram project itself!

As a citizen, I wish to raise the following questions for the consideration of the govt.

- i. Is the govt more concerned about saving Bhadrachalam town and its temple, than more than 2 lakh people who are going to be displaced by this project?
- ii. The govt was well aware that the highest level that Godavari had ever touched was in 1986 when the water discharge was as high as 35 lakh cusecs. In August this year, when the discharge was 28 lakh cusecs, even without the Polavaram project in place, 322 villages were flooded. On the other hand, the govt has all along been planning for the rehabilitation of people on the premise that only 276 villages would get inundated. Is there some serious flaw in the computation of the levels and the area of submergence?
- iii. Would it not be necessary to review the basic numbers that go into the design of the project, in view of the latest developments? What would be the area of submergence if the pond level of the project were to be 150 ft MSL?
- iv. The proposed "flood bank" appears to be larger than the dam itself! If it ever breaches, what would be the magnitude of the disaster that would follow?
- v. Eminent environmentalists like Prof Shivaji Rao and others have cautioned the govt about the possible consequences of a "dam break" in the case of Polavaram. Its adverse impact would be on the downstream population and assets. It is perhaps necessary to carry out a similar stochastic analysis of breaches in the flood bank before proceeding further with this project on which the govt is spending crores of rupees that belong to the tax payer.
- vi. The proposed flood bank will cost more than Rs 300 crores, as per the news reports. Going by the lackadaisical way in which the project design and estimates have so far been handled by the govt, the cost of the flood bank will be much more and it will further add to the cost of the project that is already astronomical in magnitude.
- vii. While the project will render lakhs of voiceless people homeless and deprived of their Constitutional rights, one is not sure whether the already crisis-ridden finances of the State could ever absorb such lavish and senseless expenditure on the project. Would it crowd out essential sectors such as health and education from the development agenda of the State Govt?

I am afraid that this latest report throws suspicion and doubt on the entire project about which the govt is reluctant to come clean.

I have copies of the resolutions of the Gram Sabhas in tribal villages that clearly reveal opposition to the project at the grass-root level. On the other hand, I understand, the State Govt has informed the Ministry of Tribal Affairs that all the Gram Sabhas have been consulted and their concurrence taken! Once again, in a democratic society like ours, these facts raise serious doubts about the commitment of our leaders to democratic principles.

I hope that these issues will get evaluated by an independent group of experts before the State Govt proceeds further.

In the name of "good governance", I will appreciate if you can acknowledge the receipt of this letter. I am marking copies of this letter to well-meaning individuals and the press.

Regards & Yours sincerely,
EAS Sarma

Polavaram: Disaster foretold? A study by the Centre for Economic and Social Studies on Polavaram Dam on the Godavari River has indicated that the backwaters of the project would submerge the temple town of Bhadrachalam, if the inflows in the river are 36 lakh cusecs at the pond level of 140 feet. According to the model, if the reservoir level is maintained at 140 ft above sea level at Polavaram dam, the backwater at Bhadrachalam would be at 186 ft ASL. The spillway of the dam was designed for a flood of 36 lakh cusecs based on the 1986 figure. The state govt is looking at redesigning the Polavaram dam to enable it to withstand bigger floods and protect the temple town of Bhadrachalam. During Aug '06, when 28 lakh cusecs flowed down the Godavari, the water level at Bhadrachalam was 180 ft ASL and water entered the town even without the dam. What would be the consequences if the 150 ft high dam were in place and flow were to be 36 lakh cusecs as designed? There are suggestions from various quarters that the govt should rethink about the project and also review the design to withstand Probable Maximum Flood of 45 lakh cusecs, assuming that all its tributaries and the Godavari flood at the same time. However, the govt does not seem to have learnt any lesson. The Irrigation minister announced that the dam will go ahead as designed.

A govt of India report says about Polavaram, "The FRL is 45.72 m, considering inter alia, the Godavari Water Disputes Tribunal Award. The submergence level considered in AP including the wave height is 48.8 m & that in Orissa and MP (now Chhattisgarh) is 52.82 m."

Embankments to protect villages According to the AP Medium and Major Irrigation Minister (Andhra Café 26x06) 275 habitations in Khammam, East and West Godavari districts would be submerged at the full reservoir level of 150 feet. In the recent floods of 28.5 lakh cusecs, 322 villages were affected. To protect these villages from future floods, the minister said it was decided to construct embankments on either side of the river covering about 43.86 kms. He said this aspect was covered in the Polavaram project and Rs 307 crore has been earmarked for the purpose. It was this response that triggered an angry letter from Shri EAS Sarma, former secretary, Govt of India see the box on page 10.

The 1986 flood In 1986, Godavari discharged 106 BCM water. Between Aug 13 and 19, discharge exceeded 42 BCM. On just one day, Aug 16, 1986 7.5 BCM water flowed down the river. In 1986 like situation, with Polavaram dam in place, Bhadrachalam would be submerged at least for a week.

Interstate meeting fails A meeting between AP, Orissa and Chhattisgarh called by the Union Water Resources minister at Delhi on Oct 4 failed as Orissa representative refused to participate in the meeting, expressing its opinion against the project. Chhattisgarh Irrigation minister did participate in the meeting, but clearly

expressed its opposition to the project at current stage. It asked the Union govt to get the survey of submergence area done by the Central Water Commission and before that the work on the dam should not be started. He said that at least 64 villages of Chhattisgarh will face submergence due to the dam. (www.charminar.com 090806, DECCAN CHRONICLE 160806, 05x06, *Dainik Bhaskar* 05x06)

Pulichintala: CEC asks for responses In a complaint before the Supreme Court's Centrally Empowered Committee filed by J Ramachandra Rao, advocate, the applicant highlighted that the work on the project has already begun in the Reserve Forest Area. Photographs to this effect have been filed before the CEC. 1151 hectares of Reserve Forest is involved in the project. In Principle forest clearance has been received on 18.6.2005 with conditions, which have not been complied with. Both the Forest Department and the Irrigation Department from the state asked for more time to file their responses. The CEC granted four weeks time to file the responses.

⇒ **Telugu Ganga and SRBC** Similarly, in complaints filed by Sri JP Rao on these projects before the CEC, the applicant explained to the CEC in Oct '06 that in case of both the projects, work has been started without getting forest clearance. In the case of Telugu Ganga project, land of two sanctuaries is also involved. CEC has the govt to file responses and the case would be heard in Nov '06. (Forest Case Update x06)

AP seeks 4000 crore under AIBP The Irrigation minister has said the state govt has sought inclusion of Pushkara, Tadipudi & 4 other major irrigation projects under AIBP. The govt would send seven more, including Gutpa and Alisagar major irrigation projects for inclusion in AIBP. With these, there would be 21 projects of the state under the programme and state has target to get Rs 4000 crore under AIBP this year. (THE HINDU 210806)

EPC flaws The EPC (engineering, procurement & construction) method (as against the open tender system) tried out by the govt for the Jalayagnam since 2004 has failed to deliver. It allows liquidation damages if the construction company fails to complete the project within prescribed deadline. However, almost all EPC projects have missed the deadlines. In all 28 major and medium irrigation project works have been awarded under the EPC system with an estimated tender value of about Rs 40 000 crores. (Deccan Chronicle 06x06)

Lower Kolab project not feasible Orissa govt has decided that lower Kolab project on Godavari river in Malkanguri district is not feasible due to possible submergence of large tracts of land. Leader of the opposition party in Orissa has claimed that the Lower Kolab project can effectively thwart the AP govt's design to go ahead with the Polavaram project. He says that the project has the potential to irrigate 1.5 lakh acres of land in Malkanguri district and can generate 400 MW of electricity. (THE ASIAN AGE 130806)

Storages not filled for many years

The Indian water resources establishment, along with its partners like the World Bank is famous for its rather narrow minded pursuit of building large dams. The Big dam lobby is also known for its resistance to any attempt at evaluation of the performance of the large water storages created at huge costs. Among the many ways to assess the performance, one way is to see if the reservoirs are getting filled to its designed Full Reservoir Levels and if what is the frequency of filling up of the reservoirs.

The large water storages are created to store water that flows in the rivers during monsoon for use in non monsoon months. Most reservoirs in India are designed for 75% dependability, which would mean that at least in 75% of the years, the reservoirs would be filled up. Since each additional increase in height of the dam means further costs (social, environmental and financial), it is obvious that it is important to keep the height of the dam at a level that is optimum. If the reservoirs do not get filled up as per designed levels and dependability, that would mean non optimum performance of the reservoirs, and wasteful expenditure in unnecessarily high dams.

Here we have given instances of some dams that have been filled up this year after many years or dams that have not been filled for many years. Thought this does not represent systematic analysis, the number of instances and their performance should be eye opening for all concerned.

Tenughat (Damodar River Basin, Jharkhand) Full Reservoir Level: 268.83 m, The highest level ever reached: 265.56 m on 17/09/1985, source: Central Water Commission website (www.cwc.nic.in) visited on Aug, 14, 2006. This means that the reservoir has never been filled to FRL.

Tungbhadra Dam (Krishna River Basin, Karnataka) FRL: 1633 ft, not filled to FRL for the last ten years.

Vaigai (Vaigai river basin, Tamil Nadu) Water for irrigation was released from this reservoir, according to recent reports, after a gap of twenty years, as the reservoir did not have sufficient storage in previous years.

Neer Sagar Dam (Karnataka) near Hubli Dharwad in Karnataka filled up this year after 10 years. Supplies water to Hubli Dharwad towns and also villages around.

Supa Dam (Kali River Basin, in Joida taluk in Uttara Kanara district in Karnataka) Filled up this year for the

first time in twelve years. The water level has reached 563.7 m (FRL 564 m) and three gates have been opened this year.

Hemavathi Dam (Hemavathi River Basin, Karnataka) The reservoir was filled up this year after 18 years. The dam has been filled to its capacity only six times since the project was completed 22 years ago. FRL is 2922 ft. Storage capacity 35 TMC.

Gandhisagar (Chambal River Basin, Madhya Pradesh) Overflowed this year after a period of nine years.

Kolar Dam (Madhya Pradesh) The gates of the dam near Bhopal were opened after eight years.

Ranjit Sagar Dam (Ravi river basin, Punjab) This dam on Ravi river in Punjab has possibly never reached FRL since commissioning. The power station was commissioned in Aug-Oct 2000, but it is not clear when the impoundment happened. The spill way was for the first time tested in Sept 2006 when water level as the dam reached 523 m, the FRL is 528 m.

Bhakra (Sutlej River Basin, Himachal Pradesh) For the last seventeen years (1989 to 2005) the reservoir has never been filled up to the FRL (1685 feet as per www.cea.nic.in). It should be recalled that Bhakra now gets a very large proportion of its flows from Beas River, where as to begin with it was designed to store only water from the Sutlej River. It is clear how over designed Bhakra dam was.

These few instances that have come to our attention recently should be alarming enough for everyone as each of the dams have been constructed at huge costs.

One would expect that the water resources establishment would have a system of assessing performance of the reservoirs from a number of parameters, including the one discussed here. One would also expect that there would be some sort of accountability for the decision makers if the reservoir does not perform as planned. Unfortunately, that is not the case. It may be noted that large dams are the most expensive infrastructure projects in terms of financial, social and environmental costs. The advocates of more large dams would do well to put in place a credible, transparent system of performance appraisal and norms of accountability if their advocacy is to have any credibility. (Deccan Herald 160706, 310706, 200806, Rajasthan Patrika 200806, Dainik Bhaskar 190806, 020906, The Tribune 050906)
SANDRP

HYDRO PROJECTS

Violation of norms by HEPs Plans to concentrate on the development of the country's hydro power potential has hit a road block derailing nearly 20 projects over 3500 MW in Sikkim alone. HEPs in Uttaranchal, Himachal Pradesh and Arunachal Pradesh will face the same cloud. All these projects have been awarded in violation of the central govt guidelines. Awarding hydro power projects above 100 MW through the competitive bidding route is the rule, not through MoUs. Two writ petitions has been filed by former Sikkim Chief Minister, Narbahadur Bhandari in the Sikkim High Court one against Teesta Stage III and another against 17 other HEPs. The projects will be affected in Sikkim are Teesta (stage I to V), Rangit (stage II & IV), Chujachen, Bhasmay, Suda Mangder, Rongni, Panan, Ting Ting, Jorthong Loop and Digchu. Arunachal Pradesh govt had awarded five hydro projects to the private developers through the MoU route. In a letter, CPM and CITU leader has asked the Union power minister to set up a probe into this irregularity. The manner in which the projects have been awarded smacks of corruption.

➤ **No Tariff based Competitive bidding for PSUS** The Panning Commission may have to reverse its stand that all power generation and transmission projects started in the eleventh plan will be done through tariff-based competitive bidding. The Integrated Energy Policy had envisaged a complete move to competitive bidding from 2007-08. This may not be possible as the National Electricity Tariff Policy has exempted govt owned/controlled projects from tariff-based competitive bidding for at least another five years. (THE ECONOMIC TIMES 070806, 100806, 110806, 150806)

Bihar Invitation for private developers Bihar Govt has invited private developers for proposed HEPs in Kosi Basin. In full page advertisement in newspapers, the Bihar State HEP Corp has invited private developers for taking up 18 projects with a total installed capacity of 227 MW in Kosi basin. Except Dagmara Phase-I all other projects are small HEPs. Bihar govt has also proposed five pumped storage projects [Sinafdar (3x115 MW), Panchgotia (3x75 MW), Telharkund (4x100 MW), Hathiahdah-Durgawati (8x200 MW) and Kohira (3x38 MW)] and one reservoir project [Indrapuri (450 MW) (waiting for approval of Ministry of Power)]. It has announced that Sone W Link Canal HEP at Dehri (4x1.65 MW), Sone E Link Canal HEP at Barun (2x1.65 MW), E Gandak Link Canal HEP at Valmikinagar (3x5 MW), Agnoor SHP (2x0.5 MW) and Kataiya SHP (4x4.8 MW) are ongoing. Under NABARD assistance 17 small HEP projects are ongoing. In addition, there are 22 other small projects which are also available to the private sector. The total HEP potential in Bihar is 2696 MW.

⇒ **Tender invited for Dagmara DPR** Bihar State HEP Corp has invited tender for preparation of DPR for 3x42 MW Dagmara HEP in Sapaul district, 22.5 km downstream of Kosi Barrage. (THE HINDUSTAN TIMES 150806, THE FINANCIAL EXPRESS 160806)

Private SHP in MP Madhya Pradesh has decided to take up SHPs up to 25 MW on its own or in joint venture. It has exempted SHPs from water tax & open access duty. Time schedule for completion have been fixed by the govt: 30 months for SHPs up to 5 MW, 36 months for 10 MW and 40 months for 25 MW. The companies will be granted permission on BOT basis for a period of 30 years. Free power to the govt would be: 5% (0-5 MW), 8% (5-10 MW) and 10% (10-25 MW). (IANS 020806)

Plans: NHPC The NHPC has taken up the 1000 MW Pakal Dul and 1020 MW Bersar project in J&K. It is also preparing the Detailed Project Reports for four projects: Kiru (430 MW, submitted), Rattle (560 MW), Kawar (320 MW) and Shamnot (370 MW), all in Doda district.

⇒ **Patel Eng** Patel Engineering Ltd plans to start its first own HEP (100 MW) in Himachal Pradesh. It would like to increase to 500 MW in 3-4 years.

⇒ **IRCON** The IRCON International, of the Indian Railways, is in talks with the Uttaranchal govt for HEPs. (THE BUSINESS LINE 050806, 210806, Business Standard 03x06)

Indian role in Nepal's HEP Under the confidence-building measure to clear up the anti-Indian feeling India will take initiative at first to build small projects in Nepal. India will construct those projects whose cost will be borne in the form of a grant. The run of the river project of Upper Karnali (300 MW) in western Nepal for which the feasibility report is ready may be taken up under this scheme. Ministry of Power has also suggested preparing of DPR for Devighat and Trishuli projects. (THE ECONOMIC TIMES 140806)

HYDRO PROJECT IN NORTH EAST INDIA

Assam claims 600 MW power from Lower Subansiri The govt of Assam is insisting on allocation of 600 MW from the 2000 MW L Subansiri HEP and 12% of free power as the state would have to face the adverse effects. The Northeast Regional Electricity Board and the NER Power Committee has resolved that the NE states should be given first priority in allocation of power. (Assam Tribune 290806)

Teesta III The 6 X 200 MW Teests III HEP has received the techno-economic and environmental clearance and is awaiting forest clearance. Teesta Urja Ltd, a private company for the project from the Athena Consortium of Andhra Pradesh is taking up the project and global tender for the Rs 6000 crore project have already been floated. The project envisages a dam at Chungthang from where a 13.32 km long underground tunnel will start. (Assam Tribune 300906)

NTPC in Arunachal Pradesh NTPC was on the verge of signing it's biggest power generation project, a Rs 20,000-crore HEP with installed capacity of 4,000 MW at Italin. In addition, the state govt has agreed to sign an agreement with the company to set up another 500 MW HEP in Attulni. NTPC has decided to increase its HEP to 11,000 MW by 2017, including 4500 MW by 2012. (BUSINESS STANDARD 140806, THE ECONOMIC TIMES 240806)

HYDRO PROJECTS IN HIMACHAL PRADESH

Nathpa Jhakri: 21 days of paralysis Since July 25 the Nathpa Jhakri HEP in Himachal Pradesh was forced to shut down because of high silt content in river water above permissible limit. Union Power ministry has scaled down the generation target for the year by 550 million units (MU) and it was based on the presumption that there would be 11 high silt days during the year. But the project had already encountered 21 such days (till August 9, 2006). Last year project generated 4055 MU as against the target of 6950 MU and was closed for 89 days. Engineers are worried about the changing pattern of silt and water flow in the river basin. Earlier Spiti river was considered as high silt river but now at Khab 43,000 ppm silt has been measured where as in Spiti the level was just 4000 ppm. 36,900 sq km catchment of the river is in China (out of total 49,820 sq km of catchment).

Silt due to debris Debris from tunneling work of under construction 1000 MW Karcham-Wangtoo project illegally dumped into the Sutlej river is part of the problem for NJPC. It has been reported that the Jaiprakash Associates Ltd, the company that is constructing the project, has not done necessary muck disposal arrangements as promised under the Environmental Management Plan. Debris from the tunneling work is being generated since the beginning of this year. Similar instances of dumping debris to the Sutlej river have been noticed and here the culprit is a govt body - PWD. The PWD is constructing an alternate route along old Hindustan-Tibet road between Tapri and Reckong Peo. Widening of old Hindustan-Tibet road, construction of new Hindustan-Tibet road and many hydro projects in Himachal Pradesh in Kinnaur district are all dumping debris in the Sutlej River.

Notices to JP, NJPC, PWD The HP Pollution Control Board has served notices to JAL and PWD. The board had asked to identify their dumping ground first and then carry on with the construction work. The board has also served notices on the authorities concern of the 412 MW Rampur HEP for dumping debris to Kaju Khud, near Rampur. The trouble is, it is not known what happens after notices are issued and if there is any change in the working of the projects. In absence of transparency and accountability of the PCB, such notices could become a means of lining the pockets of a few individuals, to the detriment of everyone else. This is likely to be the case as such news had appeared in the past too, without any perceptible change in the working of the projects.

Two approaches are proposed to solve the problem of silt in the Sutlej. One proposal is to construct chain of small dams and the other is to construct a big dam in the upstream at Khab. According to the engineers life of the proposed 275 m high Khab dam can be 27 years and after that the dam would be useless.

According to a retired chief engineer a number of dams across all the tributaries and sub-tributaries of the Sutlej

in the entire upstream region will not only check soil erosion and silt flow but also stabilize the flow & prevent instant floods. The silt problem would be dealt with better by the chain of small dams as it would take care of the silt brought down in the tributaries of the Sutlej as well. (THE TRIBUNE 100806, 110806, 280806, 290806, 300806)

Construction debris Construction debris dumped by the JP cement plant in the nullah has caused wide spread damage in Bhalag village of Arki tehsil in Himachal Pradesh. This led to sudden flood in the areas. Two locally run flour mills run by Gharat were massively damaged and four are partially damaged. (THE TRIBUNE 040806)

Chamera III labour unrest Security personnel of the Hindustan Construction Company and Police has resorted to firing and lathicharge on workers of the Chamera III HEP at the time of protests against the torture by police to their leader in jail custody and demanding to settle their dues.

➤ After 75 days the work on 231 MW Chamera III HEP has been resumed on Aug 25. The construction work was stopped after the killing of three workers on June 10. (THE TRIBUNE 260806, 280806)

HP govt enquiry committee on Baspa II costs The Himachal Pradesh State Electricity Board and Jaiprakash Associates Limited are at loggerheads on the issue of tariff of power from Baspa II HEP. The final tariff has not been finalised though the plant has started its power generation since 2003. The JAL has claimed that the cost of the project has escalated by over 100% from the initial estimates of Rs 750 crore to over Rs 1550 crore due to cost overrun. It may be recalled that Centre for Water Policy-Delhi had challenged the costs claimed by JAL before the HP Electricity Regulatory Commission, but at that stage HPSEB did not question the costs in a fundamental way. Following CWP objections and also now the HP govt setting up an enquiry committee under the chairmanship of the Chief Secretary of the state, HPERC has postponed declaring the orders on the JAL application for fixing the tariff of power from Baspa II. This is a significant impact of the work of the CWP. (THE TRIBUNE 270806)

Drying up of water sources Local villagers of Tarella area in Chamba district of HP have said that due to construction of a mini hydro their sources of water are becoming dry. Villagers have demanded compensation for their land and drying up of water mills. 5 persons were injured due to clash between the outsiders working in the project and villagers. (THE TRIBUNE 260806)

Landslide in Kinnaur Villagers near Reckong Peo, district headquarter of Kinnaur have said that due to blasting by the Public Works Department for widening of old Hindustan-Tibet road and drilling a tunnel by State Electricity Board for its Kasham HEP, landslides have been caused along the old Hindustan-Tibet road. At least 10 houses have been vacated. (THE TRIBUNE 080806)

IRRIGATION

Water rates revised in Gujarat The Gujarat govt has decide to charge uniform rates across the state for providing irrigation water to farmers. Presently there is a huge disparity between the rates charged by the state irrigation department and Sardar Sarovar Narmada Nigam as shown in the table below.

Crop	No of Waterings	Rate in Rs per hectare		
		Irrigation	SSNNL	Uniform
Paddy	8	603	2190	1806
Wheat	5	402	1369	1206
Groundnut	3	446	821	724
Cotton	6	724	1643	1448

(THE TIMES OF INDIA 030806)

Japan, WB loan for Minor Irrigation in AP The Japanese Bank for International Cooperation has in principle agreed to provide Rs 1900 crore loan to AP, while the World Bank is to provide Rs 900 crores. A Minor irrigation Corporation was earlier proposed, but the proposal now has been shelved. It is proposed that the existing Water Users Association will take up the work of maintenance and strengthening of Minor Irrigation Projects. (Deccan Chronicle 240906)

Taxes without Irrigation Taxes are presumably paid for availing services. But such notions have no relevance in Keonjhar district of Orissa where people continue to pay water taxes year after year without ever getting water. When the construction of the Anandpur barrage was taken up in 1979-80, it was intended to irrigate nearly 11 210 ha in Keonjhar and neighbouring Balasore districts. But 25 years down the line, the project has managed to irrigate only a paltry 690 ha. Farmers of the area continue to pay their water tax. Ratnakar Nayak is a farmer under the Dinkikote Revenue Inspector's circle in Keonjhar district. He has 4.38 acres land. Since 1992, when the project was completed, he has been regularly paying water taxes though his land is yet to be irrigated. Starting off with Rs 12.35, the tax on his land has now gone up to Rs 77.25. Kalu Mahanta of the same village has to pay Rs 255.50 for his 6.99 acres land. Why, even a former MP of Keonjhar, who belongs to the same village, has to pay tax for a service that he has never availed. There are scores of farmers living within a km of the canals constructed to provide water to the fields, who regularly pay their taxes but are still dependent on the mercy of the rain gods to raise a crop. Asked why they pay taxes when they don't get water for their fields, the farmers say they have for three years. This, they have been told, would strengthen their claim for water! But nobody has bothered to explain to them as to why they need to press the demand for something, which should have come to them as a matter of right. On his part, the RI says no water tax would be collected from the farmers this year – as if it would be a great favour done to the farmers. Even this small mercy has been granted only after the Keonjhar and Patna MLAs repeatedly raised

the issue in the Assembly, forcing the govt to order a halt to the collection of water charges. The branch canals are now completely silted up with only the cement structures visible. There is an urgent need for re-digging these branch canals, besides the repair and renovation of the main canal. (WaterWise Nov-Dec '06)

Massani Barrage gateless Massani Barrage (with 3500 ha m storage capacity) on Sahibi River in Rewari district, whose construction started in Feb 1979 (after devastating floods of 1977) about 12 km from Rewari near the National Highway 8, still does not have shutters on its gates and poses risk to Delhi. It was estimated that the barrage would provide flood protection to about 1.6 lakh acres in Haryana and about 40,000 acres in Delhi apart from providing irrigation facilities to about 50,000 acres in S Haryana. However, this is contradicted by Haryana govt sources which says that very little water is reaching the Massani Barrage because Rajasthan has built check dams in its catchment. Hence a scheme has been prepared by Haryana to lift Yamuna water from JLN canal (during its lean use period) and fill up Massani barrage for irrigation (in Mahendragarh and Rewari districts) and groundwater recharging. Earlier in May '06, Haryana govt said that this Rs 6.7 crores scheme is already under implementation. The Sahibi River, flowing through Rewari-Jhajhar-Gurgaon ends in Najafgarh jheel in Delhi. Its catchment includes Sotanala, a small river that is known to be flood prone. Buchara dam on Sotanala in Rajasthan, constructed in the 19th Century, is already in dilapidated state in absence of proper maintenance and its top two feet is in damaged condition. (Bhaskar 17x06)

AGRICULTURE

No Progress on hunger eradication According to the Food and Agriculture Organisation, the number of underfed people in the world has remained same over the last decade. In 1996, the number of underfed people was 857 million and now there are 854 million hungry people. Thus, there is no progress in the world pledge to halve the number of underfed people from 1990 to 2015. (Financial Express 31x06)

Bharatpur Bird Sanctuary vs Agriculture The Pacchna dam on Gambhiri river that feeds the wetland has just 500 m cubic feet water this year compared to its capacity of 2100 mcft and about 10 000 families are dependent on the water from the dam. A petition has been filed in Rajasthan High Court, praying for allocating 550 mcft for the sanctuary. This problem has been persisting for several years and the bird population at the famous Ghana bird sanctuary has dwindled and the size of the wetland area has reduced drastically from 29 sq km to about 11 sq km. Rajasthan wild life dept says it is trying to supply water to the wetland from groundwater sources, but that is clearly insufficient. (The Hindustan Times, Hindustan 021106)

The Farmer Agitation in Rajasthan for Water

The agitation of farmers for adequate release of water for irrigation from the Indira Gandhi Canal restarted this year in Oct. The agitation led by the Kisan Mazdoor Vyapari Sangarsa Samiti is supported by a number of political parties, including the CPI, CPM, CPI(ML) and the Congress. The agitation is most intense in Gharsana and Raola towns in Sriganganagar district, but is also spread to Bikaner and Hanumangarh districts. The rally of over 10 000 farmers on Oct 16 was held after the expiry of a week long ultimatum for acceptance of their demands. During the week farmers had laid siege to the Dan Mandi area in Gharsana. Their main demand was implementation of the agreement reached with the govt on Dec 11, '04 after the agitation in Oct-Nov 2004. During the week, the govt refused to enter into a dialogue with the govt and said that 5.23 cusecs of water per 1000 acres was being given by turn and there was no reason for agitation. On Oct 16, police beat up the agitating farmers after which indefinite curfew was imposed in the two towns on Oct 17. At least fifty people were injured. A number of leaders of the Samiti were arrested. On Oct 20, Police beat up the people in 17 KD & 12 KND villages, where even kids and old women were not spared.

Chandu Ram Saran from 10 LM in Anupgarh tehsil, who was injured on Oct 16, succumbed to his injuries on Oct 24. Farmers agitated over the dead body of Chandu Ram, demanding a compensation of Rs 5 lakh, employment to a member of his family, release of arrested persons and enquiry into the incidents. On Oct 30, the state govt agreed to give Rs 5 lakh compensation to the family of the farmer. On Oct 31 the body of the farmer was cremated. On Nov 1, Parmeshwari Devi (age 60) of 17 KD village, who was victim of police repression on Oct 20 died and farmers were very agitated. The farmers continued the agitation and declared mahapadav at Kajuwala from Nov 6.

The Genesis Two years ago four farmers were killed when the agitation had to face police firing. The seeds of the trouble were sown in 1975 when unrestricted water was available to the farmers of Sriganganagar and Hanumangarh districts in Phase I of IGC. The farmers got used to getting a lot of water, much beyond their due share till the Phase 2 was developed. However, once phase 2 started, they had to share the water with farmers from Bikaner, Jaisalmer and Barmer, which meant less water for the farmers of Sriganganagar and Hanumangarh than what they were used to. The agitation has the backing of traders as less water means less crop and less trade. Farmers want 5.23 cusecs per 1000 acres, but officials say such demands, which amount to 58% of the total water available in IGC cannot be met. Though Rajasthan is supposed to get 8.6 MAF (Million Acre Feet) from Punjab under the 1981 agreement, what they actually get is about 8.0 MAF from the Pong reservoir. The Punjab-Rajasthan dispute is before the Supreme Court.

Seeds of conflict in Gujarat Similar situation is fast developing here. In the initial reaches of the Sardar Sarovar Main Canal, farmers are now getting used to having unrestricted amount of water. However, the water they are using now is much beyond their share & once further phases of command area is developed, similar conflicts could develop. (The Hindu 12x06, 18x06, 19x06, 27x06, 021106, The Hindustan Times 18x06, 19x06, The Tribune 17x06, 19x06, 31x06, *Dainik Bhaskar* 21x06)

GROUND WATER

Macro picture As per a new report from Ministry of Water Resources, out of utilisable GW resource of 399 BCM (Billion Cubic Meters), 231 BCM (58%) is presently under use, 213 BCM for agriculture and 18 BCM for water supply. However, many areas are using over 100% of utilisable GW and are in fact depleting the levels. (*Amar Ujala* 08x06)

Haryana: Deteriorating quality reduces wheat yield 54% of the GW in Haryana is not fit for irrigation, due to which wheat yield has reduced by 321 kg per ha over the past 5 years. The state wheat production has reduced by 8 lakh tonnes as wheat is grown in 60% of cultivable land in the state. (*Business Standard* 06x06)

Orissa A recent Central Ground Water Board report says that GW levels had dipped at many places in 24 out of the 30 districts. The state govt had prepared a draft bill in 2000. The draft bill provided for the setting up of a body to be called Ground Water Authority. But the draft bill could not be converted to an Act even five years after it was circulated. In 2005, a new legislation was proposed to regulate the GW. Since then, nothing has

happened at the govt level. The state govt constituted a Ground Water Survey & Investigation Board in 1995 to assess the amount of exploitable GW and to suggest ways for its judicious use. It took the Board a full decade to complete its assessment. As per the recently completed assessment, Orissa has 21 BCM GW. The annual use of GW for various purposes is 311 BCM (14.81%). Out of this, drinking water is being supplied through 2 lakh tubewells, while 236 BCM is being used for irrigation. (*WaterWise* Jan-Feb '06)

Vasant Kunj Mall violates norms The Ministry of Environment and Forests have acknowledged before the Supreme Court that the entire Vasant Kunj Mall project was illegal as it had come up on Ridge land, which is a water recharge zone. The Delhi Development Authority and specially those officers who sanctioned those projects had not exercised necessary environmental caution while taking up the plan should be identified and prosecuted said the petitioner Onkareshwar. Keeping in mind the deteriorating ground water level very fast in the ridge area of Delhi it has been suggested that the ridge area as a whole should be declared as a ground water sanctuary. (THE HINDU 100806)

WATER OPTIONS: AGRICULTURE

Unique cooperation for catchment protection Two Villages in Kuhan micro watershed in Kangra district in Himachal Pradesh have arrived at a unique agreement to protect the small dam from siltation in Kuhan village. The dam had silted by a third in just two years, by 2004. Kuhan village in 2005 signed an eight year agreement with the upstream Oach Kalan village to protect an erosion prone hill side by stopping grazing. In return, Kuhan has paid Rs 1150 for saplings planted in the protected area. The money was collected in Kuhan from those using water from the small dam. The agreement has held for year now and the pradhans of two villages expressed satisfaction. HP Eco Development Society, an NGO, has helped make this possible. (Splash '06)

Water Management vs new big dams According to the experts at the World Water Week in Stockholm, there is no shortage of water in the world but there is a crisis of management. Head of the Third World Centre for Management in Mexico City has said many developing nations are wrongly putting emphasis on expensive projects like dams or diversion of rivers. Simpler & easier option is to fix the leaks. In mega cities 40-60% water never reaches the customers because of leaks & poor management. Better management, rainwater harvesting and use of simple manual water pumps can solve the water problem. (THE HINDUSTAN TIMES 230806)

Some important water facts According to some water experts labeling foods to show how much water is used in their production (water needed for irrigation beyond rainfall) could help combat pressure on the water supplies. Typically, a calorie of food demands a liter of water to produce, according to UN estimates. But a kilo of industrially produced meat needs 10,000 litres while a kilo of grain requires just 500 - 4,000 litres.

- One in every three people lives in regions with water shortages. It is projected that demand for water, led by irrigation, was likely to almost double by 2050.
- Irrigation takes 75% of all water used by humans.
- Producing meat, milk, sugar, oils and vegetables typically requires more water than cereals.
- Arid countries might even face trade barriers if they exported water-intensive crops. Arid Australia exports meat to countries where water is far more plentiful. Israel and Jordan were among countries who learnt a need for water efficiency in agriculture and trade by producing export crops such as citrus, olives, figs or avocados that need relatively little water to produce. (REUTERS 230806)

Ghunesh village sets example in Orissa The people of Ghunesh village in Tureikela block in Bolangir district has over the last decade, through local water systems, transformed itself from a food deficit village to food surplus one. The seasonal migration of people from the village has come down from 70% to 10%. In three years from 2000, 11 *mudas*, (small structures in the upper reaches that facilitate seepage irrigation), three *chahalas*

(a small tank dug inside a tank that stores water when the water level goes down during summer) and five wells were constructed and nine wells repaired. Surface runoff was checked by embankments at all low-lying places. They have started protecting a forest patch. Vikalpa, an NGO, has helped achieve this. (WaterWise Jan-Feb '06)

Tanks restoration projects The water resource ministry has approved 24 projects in 14 states for repair, renovation & restoration of 1,116 water bodies for addition of irrigation potential to 1.48 lakh ha at a cost of Rs 299.79 crores. The Centre has released its share of Rs 99.3 crore. (THE FINANCIAL EXPRESS 280806)

PM plan just on paper There is no planning to carry forward the PM's promise to construct 500 check dams every year in the next three years in the six Vidarbha districts of Wardha, Amravati, Yavatmal, Akola, Buldhana and Washim. There is no action plan, nor are any sites selected. (THE TIMES OF INDIA 070806)

WATER OPTIONS: URBAN WATER SUPPLY

RWH in Mumbai 250 families of the 33 storied building in Powai this year invested Rs 1.4 lakh in simple rainwater harvesting: diverting the open pipes from the top of the building to an underground tank and saved Rs 1 lakh from its annual Rs 3.6 lakh water bill. If Mumbai harvests 20% of its rainfall, it can add 600 ML per day to its supply, more than sufficient to bridge the current gap of 550 MLD between supply and demand. Only 3% of rainwater received in Mumbai now gets stored in lakes of groundwater, 97% flows away. (The Times of India 05x06)

WATER PRIVATISATION

Bangalore The recent Karnataka govt order implies that foreign private companies may have a role in managing the piped water supply to the eight urban local bodies around the City. Urban Development Dept approved a proposal of UK-based 'non-profit organisation'- Water and Sanitation for the Urban Poor- to "develop models for improving water & sanitation services" in the Greater Bangalore Water Supply & Sewerage Project. The order states that WSUP will conduct pilot projects in 3 slums. Earlier attempts to privatise water in Bangalore in 1998-99 were thwarted following opposition by employees. Later, Thames Water was contracted for leakage prevention, which, too, was stalled. (Deccan Herald 160806)

BOTTLED WATER

Pesticide in soft drinks The Centre for Science and Environment has again exposed the presence of 3-5 different pesticides in the samples they have analysed. The study was conducted on 57 samples of 11 soft drink brands from 25 manufacturing plants of Coca-Cola & Pepsico, spread over 12 states. The levels in some samples exceeded the BIS standards by 140 times for the pesticide Lindane. Haptachlor, banned in India was found in 71% of the samples, at levels four times higher than BIS standards. (THE HINDU 030806, 110806)

FLOODS

Releases from Manikheda Dam kills people Sudden release of large quantity of water from Manikheda dam on Sind River at Basai Ghat in Shivpuri district in Madhya Pradesh has led to death of at least 39 people in Datia district in the downstream area. People who were crossing the river on foot on a religious occasion to visit the temple at Ratangarh were washed away on Oct 1. The CM visited the place, announced compensation of Rs 1 lakh to the family of dead and a judicial probe into the incident by a retired high court judge. The SDM and the SDOP of Sevdha were suspended for negligence. Gwalior commissioner claimed that power generation at the Manikheda dam was stopped on Sept 30 night. In April 2005, about 70 people were killed at Dharaji in Dewas district in MP due to sudden release of water from the Indira Sagar Dam of NHDC, where those responsible are yet to be punished. If officials are allowed to go scot free after such serious incidents, there would be little deterrence for them so that they are careful in future.

The Dam has already installed power capacity of 40 MW (Full capacity is 60 MW, the third generator of 20 MW is under installation), which started power generation in Sept 2006. In Sept, the dam produced 12.28 MU power. According to Govt of MP website, the water from the dam will be diverted to Harsi dam on Parvati River so that some 58 000 ha of existing irrigation facilities can be on surer footing. This is part of the World Bank funded MP Water Sector Restructuring Project. The project is also getting money from the centre under Accelerated Irrigation Benefits Programme. (*Dainik Bhaskar, Rashtriya Sahara, Hindustan 02x06, 03x06, The Hindu, IANS 03x06, Central Chronicle 04x06*)

When Dams Bring Flood Disasters

Maharashtra Apart from damage of about 2.5 lakh ha land due to flood Maharashtra has also lost 1000 tmc of water. According to the govt officials dams had released water as they have exhausted their storage capacity. Over 2.8 lakh persons have been rendered homeless. Embankments on the river are seriously damaged.

➤ 2.5 lakh cusecs of water released from Jayakawadi dam has flooded Nanded, Parbhani, Beed and Jalna districts of Maharashtra.

➤ Due to floods 14 districts have been affected. 9000 villages had been declared as flood hit, with several thousand houses fully or partially damaged. Relief and rehabilitation minister has proposed setting up of an expert committee to analyse dam related floods.

Mumbai was again flooded this year, just like in '05. Nanded, western Vidharbha become flood affected. Painganga River has been in spate in Yavatmal district, leaving about 1300 people stranded. People living along the banks of the Godavari had been alerted after the

irrigation department released 11 610 cusecs water from the Gangapur dam. Pandharpur town and 90 villages around were under high alert following the release of 3.23 lakh cusecs water from several reservoirs in the Bheema valley.

According to MP of Sangli, Pratik Patil, "It is a manmade disaster. Neither Maharashtra nor Karnataka has a proper water management system." Maharashtra blames Karnataka for not releasing water from the Almatti dam that leads to inundation of villages that lie in its backwaters. Maharashtra's largest HEP, Koyna, on the other hand releases water to the Krishna river every monsoon leading to flood every year.

Karnataka Bhima River along the Karnataka-Maharashtra border have

Victim of Maharashtra's unscientific methods of storing and releasing of water

flooded at least six residential plots and destroyed standing crops on large tracts of land in Indi and Sindagi taluks. It has recorded 3.16 lakh cusecs water flow. Water level of Bhima River has increased due to discharge of water from Ujjini and Veervatkal dams in Maharashtra. Five villages in Indi Taluka and one in Sindgi taluka were completely surrounded by water. Krishna River is getting more water because of torrential rain and release of water from dams in Maharashtra. About 1.62 lakh cusecs of water was being let out into the Krishna River from Koyna dam in Maharashtra. According to the district administrator 56 out of 71 villages are affected and surrounded by flood water. The outflow from Almatti dam was 2.78-3.01 lakh cusecs.

➤ Red alert has been sounded in Bellary district as the water level in Tungabhadra reservoir has reached to the maximum level of 1633 feet. It was expected that the reservoir could release 1.45 lakh cusecs water.

➤ Rs 250 crore has been announced by the Centre for flood relief in six districts - Bidar, Raichur, Bijapur, Bagalkot, Belgaum and Gulbarga in N Karnataka.

From 2002 - 2004 N Karnataka had faced acute shortage of drinking water and at that time Maharashtra had released water from Koyna reservoir in exchange of money. Karnataka paid Rs 8 crore for 10-12 tmcft of water during that period. But in '05 & '06 Maharashtra has received copious rainfall which caused over flowing of reservoirs & release of huge quantities of water which has flooded Belgaum, Bijapur, Bagalkot districts of Karnataka. Lack of coordination between two states is the main cause of such disaster. Deputy Commissioner of Bijapur has stated that he had never received any official communication about water releases. Ironically all five taluks of Bijapur have not received any rainfall for the past two months and all those taluks are facing drought like situation. (THE FINANCIAL EXPRESS 100806, THE HINDU 070806, 110806, 120806,140806, 310806, THE TRIBUNE 130806, THE INDIAN EXPRESS 130806, THE TIMES OF INDIA 150806, 180806, DECCAN HERALD 180806)

Dams, Embankments bring floods in AP This year 14 districts were affected and the worst hit were the Khammam, E Godavari, Visakhapatnam, Srikakulam and Vizianagaram. 106 people have died and 5.42 lakh people had been evacuated to 455 relief camps. Dams and embankments constructed for flood control measure failed to control the floods. State govt official admitted that dams became a major cause of the floods. State also blamed dam authorities for storing excess water before the onset of monsoon. According to the National Institute of Disaster Management the flood problem in Andhra Pradesh is due to acute drainage problem of the Godavari and Krishna rivers. Embankments have disrupted the natural drainage system in flood plains.

Though the water level in the river of Godavari receded by Aug 8, due to full moon day high tide in the Bay of Bengal some 25-30 lakh cusecs of water was not entering into the sea as the tide is pushing it back to villages near two of the seven confluence points- Mukteswaram and Kotipalli Revu. 350 villages mainly in the Konaseema area of E Godavari, were marooned.

Villagers along the Krishna River in AP are under threat because of discharge of 5.2 lakh cusecs of water from Nagarjunasagar to Prakasam barrage. The Nagarjunasagar dam has also received heavy inflow from Jurala and Srisailem reservoirs. (THE HINDU 090806, THE INDIAN EXPRESS 130806)

Gujarat Central & North Gujarat were flood affected and 70,000 people were evacuated due to release of water from Kadana, Vanakbori and Panam dams. Govt of Gujarat claimed that flood situation was created mainly because of excessive discharge of water from Mahi Bajaj Sagar dam in Rajasthan, which entered the Kadana Dam of Panchmahal district and started flooding parts of central Gujarat. The situation was repeated a number of times during the monsoon. A high alert has been sounded in districts of Anand, Kheda, Davodara, Panchmahals, and Ahmedabad districts as the administration ordered release of 17 lakh cusecs of water to Mahi River from three dams. 2.25 lakh cusecs of water was released from the Dharoi dam and it was expected to increase to 3 lakh cusecs. (THE INDIAN EXPRESS 130806, FINANCIAL EXPRESS 170806, THE HINDU 200806)

Surat floods: Editor arrested for criticizing govt In an editorial, the editor of a city base newspaper *Samna* had accused Gujarat CM and various govt officials of having failed to properly handle the recent floods in the Surat city. Police arrested the editor of on the ground of anti-national activities including "instigating people against a duly elected government" and defaming senior officials and executives. Surat Based journalists in response had taken out a rally and submitted a memorandum to the Collector. The memorandum said the govt had imposed a virtual censorship over the media and was refusing to divulge any information on the floods. (THE HINDU 300806)

Embankments bring floods in Uttar Pradesh Ghaghra river, which flows from Nepal have flooded many areas in Bahraich district of Uttar Pradesh. Heavy rainfall in its catchment has breached several embankments, causing floods. 70 villages in Nanpara and Mahsi tehsils had been cut off from the rest of the region. It has been reported that despite the advance warning from CWC no effort had taken to plug the breach in the Belha Bahrauli embankment. The Bahraich district magistrate stated that these were flash floods caused by the water gushing out from the breach. The same river also devastated Sirauli Ghauspur, Ramnagar, Ram Senehi Ghat and Rudauli tehsils of the neighbouring Barabanki district in the downstream. Three engineers of the irrigation department have been suspended for negligence in work. (THE HINDU 210806)

Orissa 16 districts have faced flood, 16 lakh people in 6498 villages in 101 blocks were marooned. 1.54 lakh ha were affected and 42 743 ha were damaged. Sand cast has destroyed 15 783 ha farmland. (THE FINANCIAL EXPRESS 100806)

WATER SECTOR

Hydrology project in HP The Himachal Pradesh govt has decided to implement the Rs 49.5 crore hydrology project to develop and improve an integrated and comprehensive hydrogeology data collection and information system for optimum utilization and sustainable management of water resources. Phase-II of the project would be implemented over a period of six years which envisaged establishing and monitoring of a network of river gauges, ground water observation, wells, rain gauges, snow gauges, fully climatic stations and water quality laboratories to prepare a data base of surface and ground water sources. (BUSINESS STANDARD 310806)

Arunachal to have Water Regulatory Authority Arunachal Pradesh govt had decided to have a Water Regulatory Authority and rename the irrigation and flood control dept as Water Resources Development Dept. It is only the second state after Maharashtra to have such an authority. (Assam Tribune 260906)

QUOTES

The whole of Orissa state will turn to a mass of barren and desert like lands in another 150 years.

Water Initiative Orissa (Press Release 011106)

If the pond dries up, one goes to the river. If the river dries up, one digs a pothole on the river bed. If the pothole in the river bed fails to yield water, one digs deep into the womb of Mother Earth to get the succor of life. And if the womb of Mother Earth also dries up, where does one go? That is the end of the sequel. Ground water is the last hope for a water starved population.

Editorial in WaterWise, Jan-Feb '06

INTER STATE ISSUES**Mullaperiyar: TN not bothered about safety of 111 years old dam**

The Water Resource minister of Kerala has urged the Tamil Nadu govt to give up its demand for increasing the water level in the 111 year old dam (built by British Engineer Colonel John Penny Quick, possibly the oldest dam of its size in Asia) from 136 ft to 142 ft (original designed water level was 152 ft and designed storage 15 700 mcft). After a visit to the dam site on Aug 6, he said that there was enough evidence to show that the dam was getting weaker by the day, causing concern to the 30 lakh people living in Idukki, Kottayam, Ernakulam, Pathanamthitta and Alappuzha. If Mullaperiyar dam fails, it would also pose threat to a number of downstream dams in Kerala, including the Idukki dam. Minister has also sought hike in the lease amount on water being used by TN, as TN earned Rs 17 crore from cultivation using the irrigation water from the dam. Under the agreement, the lease amount of Rs 30 acre is subject to revision every 30 years.

The Supreme Court had earlier in Feb '06 rejected the Kerala govt's review petition against the court's verdict allowing raising of the water level in the dam to 142 ft after taking certain steps. Kerala is now considering filing a curative petition. Kerala water resources minister suggested that one option could be construct a new dam in place of the old dam. This was also the LDF promise in Kerala during the recent assembly elections. Following an all party delegation from Kerala meeting the Prime Minister on Aug 31, the PMO is reported to be trying to solve the 25 year old dispute between TN & Kerala. A lease agreement valid for 999 years was signed between the Maharajah of Travancore and the British ruled Madras govt on Oct 29, 1886.

The live storage at 152 ft height is 10 600 mcft as the dead storage at 104 ft is 5100 mcft. After power generation, water let out into a small river called Vairavanar near Bodi in Theni district, which joins the Vaigai river to irrigate 1.5 lakh acres of first crop and 60 000 acres of second crop in the Cumbum valley and Periyar-Vaigai region. A decision was taken in 1979 to reduce the water storage behind the dam (managed by TN) to 136 ft following concerns of safety of the dam. At 136 ft, the irrigation potential is 70 000 acres.

Kerala Dam Safety Authority Kerala govt would seek the services of constitutional experts to handle the case filed by the Tamil Nadu questioning the validity the Kerala Irrigation and Water Conservation (Amendment) Act 2006, passed by the Kerala Assembly earlier this year. Under the Act, decisions on dam safety and adjusting the water level in the dams were vested with the Dam Safety Authority. Members of the Kerala Dam Safety Authority (KDSA) have advised reduction of the water level to 136 ft. The Kerala Dam Safety Authority would discuss all options including decommissioning of

the dam. Members of the Kerala Dam Safety Authority, after an inspection of the dam on Aug 20, decided to have a 10 day joint inspection along with TN officials. It has been decided to ask all three parties involved in the earlier inspection - the Water Resource Dept, the Centre for Earth Science Studies and the Kerala State Electricity Board to prepare separate reports for further discussion. TN had decided not to allow Kerala officials to monitor the dam continuously for ten days. Kerala retaliated by saying that the dam was on Kerala land given on 999 year lease to TN and TN's decision to deny permission to Kerala officials to inspect the dam could lead to Kerala considering other options including cancellation of lease. Kerala minister said that invalidation of the lease was possible under section 108 (m) of the Transfer of Property Act. Kerala govt has put the TN govt on notice after Kerala officials were refused permission to inspect the dam by TN govt.

TN has filed a suit in the Supreme Court, demanding that the Kerala Act of 2006 should be declared illegal and unenforceable. It said that the dam was important for irrigation in 0.8 lakh ha in TN districts of Theni, Dindigul, Madurai, Virudhanagar, Sivaganga and Ramanathapuram.

Meanwhile, two members of the KDSA belonging to the opposition parties resigned from the Authority so that state govt can present a strong position on the issue. Former water resources minister of Kerala, while writing to the Kerala CM about the resignations, said that he wanted the state govt to exercise its powers under the sections 57, 58, 62(a), 62(b) and 68 of the amended Irrigation and Water Conservation Act. The act has provisions to include dams that are above 40 years old under scheduled dams and decommission them if necessary. The law had declared 22 old dams as scheduled dams.

Dam in weak zone Centre for Earth Science Studies in their study have earlier reported that the dam is in the weak zone and there are possibilities of earth quakes of magnitude higher than six in Richter scale. According to a study commissioned by the govt, the dam will not withstand an earthquake of such magnitude with its epicentre nearby. On Aug 18 there was a tremor of 2.1 on the Richter scale with its epicentre 17 km from the dam site. On Aug 20 the govt asked the Dam Safety Authority to visit the dam site in 48 hours to assess the condition of the dam after the earth quake.

After a visit to the dam on Sept 2, the Kerala Revenue minister announced that a disaster management plan will be made involving the gram panchayats, non govt organisations and others. On Sept 15, Kerala Forest minister suggested that an Environment Impact Assessment of increasing water level behind the dam to

142 ft should be done as the increased water level would submerge over 600 ha of Periyar Tiger Reserve.

An all party meeting in TN on Oct 23 suggested that talks on the issue can held with Kerala under center's leadership if Kerala agrees to increase the water level behind the Dam. Kerala CM on Oct 24 rejected any condition for talks. (THE HINDU 050806, 090806, 200806, 210806, 220806, 300806, 030906, 100906, 160906, 260906, 25x06, The Financial Express 040906, The Tribune 050906, New Sunday Express 15x06)

Tamil Nadu-Kerala agreement on Sholayar The Kerala Sholayar reservoir under the Parambikulam Aliyar Project between Kerala and Tamil Nadu reached the FRL of 2,663 ft. According to the project agreement the reservoir should be full on Sept 1 and Feb 1 by Tamil Nadu which will ensure 12.3 TMC of water to Kerala. TN has so far fulfilled the agreement only nine times for the month of Sept 1 and only once for the month of Feb 1 between 1970 and 2004. In the last two consecutive water years reservoir reached FRL. (THE HINDU 020906)

Karnataka-Goa-Maharashtra Karnataka has urged for clearing Rs 100 crore Kalasa-Banduri water project. The

Kalasa-Banduri

project, it is claimed, is aimed at providing drinking water to over 100 habitation, including those in the Hubli-Dharwad region. Karnataka designed the project in 2000 to divert 7.56 tmc of water from Kalasa and Banduri, tributaries of Mahadayi river to Malaprabha reservoir (in Krishna basin). The Mahadayi River originates in Karnataka and passes through Maharashtra and Goa. The Centre gave in principle clearance for the project in April '02, but in Sept '02 the ministry of water resources kept the clearance in abeyance following objection from Goa, which said that Mahadayi River as water deficit river and water diversion to another basin would create negative impact on the basin. In fact, the then secretary, union ministry of Water Resources, had to resign from his post after it came to light that the union govt had given clearance to the project without consulting the states. Malaprabha Farmers Union president said that according to the CWC report yield in Mahadayi was 200 tmc. Karnataka's share is estimated as 45 tmc. He claimed that Goa and Maharashtra have come to an understanding on sharing of water by building a dam on the river in Sindhudurg district in Maharashtra.

➤ Karnataka govt has decided to go ahead with the project with or without central nod. According to the Karnataka minister for water resources civil work on the project would start by Oct. Farmers of the region have threatened to take up construction work on their own if the govt delays. Meanwhile Goa has requested the PM to restrain Karnataka from proceeding. Goa also threatened that if Karnataka is not restrained Goa may approach the Apex court seeking direction for staying the project and the setting up a tribunal. (THE FINANCIAL EXPRESS 220506, 140806 THE HINDU 020806)

RIVERS

Kali Bein rejuvenated After 6 years of dedication Kali Bein became a rivulet without any pollution. Earlier it suffered the burden of sewage of villages and towns situated on its banks over a stretch 160 km. Efforts by Sant Balbir Singh Seechewal and his hundreds of followers have changed the nature of that rivulet. He has requested villages and other municipalities situated on the both sides along the rivulet not to discharge sewage water into the rivulet. He has also created alternative sewage disposal facilities in various places. Donation from his followers of Rs 50 crore has been spent by the group for rejuvenation. Cleaning operation of the rivulet has also solved water logging in Dasuya and Mukerian in Hoshiarpur district as flow of water to the rivulet was restored. Ground water table in several parts of Kapurthala district has gone up. 200 cusecs of water releases has been ensured from Mukerian Hydrel Channel. Sewage treatment plants have been set up in Sultanpur Lodhi and Kapurthala Municipalities. The same are yet to be installed at Bholath and Begowal in Kapurthala district and Dasuya and Mukerian in Hoshiarpur district. Similarly, ponds located in 42 villages on the banks of the rivulet have been proposed to be repaired to check the flow of sewage to the rivulet. Punjab govt has sanctioned Rs 5 crore for the purpose.

⇒ The Punjab state govt in association with Eak Onkar Charitable Trust of Sant Baba Balbir Singh on Oct 30 announced a Rs 75 crore scheme to clean the rechristened holy Bein river and its catchment. In first phase, by Jan '07, sewage flowing into the river from 38 villages and seven towns of Hoshiarpur and Kapurthala districts would be stopped from entering the river. In second phase, sewage treatment plants would be set up for all these villages and towns. Regular flow of water would be facilitated from Mukerian hydro channel into the holy Bein from Dhnoya village to Harike. (THE TRIBUNE 140806, 170806, 31x06, see DRP June 2006)

Changing of river course by human intervention

Residents are constructing diversions to change the natural course of the rivulets which come down the Shivaliks across the districts of Mohali and Ropar. Hundreds of acres that form the bed of these rivulets are encroached upon as these lands are presently not carrying the same amount of water as before. The World Bank funded watershed project has helped as it started to harness waters 5-6 years ago, leading to drying up of the rivulets. The rivulets do not hold any threat as the release of water has been restricted and only small amounts of water is being released. In the border villages near Haryana in Mohali district passages for walking along the rivulets have vanished and people are forced to wade through the deeper parts of the rivulets. Since river are obstructed with stone abutments, the water flow has changed course at places during rains, damaging nearby property. (THE TRIBUNE 040806)

WATER POLLUTION

Ranipet: among top ten polluted sites of the world

Ranipet, a small town about 100 km SW of Chennai in Vellore district along the Palar River in Tamil Nadu has been listed among the world's top ten worst polluted places. The list has been brought out by the Blacksmith Institute, New York. The report available on the website of the institute (www.blacksmithinstitute.org) says that due to the accumulation of 1.5 million tons of solid waste from tanneries over the last two decades, including hexavalent chromium and azodyes, have put some 35 lakh people in the basin under risk as toxics have been leaching into the groundwater from the open cast dump. The reports says, "The contamination of the soil and groundwater with wastewater, as well as run off from solid wastes has affected the health, resources, and livelihood of thousands of people in a residential colony about 1 kilometer from the factory. Three open wells, a dozen bore wells and about 25 public hand pumps have been abandoned due to high chromium levels in the water. Agricultural land about a kilometer from the factory has also been affected... Farmers who have the misfortune of cultivating this toxic land claim that the toxic waste from the nearby tanneries degrades the fertility of the land citing that "invariably, only one in five crops does well." Farmers also complain of the foul smells which emanate from the very water they use to irrigate their fields claiming that, "when we come in contact with the water we get ulcerations on our skins and it stings like an insect bite"... In 1996 the government shut down Tamil Nadu Chromates & Chemicals Ltd, the factory responsible for an estimated 1.5 million tons of untreated chromate sludge... The Tamil Nadu Pollution Control Board authorities have assigned the National Geophysical Research Institute and National Environmental Engineering Research Institute to design and implement remediation plans to cleanup this site."

Among the other Indian places that figures in the race, but missed out the "honour" were:

- ⇒ **Bhopal** Thousand killed in 1984 Union Carbide (now Dow) MIC leakage,
- ⇒ **Kanpur** 30 000 residents of Noraiakheda near Kanpur are affected due to the groundwater pollution due to tanneries in Kanpur, chromium level here is very high),
- ⇒ **Kolkata** Upto 50 000 people are in lead pollution risk zone in Tiljala in eastern Kolkata where 34 secondary lead smelters are operating. In Picnic Gardens area there are 27 lead factories. The toxic products of these factories have grossly affected the health of the population. A survey conducted by the Chitranjan Cancer Research Institute revealed symptoms of upper respiratory problems found in 41.3% of urban and 13.5% of rural subjects, while lower

respiratory tract symptoms were found in 47.8% of urban people in contrast to 35% of rural controls.

- ⇒ **Vapi** 71 000 people here are in the area affected due to an industrial estate with 2500 chemical factories set up in 1967. CPCB declared it critical in 1994.
- ⇒ **Ankaleshwar** On the banks of Narmada river in Bharuch district in Gujarat, the Ankaleshwar Industrial area over 16 km² is producing 250-270 million liters liquid waste per day (about 5% of India's total liquid waste) and 50 000 tons solid waste annually. The groundwater used by about 150 000 people is already polluted with heavy metals and chemicals.

Water Pollution leads to Farmer Suicide When a farmer committed suicide in Medak district in Andhra Pradesh, just 25 km away from the state capital, few noted that he was a wealthy farmer till mid 1990s, but was deep in debt when he died. His land, like that of thousands of other farmers in the nearby area, became infertile due to the illegal discharge of industrial effluents into the nearby water bodies by industries in Patancheru, Kazipally, Gaddapotharam and Pashmailaram industrial development areas. Following a petition in the Supreme Court, the apex court ordered that farmers are to get compensation for the loss of productivity of their land. Initially they got some compensation, but the last time they got it was in 1998 when they got Rs 1300/ acre per year. The damaged area in 1999 was 975 acres has now gone upto 1900 acres, but land eligible for compensation is just 300 acres. It seems we are going to see more farmer suicides like these in future. (Splash Oct '06)

Ghaggar pollution The drainage wing of Punjab Irrigation department has issued notices to about 30 industries in Patiala and Mohali districts to stop discharging untreated effluents into various drains, tributaries within a month otherwise legal action would be taken against them. About 3000 cusecs of effluents had been found to be flowing into the River Ghaggar. Apart from industrial effluents the sewerage water of Samana Mandi, Nabha city and Patiala, waste water of rice mills of Samana Mandi were being discharged into various drains and tributaries. (THE TRIBUNE 250806)

Ganga, Yamuna, the Govt, the SC and the media A large number of plants installed under the Ganga Action Plan & Yamuna Action Plan are not functioning properly. The rate of non-compliance of sewage treatment plants to operational norms is 17% in Delhi, 50% in Haryana, 64% in Uttar Pradesh, 66% in Uttaranchal and 100% in Bihar. CPCB says that annually 29 000 MLD of sewage is generated from Class-I and Class-II cities and towns while the capacity of treatment is about 7000 MLD.

- ⇒ On Oct 10, the Supreme Court again rapped the govt for failure to clean the Ganga and Yamuna rivers even after spending hundreds of crores over action plans for each of the rivers and the media faithfully reported the same. So what's new? This seems to be

repeated every few weeks. The court has asked the Ganga basin states to file status reports by Oct 31. The Court noted that a plethora of committees including a Central Ganga Authority headed by the PM, the Steering Committee under the Secretary, Planning Commission and the National River Conservation Directorate are responsible for the River cleaning, and on top of it, the apex Court has been monitoring the scheme. Only 39% of the primary target set out under the GAP has been achieved so far. According to the WHO, one person dies every minute due to water borne disease in the Ganga basin. Govt Counsel Vijay Panjwani told the court that he intended to withdraw from the case he cannot come out with excuses every time. The bench was angry as despite order on March 31, the parties had not filed status reports. (THE TRIBUNE 310806, UNI, DNA 11x06)

Budha Nullah Thousands of industrial units of Ludhiana discharge toxic waste into Budha Nullah, which finds its way to Harike through the Sutlej. The Nullah has further polluted the groundwater, Central Ground Water Board confirms. Even through the Municipal Corp has banned use of handpumps (and has dismantled a few handpumps), for most slum dwellers, they provide the only source for drinking water. Alarming, a few industries have dug tubewells in their premises to pump the untreated effluents into the groundwater. The low water table (30 feet) is making the situation worse. There is little freshwater flow in the Sutlej after the construction of Bhakra dam, says Dr G S Dhillon, well known water expert. Punjab Agricultural University has found that the concentration of heavy metals like lead, chromium, cadmium and nickel in the ground water around Budha Nullah is 21, 133, 280 and 300 times higher respectively than the permissible limits. Ludhiana's groundwater is polluted upto 1200 m on the right side of Budha Nullah and upto 300 m on the left. Another study by department of Soils has found that the level of Chromium, nickel, cadmium and lead in the soil irrigated by sewage water is 35.5, 14.3, 3.6 and 1.8 times higher than in tubewell water irrigated soil respectively. These metals are getting absorbed into crops. The Nullah had 56 species of fish till 1960s, which dropped to 18 in 1970s, 4 in 1984 and none, not even plankton today.

Following the Tribune reports in Aug '06, a petition was filed with the Punjab Human Rights Commission, which sought action of the violation of health, human and environmental rights of the people of Ludhiana due to criminal negligence and corruption among officials of concerned govt departments. A committee on the Clean Budha Nullah Project was formed by the Human Rights Commission and state CM. In its preliminary findings presented at a meeting on Nov 1, the committee suggested conducting a comprehensive ecological survey to ascertain the health impacts of the pollution of the Nullah and an intervention plan, both by an independent body. (THE TRIBUNE 290806, 310806, 021106)

Periyar River polluted again Increasing incidents of pollution of the Periyar have again triggered widespread protest by residents of Eloor and Edayar of Kerala. Two years after the Supreme Court Monitoring Committee on Hazardous Wastes levied a collective fine of Rs 2.5 crores on industrial units, Eloor residents feel that the river has once again turned into a dumping ground for toxic and other industrial effluents. The Pollution Control Board has not taken any concrete action on complaints.

On Sept 6, the water of Periyar suddenly became discolored due to foul play by some extraneous elements according to the Pollution Control Board. The Periyar Malineekarana Virudha Samithi alleged on Sept 25 that the Board was trying to shield industrial units that dumped toxic effluents into the river. The environmentalists also protested against the delay in revamping the PCB by the State Government in spite of a directive from the Supreme Court Monitoring Committee on Hazardous Waste in this regard. (The Hindu 230806, 260906)

Fish pond to check pollution The Himachal Pradesh State Environment and Pollution Control Board has decided to make it mandatory for all industrial units to maintain fish ponds within the premises and pass treated waste water through it before releasing to nullah or river. Despite the claim of installation of effluent treatment plants by industrial units fresh cases of fish deaths in the river have been reported frequently. According to the plan in case the waste water is not properly treated the fish in premises tank will die first. It is hoped that this make the industrial units operate their effluent treatment plants properly. (THE TRIBUNE 190906)

Goa PCB orders closure The metallurgic, sponge iron and alloy units have run into controversy over air and water pollution. The Goa State Pollution Control Board has shut down 15 industrial units, including 10 in Cuncolim industrial estate of south Goa, on the grounds of pollution. A petition has also been filed in the Goa High Court. The industries also blame the ensuring assembly elections for the action. (Business Line 26x06)

Closure notice by GPCB Gujarat Pollution Control Board has issued a notice to a pharmaceutical plant of Alembic Ltd in Panelav after getting evidence of water contamination. Since 1997 farmers of Panelav region have been demanding action on this issue. (THE INDIAN EXPRESS 260806)

Award to informant GPCB have awarded a person with Rs 5000 for information about two units, Dhanlaxmki Paper Mills and Hindustan Coca Cola, releasing untreated effluents into Khari cut canal on the outskirts of Ahmedabad. Board in a statement mentioned they will encourage such information. In Feb '06 GPCB announced rewards for giving information about errant units. (THE INDIAN EXPRESS 300806)

THE NEPAL PAGE**Debate about storage projects & Hydro projects for export of electricity**

Nepal authorities are currently reviewing proposals submitted recently by several Indian private sector companies for conducting feasibility studies on sizeable projects including the 600 MW Budhi Gandaki, 402 MW Arun-III and 300 MW Upper Karnali. This is the first time India's private sector has shown interest in hydropower generation in Nepal. The ministry for Water Resources has constituted a technical team to review the proposals. Select proposals will be presented to the cabinet for approval.

However, expressing reservations about projects for export of power, Ajay Dixit of Nepal Water Conservation Foundation argues that today Nepalese are capable of building small-scale hydropower projects, as demonstrated by Chilime, and this achievement should be consolidated. "We are facing power cuts. The electricity we consume is one of the most expensive in the world. Why go for export when there is a market in the country? Let's build cheap projects, reduce electricity tariff and shift energy consumption from traditional sources to electricity. Let's not export raw electricity, but rather use the electricity to manufacture value-added goods and compete in the global market." Energy economist RS Shrestha agrees that the time is not right for entering into agreements on projects intended for power export. Nepal's annual rise in power demand is 10 percent, which means we require at least one project of 60 MW size added to the national grid every year.

Storage projects Despite the risk of getting entangled in further disputes on water sharing, Nepal government's policy does not shelve storage projects. "We don't have reservations on awarding storage projects to private investors from India or other countries," said Jay Kishore Mackay, director general of Department of Electricity Development.

Many experts argue that storage projects, by virtue of involving regulated sharing of water, attract Article 126 of the Constitution of 1990 (also incorporated in the draft of interim constitution), which requires that all treaties that have long-term, serious and pervasive impact need to be ratified by two-third majority of parliament. Gyanendra Lal Pradhan, general secretary of Independent Power Producers' Association of Nepal, says that storage projects should be left alone, "We should not touch storage projects. It will entail water sharing. Water will be a valuable asset in a few decades. The government should award only run-of-river projects to foreign private investors. Run-of-river projects won't involve water sharing and won't cause displacement as well". Santa Bahadur Pun, former managing director of Nepal Electricity Authority also gives a big "NO" to storage projects. "Let's allow the building of run-of-river projects only." (Kathmandu Post 08x06, 09x06)

Kulekhani III Under Construction Nearly two decades after the construction of Kulekhani II storage project, construction of the 14 MW Kulekhani III storage project is now underway. Nepal govt had requested the govt of Japan seven years ago for assistance to build the project. With Japan's reluctance to assist in the project construction, Nepal Electricity Authority and the govt went ahead with the construction two months ago. Out of the total project cost of Rs 2.3 billion, NEA is bearing 75 %, while the govt has agreed to bear the rest. The project will use water released by Kulekhani II as well as other rivers, channeled through a four kilometer tunnel to a powerhouse that will be located in Sanutar, Bhaise VDC-6. The project is expected to start commercial operation in March 2010. (The Kathmandu Post, 13x06)

Norwegian Company for U Tamakosi HEP The 309 MW Upper Tamakosi HEP has been given priority in the budget this year. A Norwegian company has proposed to Nepal Electricity Authority regarding the joint construction of the project. The company has stated that it was willing to provide as much as possible opportunity to NEA and Nepalese investors and will then arrange the remaining funds to finance the project. A delegation of officials of Statkraft Norfund Power Invest, a Norwegian company met with Water Resource Minister, Secretary and NEA officials and presented their proposal for Rs 30 billion joint venture. Norway has been involved in project identification and feasibility studies. (www.sari-energy.org 160706)

China Loan for Upper Trishuli The govt is finalizing an agreement to use concessional credit committed by the Export Import Bank of China to build the 61 MW Upper Trishuli HEP. A team from the bank recently committed US \$ 200 million in concessional credit to Nepal and agreed to spend US \$120 million out of that for building a hydropower project. The Nepal govt has chosen Upper Trishuli for this. With the commencement of construction, NEA will simultaneously construct the 44 MW Upper Trishuli B with internal funds. Upper Trishuli B will require comparatively less investment in infrastructure as it will use the flow in Upper Trishuli's tail race. (Kathmandu Post 220906)

North South Transmission Lines & Kabeli HEP Private sector has not been that much enthusiastic to invest in the HEPs in Nepal due to the absence of North-South transmission line, an official at the Dept of Electricity Development said. More than 230 licenses have so far been issued to various companies and firms since the introduction of the Electricity Act, 1992, and Electricity Regulations, 1993, but half of them have been cancelled as they found it too expensive to invest in the transmission lines, besides financial crunch. One such project is the 30 MW Kabeli project, being developed by mobilising 40 % of the World Bank's Power Development Fund. (The Himalayan Times 230906)

THE BANGLADESH PAGE

Ministers fail to reach agreement A meeting on Sept 20 between the water resources ministers of Bangladesh and India failed to reach any consensus on issues relating to the border Rivers. "We discussed different issues at the meeting but nothing was resolved" said Bangladesh Water Resources Minister Hafizuddin Ahmed after the daylong meeting on how to protect against erosion by the trans-border rivers. (The Daily Star 210906)

Proper study on Buriganga demanded Speakers at a rally in Dhaka urged the govt for not building a bridge over the river Buriganga without conducting proper feasibility study. They said the Buriganga River is almost close to death because of excessive pollution, illegal encroachment and rampant commercial use by the unscrupulous people. Another bridge over this river without proper study will further aggravate the situation. Buriganga Bachao Andolan, a component of the environmentalists' forum Bangladesh Paribesh Andolan, organised the rally. (The Daily Star 260806)

Rivers and Peoples of South Asia On Aug 11, the Transboundary rivers Group of Bangladesh Poribesh Andolan in association with the Civil Engineering Division of Institution of Engineers Bangladesh organized a Seminar on *Poor People, Poorer Rivers: Growth Paradox in South Asia*. (BAPA e-Bulletin 250806)

Indian Projects opposed Minister for Local Government, Rural Development and Cooperatives Abdul Mannan Bhuiyan said the proposed River-linking Project, Tipaimukh Dam and Gajaldoba Dam project of neighbouring India are threatening the ecology of entire Bangladesh. Addressing the inaugural session of an international conference on *Trans-boundary Rivers: Cooperation in South Asia* on Aug 8-9, he emphasised the need for taking a regional and global approach to readdress the upstream diversions. International Farakka Committee, a New York-based organisation, arranged the conference. It ended with a call for formation of three regional river commissions, one each one for the Ganges, the Brahmaputra and the Meghna basins comprising the co-riparian countries. The recommendation also urged the Indian government to abandon the Inter-Basin River Linking Project. (The Nation 090806, 100806)

USAID study for South Asian Electricity Grid The Bangladesh Power Division held a meeting with the United States Agency for International Development for conducting a feasibility study on interconnections between Bangladesh's power grid and India's eastern and northeastern grids and gave consent to the USAID representatives for conducting the feasibility study. The feasibility study is likely to be completed by September '07. The power division has suggested the USAID to initiate a regional electricity interconnection deal instead of bilateral agreement involving all the countries of the South Asian Association for Regional Cooperation. BPD have requested the USAID to include Nepal and Bhutan with this trans-border electricity interconnection. The power ministry, in May, nominated two consultants for a USAID team that will design plan for a feasibility study on import of electricity from India. The feasibility study will be conducted under the USAID's South Asian Regional Initiative for Energy (SARI/Energy) programme. The USAID is supporting the development of feasibility study for electricity interconnections. The USA-based Nexant Company, Power Grid Corporation of India, Bangladesh Power Development Board and Power Grid Company would jointly undertake the feasibility study. Meanwhile, the Asian Development Bank has expressed its keen interest to invest in the project feasibility to import 300 MW hydropower from Meghalaya. (The New Nation 010806, Financial Express (BD) 020806)

River Basin friends: People driven flood forecasting

The River Basin Friends is a people's network in which more than 300 organizations located along the GBM basin and more than 1000 people of different disciplines and locations of the basin areas are associated. The network also circulates flood forecasting messages from its upstream location to the downstream locations. Though the Central Water Commission (Govt of India) and Indian Meteorological Department give the flood forecasting messages to different agencies, departments and on their websites (<http://www.india-water.com/ffs/index.htm>), but the messages have regional context and the information is not sufficient for local level forecasting and the information can not reach to the people at the vulnerable locations. So River Basin Friends with its own initiative and support from the organizations and people in the network initiated a flood early warning mechanism which reaches to the people at downstream at Bangladesh. The central hub at Village Akajan in Dhemaji District of Assam collects information from different sources and peoples' network in the up stream locations of river Brahmaputra and its major tributaries over phone and email. This information is then processed based on correlation of different background information, statistical and operational analyses. The final flood early warning messages are then formulated for different vulnerable locations in the areas and disseminated to these locations through different Medias.

This has been going on quite effectively at least for the last three years. More in-depth study of this remarkable initiative needs to be done as it has the potential to provide lessons for many other communities. (*Flood forecasting and experience of River Basin Friends network* by RVC, 2006)

THE PAKISTAN PAGE**Failures of the World Bank Project**

A big World Bank irrigation project in Pakistan was poorly designed, failed to comply with guidelines and put people at risk, a scathing report by the bank's investigation panel concludes. Bank management, headed by Paul Wolfowitz, concedes that mistakes were made. The investigation relates to the 1997 national drainage programme, which built on earlier bank-supported irrigation schemes in southern Pakistan. Although the NDP project is now over, the findings are sensitive as the bank wants a big increase in funding for other irrigation projects in Pakistan. One key component of the system of drains and levees, the tidal link, was designed to cope only with storms of a severity that occurred every five years. In 1999, a cyclone hit the link, damaging it severely. Flaws in the design of the tidal link and an emphasis on draining salt water from upstream agricultural lands quickly "heightened the risks to local people from flooding", the panel found. When "monsoon rains in 2003 led to the loss of many lives" (over 300 people died) in downstream coastal areas, bank projects compounded the loss. The bank "failed to identify and assess critical environmental concerns" in southern Sindh and the impact of the drainage scheme on the coastal wetlands amounted to "a significant conversion or degradation", the panel found. It concludes that "to a very large degree" the damages have not been redressed and "many of the same conditions that led to these harms are still in place". The Panel found that the project fully or partially violates the Bank's binding policies on Environmental Assessment, Natural Habitats, Indigenous Peoples, Involuntary Resettlement, Project Supervision, and Disclosure of Information. The Action Aid (Pakistan) and the International Rivers Network said the findings showed that the bank's "lack of environmental and social due diligence" had harmed thousands of people, their livelihoods "and crucial ecosystems".

Taking into account the failures of the previous projects, the World Bank has drafted a plan to tackle salinisation and water-logging in its Indus Basin project in Pakistan, the world's largest irrigation system, serving 36 million acres of contiguous cultivated land. Previous World Bank assistance focused on repairs of breaches in canal embankments, removal of debris deposited in the canals and repair of control structures, drainage structures and water storage infrastructure. A World Bank inspection panel, convened after complaints from Pakistanis in 2004, concluded in July that the \$785 million World Bank project did not sufficiently take into account the downstream effects on local residents. The World Bank claims it has already spent \$18 million on improving living conditions in the affected areas since 2004 and is proposing a flood management and coastal development plan between now and 2009, as well as improving the irrigation and drainage infrastructure between 2009 and 2016. Responding to the recent drought and political conflicts over water, Pakistan has proposed a huge investment programme in water resources development. Under this plan, nearly \$8 billion will be spent over the next 10 years and over \$30 billion by 2025. More than three-fourths of this investment would be for new storage dams, hydropower capacity, and for new canals.

The irrigated agriculture system fed by the Indus and its tributaries account for about a quarter of Pakistan's gross domestic product, two-thirds of its employment and about 80 % of its exports. The system includes three major storage reservoirs with live storage capacity of 12.7 million acre feet. There are 80 small dams and barrages, 19 inter-river link canals and 12 independent irrigation canal commands. (Financial Times 26x06, Dawn 29x06)

Drive against mega-projects A national conference on impacts of mega projects and role of International Financial Institutions held the IFIs responsible for manmade disasters and agreed to form a national commission to initiate campaign against disastrous mega projects. Water experts, environmentalists, people affected by the mega projects, representatives of civil society organizations and political parties participated in the conference organised by Pakistan Fisherfolk Forum.

The conference recommended that the affected people of Left Bank Outfall Drain, Right Bank Outfall Drain and Chashma Barrage should be rehabilitated and compensated. It rejected both the projects. The participants rejected construction of any further dam and barrage on Indus river upstream Kotri. "No more dams, no more cuts and no more diversions," they said. The conference rejected the notion that Indus water was being wasted in the sea and said 2.7 million people lived in the delta and discharge of water downstream Kotri was necessary for the environment, livestock and the people. It recommended a minimum of 35 maf discharge downstream Kotri.

Mohammad Ibrahim Joyo, writer, said the World Bank had proved as the world poverty development bank and Asian Development Bank as Asian destruction bank, as their projects had proved disastrous. Mohammad Ali Shah, chairman PFF said that the dams & barrages on Indus had deprived the people of the delta of their water & had negative impact on environment. (The News 19x06)

The Dam killed over 500 people, WAPDA accepts

Pakistan Govt's Water and Power Development Authority has accepted now that its operational and engineering faults were behind the outburst of floodwater from the Mangla Dam that killed over 500 people, including dozens of army personnel in 1992. In 1992, Wapda had opened the spillways of the dam in an emergency without informing villagers and the army garrisons lying just below the dam. The floodwater had played havoc in Jhelum, Serai Alamgir and Mirpur. A special study report of the audit department on operation of the Mangla Dam during the 1992 floods, which was presented before the Public Accounts Committee of the National Assembly on Oct 30, revealed numerous lapses on part of Wapda, which caused huge losses to human lives and infrastructure. The report said Wapda rose up the dam's conservation level by two feet beyond the prescribed level without consulting any technical experts. The losses of lives and property could have been averted had Wapda released excess water on time, it added. The report suggested that heirs of those who had lost their lives in the tragedy should be paid compensation. But, water and power secretary differed with the suggestion and said it would not be possible for the authority to compensate the affected people. "If we compensate Mangla-affected families, several other victims of similar tragedies will also demand similar treatment," he argued. PAC convener said lack of internal accountability in Wapda was the main reason for the eroding image of the authority. He expressed dissatisfaction over the behaviour of Wapda officials with people. (Dawn 31x06)

Bank Board Approves Southern Pakistan Water Management Action Plan On Nov 1, '06 the World Bank Board approved the Bank Management's Action Plan that came in response to the Inspection Panel's investigation requested by residents of Badin, see box on page 26. "The World Bank and everyone involved in the projects could have done a better job of mitigating the risks and impact of natural disasters on the poor within and outside the project areas," said the World Bank President Paul Wolfowitz. The AP is designed to address with urgency the plight of the poorest people of the lower Badin and Thatta districts, claimed the Bank. (The World Bank Press Release 011106)

Kalabagh, the World Bank, poor farmers & repression In the villages around Makhad, a small town on the left bank of the Indus River, we learned that many poor farmers are currently selling their land to the large landlords. The region is at risk of being flooded by the proposed Kalabagh Dam, and the farmers know that once their land is expropriated, only the rich will be able to pay the bribes required to receive fair compensation. If Kalabagh follows the example of other dam and irrigation projects in Pakistan, the large farmers will also bribe the water bureaucrats so that they can build illegal canals and divert additional water flows. Like the people who were displaced by the reservoirs, the small farmers at the end of the irrigation canals will be left high and dry. Journalists who write about development conflicts in Pakistan live dangerously. In April, Mehruddin Maree, a journalist who used to cover the impacts of large dams and irrigation canals on the Indus delta, was arrested by the police in Golarchi, a small town in Southern Pakistan. He has been missing ever since. "We are often intimidated when we touch on the interests of powerful parties, but this would not stop Mehruddin," one of his colleagues told me. The case of Mehruddin Maree is not an exception. In spite of widespread repression and corruption, the World Bank announced in summer 2005 that it plans to increase its lending for the country's water sector tenfold between 2006 and 2010. If the Bank

gets its way, this support will include \$300 million for a mega-dam project like Kalabagh. (Peter Bosshard Article in www.fpif.org Oct 6, '06)

Land Acquisition for big dams on hold The centre has put on hold Rs167 billion acquisition of land for three mega dams - Bhasha, Kalabagh and Akhori - when Sindh and NWFP governments protested over not taking them into confidence while finalising technical studies. The centre, however, asked the provincial governments to issue letters under section 4 of the Land Acquisition Act to ban sale and purchase of land by private parties around the dams' sites that could trigger cost escalation and speculative buying. (The Dawn 20x06)

Munda Dam Feasibility Study approved A panel of experts of the federal government has approved the feasibility study of the \$ 1.028 billion Munda dam on river Swat to be completed by 2013. Negotiations are now expected for power tariff and implementation of the 660 MW project. President is to inaugurate the project in December. The 200 m high dam would have about 1.2 billion cubic meters storage capacity. Amzo Corp — a group of US-based real estate developers of Pakistani origin — is the lead sponsor of the project which is co-sponsored by Hydro Energy Investment of the United Kingdom. Vatech Hydro of Austria, which has been engaged as electrical and mechanical engineering contractor, will extend \$800 million loan for the project. (Dawn 20x06)

Dams destroy the Indus Delta "What used to be a food security area has turned into a famine area," comments Nazeer Ahmed Memon, the secretary general of the Sindh Agriculture Forum. The Indus — the world's tenth-largest river in terms of runoff — used to discharge 4 billion tons of sediments into the Arabian Sea every year. Since the 1930s, the Indus has been dammed by 19 barrages, and its water is diverted into the world's largest irrigation system through 43 large canals. Due to the dams, the once mighty Indus no longer reaches the sea in most years. Its sediments no longer replenish the

delta. The region only receives polluted drainage water. As a consequence, the Arabian Sea eats away at the coastline, and saltwater intrudes up the riverbed and groundwater aquifers. According to estimates by Pakistani experts, 8,800 square kilometers of agricultural land have already been lost to the sea since the beginning of dam building. The mangrove forests have been greatly reduced, and the coastal fisheries have collapsed. Pakistan's water politics is dominated by the large landlords, often with a military background, who live in the upstream province of Punjab. The downstream province of Sindh, and particularly the Indus Delta, is left high and dry. The World Bank is the main architect and external financier of Pakistan's irrigation system.

According to World Bank policies, people who are negatively affected by the institution's projects are supposed to be compensated for their losses. Yet the people of the Indus Delta have never been offered any compensation for the losses that they are suffering. The World Bank does not recognize them as being affected by its projects. According to a 2005 report by the Bank on Pakistan's water sector, the degradation of the Indus Delta is "an inevitable phenomenon and a part of the bargain struck in order to support large numbers of people in the Indus Basin."

In a new water sector strategy for Pakistan, the World Bank proposes that the government build new large dams on the Indus such as the Bhasha or Kalabagh Dams. The Bank plans to allocate \$300 million for such projects in 2009. The dams would divert even more water, and would make the rehabilitation of the Indus Delta impossible.

Social movements and non-governmental organizations such as the Pakistan Fisherfolk Forum (PFF), SUNGI Development Foundation and Action Aid are opposed to the World Bank's dam-building plans in Pakistan. The PFF demands a legal agreement that guarantees downstream waterflows in the Indus sufficient to sustain the ecology and economy of the Indus Delta. It argues that such flows could be assured if water were used more efficiently in Pakistan's irrigation system. "The very existence of this region depends on the water flows of the Indus," says Mohamad Ayub Sahito, a poor fisherman of Kharochoan in the Indus Delta. (Peter Bosshard in *World Rivers Review* Oct '06)

GBP affected await compensation 12 years after displacement About 6,000 people from 55 villages affected by Ghazi Barotha Hydropower Project have not yet been given compensation amounts of Rs 295 million for their land acquired in 1994 despite the passage of 12 years. The reason for this delay is the vacant post of Land Acquisition Collector, although the project had been commissioned in 2003. Importantly, the National Accountability Bureau on August 20, 2001 had arrested 12 officials including the then LAC Attock, in Rs 1.4

billion mega land scam of GBHP. In acquisition of lands, they over-assessed the lands of influential and awarded, in connivance of members land valuation committee, Wapda high officials, huge compensation for gardens and trees that were existed only on papers and allegedly earned windfall commission. (Dawn 101006)

50% of Agriculture production from livestock

According to the latest economic survey of Pakistan, the livestock sector contributes almost 50 % to the value addition in the agriculture sector and almost 11 % to Pakistan's GDP, which is higher than the contribution made by the crop sector. (Dawn 290906)

THE BHUTAN NEWS

The Tala HEP The 1020 MW Tala hydroelectric project, which started commercial production from its first unit on 31 July, exported 22 million units of electricity to India as of 10 August. Tala is connected to eastern region load dispatch centre in Siliguri, India, via the Malbase substation in Pasakha, 20 km away from the Tala powerhouse. While the full generation capacity of a single unit is 170 MW, the first unit to start commercial production has so far been producing electricity below its capacity for reasons of maintaining stability of the unit. The project cost an estimated Nu 42.5 billion, the money provided entirely by the Indian govt as grants and soft loans. 60% of the money came as grant and the rest, 40% came as a loan with an interest rate of 9%. About 85% of the power generated by Tala will be exported to India. The rest will be supplied to Pasakha industrial area. Apart from the financial cost, at least a hundred people lost their lives during the construction of the project. (www.kuenselonline.com, www.bbs.com.bt 130806)

Bhutan-India agreement Bhutan and India signed agreements on the 1020 mega watt Tala HEP and the agreement on cooperation in the field of hydropower. The protocol to the agreement on Tala establishes the export tariff for the sale of power from the 1020 megawatt Tala Hydropower Project to India. It also lays down the mechanism to review the tariff. The agreement on the cooperation in the field of hydropower is aimed at further strengthening the cooperation on hydropower. Under the agreement, India will import 5000 MW electricity from Bhutan by 2020. With the commissioning of the Chukha Hydropower Project in 1986 and the Kurichu Hydroelectric Project in 2001 hydropower, earns about 45 % of Bhutan's revenue. According to the agreement - valid for 60 years, to be reviewed every 10 years - India will facilitate funds and manpower for the construction of power projects in Bhutan. After a series of negotiations over three years Bhutan and India agreed on the tariff for the export of power to India at Rs. 1.80 per unit. The rate will be increased every five years by 10 % until the loan of about Rs.17 billion for the project is repaid and then by five % every five years. (www.kuenselonline.com, www.bbs.com.bt 280706)

THE CHINA PAGE**China plans for Brahmaputra diversion**

The Chinese plans to divert water from Brahmaputra River to the Yellow river in the Northwest China was again in news recently, though China's foreign ministry spokesperson has said that there is no such project and China's water resources minister has said it is unnecessary project. The site of the proposed dam for diverting Brahmaputra waters is said to be the Shomatan point in the Himalayan region of China, where this mighty river (called Yarlung or Tsangpo in China) takes the spectacular U-turn. This is geologically highly fragile terrain, being the meeting point of the Indian plate with the Eurasian plate.

The dam would have far reaching implications for India and Bangladesh. India's river linking programme will be left without the only indisputably water surplus river as all the surpluses of the Brahmaputra would get diverted by the upstream China's proposed project.

The Great Western Route Water Diversion Project envisages the diversion of 200 billion cubic meters of water every year from three rivers — Yarlung Zangbo (the Brahmaputra), Nu (Mekong) and Lancang (Salween) to the Yellow River. The project that would cost more than the USD 25 Billion Three Gorges project and might be built in 2010 and is reportedly backed by the Chinese President Hu Jintao.

The western diversion projects is inspired by a book, "How Tibet's Water will save China", by Li Ling. Picking up a great deal of support among the Communist Party leadership in Beijing, this book details the proposal by hydrologist Guo Kai called a "Shuo-tian" (reverse flow) canal, which proposes to divert the Brahmaputra.

China's Water Resources Minister Wang Shucheng reportedly poured cold water on the controversial proposal on Oct 24, calling it "unnecessary, not feasible and unscientific." However, his clarification could be disturbing: "As a minister, I won't comment on whether it's possible to realise the proposal in the long run," he said. "But as a water expert, I can say that the idea is unnecessary, not feasible and unscientific."

He added, "We must keep an eye on possible floods when the Yellow River has 58 BCM of water. If another 50 BCM, not to mention 200 BCM, is poured in, I am sure all the dams and protection embankments will be destroyed immediately. The cost of diverting one cubic metre of water from the central and eastern routes of the south-north project would be about 10 yuan. From the western route - the Yalong, Dadu and Jinsha rivers - it would cost about 20 yuan (\$ 2.5), but diverting water from the Yarlung Zangbo would be much more. These costs are much higher than the 3 yuan per cubic metre it would cost to conserve water using various

technologies". He however did not reject the existence of the plan. However, on Oct 25, Chinese foreign ministry spokesperson said, "China has no such plans to build a dam and divert water from Yarlung Zangbo (Brahmaputra) to the Yellow river". He said he had no further information on the issue.

The Arunachal Pradesh govt and the Assam Chief Minister, concerned at the news, have expressed serious worries in their letters to the Prime Minister and requested him to take up the issue with China. Assam govt has decided to form an expert committee to study the impact of such a proposal on Assam.

Upstream big brother does not bother India does not have any water sharing treaty with China. Indian govt has never seemingly taken the issue of water sharing treaty with China seriously. And China has not particularly bothered about the implications in the downstream regions. This is evident from the following instances.

⇒ India still does not know the cause of floods in Arunachal Pradesh in June 2000 that originated from China. The flash floods killed many people and destroyed property on large scale. There was no apparent reason for the floods as there was no rainfall in the area.

⇒ Nor does India know the cause of floods in Sutlej basin in Himachal Pradesh in July-Aug 2000, which too originated from China. Here too the floods were sudden and devastatingly high. Large number of people were killed and damages were on bigger scale. In this again there was no apparent reason for floods as there was no rainfall in the area.

⇒ Till early this year, India did not know that China has built a hydropower project in upstream Sutlej basin in China. Now it seems China may be building more hydropower projects on various tributaries of Sutlej. The character of silt in Sutlej recently has changed in last five years, claim the authorities at the 1500 MW Nathpa Jhakri Project in HP. The project is facing serious problems due to high content of abrasive silt in the Sutlej river and had to be shut down for weeks due to the problem.

⇒ When the problem posed by the Pareechhu lake in Tibet in Sutlej basin came to light in 2005, China was not particularly cooperative in helping India with investigating the parameters and implications of the lake and India could do little to change that.

Indian Options It is clear that India has very little leverage with China currently on this issue. China is known to go ahead with projects that affect the downstream areas, without consulting or informing the downstream countries about the same. This is evident

from the Mekong example, but is also known to India from the Sutlej example quoted above. China did not consult or inform India before constructing the hydropower project on Sutlej. China accepted the existence of it only after it was a fait accompli. There is UN convention on non navigable use of waters (1997), but China has not ratified the same, so going to International Court of Justice under the convention is not an option. The only option remains is diplomacy and Indian govt has confirmed that the issue will be raised when the Chinese President visits India during Nov '06.

Indian media's double standards "Any interference with the geology of this tract through the construction of huge tunnels or other means of water conveyance will entail hazards like land slips and earthquakes", said an editorial in the Business Standard on Oct 27. This is a strange assertion, for the pink papers would laugh off such a statement about any Indian dam in the same Himalayan region.

"What can India do about this and what should it do? Persuading China to not go ahead with this project is unlikely to be easy, as the implementation of its inter-river water transfer project is already under way", continued the editorial. The reports said that Indian govt is now taking the issue seriously and is raising the issue with the Chinese counterpart. However, Indian govt's concerns is likely to have even lesser impact on China than the expression of concerns by the downstream Bangladesh would have on India when the former expresses concerns about say India's proposed Tipaimukh dam. Though Bangladesh media is full of their concerns on impact of the Tipaimukh dam on Barak River (Bangladesh's Meghna River), India's National media had no place for the concerns.

The editorial in The Times of India on 24x06, (a day after the two reports appeared in that paper and which triggered a spate of media reports in other media agencies) even went to the extent of recommending an ETO (Environmental Trade Organisation) on the lines of WTO, without possibly thinking that WTO is already a failure and yet has had devastating impacts on poor farmers in developing countries. However, some very useful guidelines on dealing with trans-boundary Rivers are available from the World Commission on Dams. Unfortunately, Indian govt has rejected the WCD report, thus closing that option as of now.

The History of the Proposal This controversial proposal has been coming up for over ten years now, some important dates of their appearance is noted here.
⇒ **June 1996** The project was first reported in Scientific American.

⇒ **Jan 1998** The German television channel ZDF presented a feature on the Yarlung Tsangpo project in a program titled Die Welt [The World]. Its chief planner Professor Chen Chuanyu described the plan to drill a 15 km (9.3 miles) tunnel through the Himalayas to divert the

water before the U turn and direct it to the other end of the bend. This would shorten the approximately 3,000 meters altitude drop, from 200 km to just 15 km. He explained that the hydropower potential could be used to pump water to Northwest China over 800 km away.

⇒ **Oct 2000** The correspondent of The Telegraph in Beijing wrote: 'Chinese leaders are drawing up plans to use nuclear explosions, in breach of the international test-ban treaty, to blast a tunnel through the Himalayas for the world's biggest hydroelectric plant.'

⇒ **July 17, 2003** The People's Daily published a small item: *China to Conduct Feasibility Study on Hydropower Project in Tibet*: 'China plans to conduct a feasibility study in October on the construction of a major hydropower project on the Yarlung Zangbo River in the Tibet Autonomous Region. An expert team [was sent] to the area for preliminary work between late June and early July.'

⇒ **Oct 6, 2006** Claude Arpi, the author of *The Fate of Tibet* wrote that the director of the Yellow River Water Conservancy Committee, Li Guoying, confirmed in Aug '06 that China plans to divert Tibet's waters towards the mainland. (Mediavigil note 23x06, The Times of India 23x06, 24x06, Reuters, South China Morning Post 25x06, DNA, Financial Express 26x06, Business Standard 27x06)

China Plan for the displaced China has started using revenues from increased electricity prices (25%) to subsidise 22 million people displaced by the construction of more than 3000 dams and reservoirs. More than \$ 1.6 billion will be raised each year to hand out to those forced to make way for the power projects. It is part of a strategy to lift the standard of living of displaced people and to curb potential social unrest. Under the scheme each resident will be given \$75 a year for 20 years. The money would be directly transferred to the personal accounts of the displaced residents. (THE HINDUSTAN TIMES 150806)

Alarm bells over dry China China's worst drought in half a century is putting the spotlight on its water problem. Through its surging economic growth, industrial pollution and widespread waste, China long ago saw itself sink into a serious and sustained water crisis. Professor He Shaoling, a researcher with the China Institute of Water Resources and Hydropower Research, said the water shortage had developed into 'a threat to national security'. Of China's more than 600 cities, 400 are short of water, the water resources ministry said. In Beijing and about 100 other cities, there are 'extreme shortages,' and in the Olympic year 2008, the Chinese capital and host city is to find itself short of up to 1.1 BCM water, the ministry said. Today China requires 10 times more water than Japan and six times more than South Korea for its economy to produce one unit of gross domestic product, said vice minister for water resources. He warned that the problem threatens China's food security as well. A persistent drought has left 18 million Chinese in 15 provinces thirsty and is causing crops to wither. (indiaenews.com 230806)

WORLD DAMS

Hydropower Generation The top ten countries that produce major portion of their electricity from hydropower are listed in the table below along with their generation in 2004 & 2005 along with the proportion of total electricity produced from hydropower. The table also gives the figures for India and China for comparison.

Countries that produce large proportion of electricity from Hydropower

(Billion Units)

Country	Electricity from HEPs		HEP generation as % of total electricity generation	
	2004	2005	2004	2005
Norway	109.3	136.6	98.47	98.99
Brazil	320.8	340.4	82.89	84.05
Colombia	39.9	39.6	81.43	80.82
Iceland	7.1	7.0	78.89	77.78
Austria	39.9	39.6	61.38	64.92
Canada	337.7	361	58.63	60.77
New Zealand	27.2	24.2	63.26	57.62
Switzerland	35.5	33.1	53.79	55.17
Chile	21.3	25.9	41.76	49.81
Sweden	56.1	68.5	37.91	44.81
India	83.8	96.0	12.79	14.14
China	353.6	401.0	16.04	16.2

Source: Power Line Aug 2006

Please note that this is from the partial list of countries given in the above source and notable names that produces almost all its electricity from hydropower absent in the table above include Nepal (& all countries from Africa). Some countries that produce a very large quantum of electricity from HEPs, but does not figure in the above list (as the proportion of HEP generation in total power generation is not so high include US 267.8 BU in '05), Russia (174.9 BU) and Japan (87.7 BU).

Fuzzy Science Big HEPs Hide role in Global warming

The big-hydro lobby has consistently underplayed the scale of hydropower emissions. In an effort to settle the debate, International Rivers Network has released a report just prior to the UN Climate Change conference in Nairobi (Nov 6-25), calling on the UN science panel to determine HEP's culpability in global warming. The tropical hydropower reservoirs can have a far greater impact on global warming than even their dirtiest fossil fuel plant rivals, says Patrick McCully, IRN Executive Director and author of the report. (IRN PR 011106)

Single fish species controls health of river Removing just one fish species from a tropical river can have major effects on the ecosystem's health, according to research published in Science (11 August). The finding

contradicts the general belief that the greater abundance and diversity of other species would compensate for the loss. Researchers removed the flannel mouth fish (*Prochilodus mariae*) from a tributary of the Orinoco River and measured how this affected the movement and use of carbon in the ecosystem. The fish is the dominant species in many South American rivers, where it feeds on algae and detritus on the riverbed. As the fish moves, feeds, and excretes waste, it plays a key role in the cycle of carbon synthesis and degradation. It also removes particles that block the light needed by cyanobacteria that process nitrogen in the ecosystem. The researchers found that the river's carbon cycle was disrupted within 48 hours of them removing the fish. The effect lasted for at least 40 days. With the fish gone, the amount of organic carbon on the riverbed rose by 450%. The amount of this carbon traveling downstream fell, suggesting a reduction in energy available to species there. The researchers were surprised that a single fish species could have such a substantial impact in a highly diverse ecosystem. The river has more than 100 other fish species, but their combined activity failed to compensate for the loss of the flannelmouth. Small detritus-eating fish such as the flannelmouth make up 50-80% of total mass of fish in the Orinoco and Amazon basins but populations are declining due to overfishing, dams, deforestation and pollution. The study also showed that flannelmouths have decreased in size over the past 25 years, a shift that tallies with changes in fishing nets. (Science 313, 833 (2006))

POWER OPTIONS

Energy Efficiency Certification Bureau of Energy Efficiency of Govt of India has started star system for efficient electrical appliances and the stars are to be prominently displaced on the products. Most efficient appliance would get five stars. An appliance with five stars would save 27% compared to one with a single star. The BEE follows three level checking: first the electricity consumption is checked at the company's facility, then it is checked at competitor's facility and finally at the govt facility. The certification would start with tube-lights & then it would be applied to refrigerators, ACs & TVs. (The Hindustan Times 021106)

NEPAL: Solar Power The first project in Nepal to install Solar Photovoltaic and Solar Thermal Systems to provide power in remote areas for alleviating poverty through use of power for income generation activities is being introduced in 24 districts. The 15.7 million euros Renewable Energy Project, a joint undertaking of the European Commission (contribution 15 m Euros) and the government of Nepal, will benefit approximately 500,000 Nepalis by the time it is completed in 2008, according to the national director of the project. Under the project, solar and thermal plants will be installed in districts with no electricity and with no prospects of having their own small hydro projects for at least the next five years. (Kathmandu Post 270906)

Publications available with SANDRP**PUBLICATIONS IN ENGLISH:**

1. *Large Dams for Hydropower in NorthEast India* SANDRP & Kalpavriksh, June '05, p 228, Rs 150 (individuals), Rs 300 (institutions)
2. *Tragedy of Commons: The Kerala Experience in River Linking*, River Research Centre & SANDRP, 2004, p 146, Rs 120
3. *Unravelling Bhakra*, Shripad Dharmadhikary, Manthan, 2005, pp 372, Rs 150/- (individuals); Rs 300 (institutions)
4. *THE GREATER COMMON GOOD* by Arundhati Roy, Published by India Book Distributors, 1999, pp 76, Rs 80/-
5. *Tehri Environment and Rehabilitation: Towards Failure and Devastation*, Published by MATU, pp44, Rs 25/-
6. *Citizens' Guide to the World Commission on Dams*, By A Imhof, S Wong & P Bosshard, IRN, pp 59, Rs 30/-.
7. *Know Your Power: A Citizen's Primer on the Electricity Sector*, Prayas, Pune, 2004, p 138, Rs 150/-
8. *Dam Vs Drinking Water: Exploring the Narmada Judgement*, LC Jain, Parisar (Pune), 2001, p 134, Rs 75/-
9. *Insidious Financial Intrusions in India's North East*, IR & FIPA, April '06, pp 100, Rs 50/-
10. *Conserving Raindrops a Much Better Option than Linking Rivers* by Bharat Dogra, pp 8, Rs 4/-.
11. *The Forest of the Buddha*, By Bulu Imam & Phillip Carter, Sanskrit Publishers, Jharkhand, 2005, pp 121, Rs 650/-

PUBLICATIONS IN HINDI:

12. *Nadi Jod Yozana Ke Mayne, Vastvikta Ke Aaine Mein* (HINDI), SANDRP, 2004, pp 58, Rs 20/-.
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15. *Bade Bandh, Bharat ka Anubhav*: Hindi, SANDRP, 2001, pp 268, Rs. 100/-.
16. *Vishwa Bandh Ayog per Nagarik Margadarshika* (HINDI), SANDRP, 2002, pp 63, Rs 30/-.
17. *Bharat mein Bade Bandh ka Lekha jokha* (Hindi) summary of WCD India Country Study, Manthan, pp18, Rs 5/-.
18. *Rahiman Paani Bik Raha Saudagar Ke Haath* (Hindi) By S Dharmadhikari, Manthan, pp 55, Rs 10/-.
19. *Bina Jaankari Kaisy Jan Sunvai?*, MATU (Delhi), 2004, p 32, Rs 15/-
20. *Kasbe Ka Paani* By Rehmat/ Mukesh Jat, Published by Manthan, pp 40, Rs 20/-
21. *Sudhar Ya Bazaar: Commodification of Water in MP by IFIs*, Manthan, pp 20, Rs 5/-
22. *Log Banam Faisla: A Reflection on Narmada Judgement* (HINDI), NBA, 2000, pp 72, Rs 10/-

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YOUR RESPONSES

I acknowledge with gratefulness that I have been immensely benefited by your esteemed journal "Dams, River and People". Earlier I translated your articles on *Large dam disasters*, *Disease of Gigantism* and issues related to Interlinking of Rivers of India in Assamese and published in periodicals like Prantik and others as well as delivered talks in public meetings. Recently I translated your article "System Rice Intensification" of March-April 2005, in an Assamese daily as an alternative method of rice cultivation in conformity with the unusual draught situation prevailed in Assam in this year. Moreover, I translated your editorial "CFLs can save 5000 MW load" of June 2006 and submitted as a Letters to the Editor of the news paper Dainik Janambhumi. This letter has been adjusted as the best letter. You are aware that as many as 8-9 mega hydro projects have been approved by the Govt. of India in Arunachal Pradesh. We the people of Assam are in a panic. I, therefore, request you to highlight the probable disasters that likely to occur in the downstream part of the projects- in the plains of Assam.

Prof JN Sarma, Dept. of Applied Geology, Dibrugarh University, Assam

Thanks for a very informative article on Reservoir Siltation (DRP Aug-Sep '06). I had a quick question for you. Do you have estimates for the marginal cost of CAT (catchment area treatment)? How much would it cost to prevent the loss of 1 MCM of live storage -- I understand the costs are a function of local topography but are some kind of average estimates available?

Deepak Malghan, Andhra Pradesh

The article on Reservoir Siltation is a very useful piece.

Bittu Sehgal, Editor of Sanctuary Magazine, Mumbai

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