

The writing on the dam

Dams were technological cathedrals, harnessing triumphant forces of water, power and earthly fertility for the benefit of humankind. What went wrong? **Robin Wiseman** explains.

The mega-dam is well on the way to being busted. It has had a short pre-eminence: all but seven of the world's hundred largest dams were built since World War Two. But people power is now bringing the era of big dam construction to a close.

There are few sites ideal for big dams which do not already contain a cliff of clay, rock and concrete. Those that remain are mostly blocked, both because of the sheer numbers of people who would have to be relocated and because of mushrooming environmental lobbies. From Brasilia to Bangkok, engineers and politicians are faced with the reality that people are no longer content to submit meekly while their ancestral lands are flooded and their way of life disrupted beyond recall.

Funding agencies have also had to change their policies in response to mounting public criticism. The World Bank, for example, is now delaying dam projects while their environmental impact is properly assessed. But even leaving aside ecological considerations, the sheer financial impact of these monster projects can be devastating.

Building a dam can take years, even decades. This is hardly surprising given their phenomenal size: the highest of them (on the Vaksh River in the USSR) reaches 300 metres. The venture is full of risks but companies in Europe, North America and eastern Asia have grown fat specializing in the business. Several dams currently under construction are worth over \$1,000 million: the Yacyreta Dam being built by Argentina and Paraguay is estimated to have cost \$5,986 million, three times the original tally.

Because of the huge costs involved, any developing country contemplating a large dam must normally borrow heavily to finance the project. Consequently, dams that have failed to deliver their vaunted economic benefits have contributed enormously to the current debt crisis. At the same time, many have brought other highly undesirable consequences in their train.

It is these failings which have fuelled the growth of the anti-dams lobby, a people-power movement which has itself begun to take on the juggernaut quality of the dams it is trying to block. The problems this movement focuses on are fourfold: the displacement of people by the rising waters of the reservoirs; the loss of fertile farmland; the effects on health; and the ecological damage.

The population issue is at the heart of the massive resistance to dam projects on the Narmada River in western India (see box). An almost revolutionary public awakening has forced the World Bank, as so often the key financial sponsor, back to the drawing board. At a recent international conference, Harold D Frederiksen, one of the World Bank's irrigation specialists, bemoaned the increasing numbers of people in developing countries and blamed them for the loss of good dam sites:

'Major transbasin water diversions are blocked on the Brahmaputra (in India and Bangladesh) because proposed canal alignments are congested by 1,000 persons per square kilometre or more. A majority of the reservoirs marked "to be developed" on Indonesia's maps will never

be built because of dense land occupancy. And China will have to relocate millions of people if it is to construct the immense water schemes needed to match the scale of its needs.'

The main conflict is between farming people who need the land to live on, to grow food and to tend their livestock; and their governments - state or national - who want to flood the land to provide cities with power and water, or distant drylands with irrigation. And these days it is mostly the people on the land who are getting their way.

Take Thailand. In 1988, construction of the 580-megawatt Nam Choan hydroelectric project in western Thailand was stopped after a wave of protest threatened to bring down the Government. Last year, demonstrators protesting against the 250-metre Kaeng Sua Ten irrigation dam refused to evacuate their homes. Protest is growing in the eastern city of Ubon Ratchtani over a decision to build a dam which will flood 117 square kilometres of land, destroy more of the country's dwindling forests, and inundate several ancient cultural sites. No wonder the Thais have suddenly started urging the Laotians to bring forward their long-term plans for developments on the Nam Theun River: they are desperately looking for new power sources free of disruption from environmentalist pressure.

On the health side, African dams have wrought much havoc. The creation of the giant Volta Lake in Ghana, and the Aswan Lake in Egypt, have both led to a huge increase in schistosomiasis, the devastating liver-fluke disease spread by the water snail. In Aswan, fishermen migrating from elsewhere brought the disease: a typical example of the social upheaval such large projects can cause.

On the ecological side, the classic demonstration of the case against large dams has been seen in the Amazon basin. Ignoring lessons in neighbouring Surinam, Brazil decided to flood vast areas of virgin forest in the interests of generating hydroelectricity. In 1988, the Balbina reservoir began to fill. The rotting vegetation and the richness of nutrients in the water are now causing ecological havoc. There is only enough oxygen for fish within 1.5 metres of the surface and the water hyacinth, a pernicious weed, is running riot.

The Balbina Dam is likely to flood an area of 2,000 square kilometres. Yet just 2.5 square kilometres of rainforest can contain, according to the US Academy of Sciences, 750 tree species, 400 bird species, 125 mammal species and 1,500 different flowering plants.

'No dam shall be built!'

The damming of India's Narmada River is one of the World Bank's pet projects. But the 100,000 people threatened by it are fighting back - with some success.

THOUSANDS of people in western India, most of them peasants and indigenous people, have pledged their lives to stop construction of dams on the Narmada River. Crowds have gathered around the town of Harsud, whose 11,000 residents are threatened with resettlement when the town is flooded by the Narmada Sagar dam. They chant: 'We shall not allow Harsud to be submerged!', 'None shall be displaced!', and 'No dam shall be built!'. Altogether, the dam would displace around 100,000 people.

The protesters may get their way: the fate of the Narmada Sagar is temporarily in the balance. It is one of two principal dam projects on the Narmada, India's fifth largest river which rises in Madhya Pradesh and visits Maharashtra and Gujarat on its 1,300-kilometre journey to the Arabian Sea. The other major dam, the Sardar Sarovar, began construction in 1987. It has since provoked local protest at the site against the resettlement of 67,000 people.

The dams have provoked such an uproar both locally and internationally that their principal backer,

the World Bank, has been forced to reconsider its support. Back in 1985, it approved a \$450-million loan towards the Sardar Sarovar's total estimated cost of \$3,800 million. Last summer, it threatened to suspend or cancel the unused two-thirds of the loan unless the Indian Government accepted key environmental conditions, including relief and rehabilitation for displaced people. In the event funding continued, despite what Indian protest groups described as inadequate plans for the resettlement of those who face eviction.

Even with its facelift, the Sardar Sarovar project looks dodgy. A study sponsored by the Indian National Trust for Art and Culture (INTAC) condemned the dam as 'not economical, even under heroic assumptions' and concluded that it was likely to grind to a halt for lack of finance. It also found that the dam failed the economic viability criteria set by the Bank in 1985 at the time of its loan agreement.

Meanwhile, for Narmada Sagar, the World Bank has instituted a separate proposal for a \$70 million loan towards resettlement, but has placed both this and \$350 million towards the dam itself on hold 'awaiting resolution' of outstanding issues. But the Indian environmental movement wants none of it. 'We have stopped talking to the World Bank,' says Smitu Kothari, a key campaigner. 'It has become clear that they have no intention of listening to us. Now we must defend our homes and our livelihoods however we can.'

Robin Wiseman

*(with additional information from **World Rivers Review**)*

Equally alarming is the impact of Brazil's dams on its Indian population. In 1988-9, the threat to traditional homelands posed by the giant Alsamira project on the Xingu River created an international outcry. Public opinion forced the World Bank to hold back an energy loan until the Brazilian authorities took certain measures to protect the environment.

The problem of power

All these examples illustrate a fundamental dilemma. How do emerging nations produce the electrical power to underpin development while avoiding massive environmental damage? It is accepted now that burning fossil fuels - coal, oil, natural gas - in conventional power stations contributes to the build-up of carbon dioxide in the atmosphere and thus to the greenhouse effect.

Hydroelectricity, clean and naturally powered, was thought the ideal alternative. But the huge turbines that are essential to heavy-duty energy production can only be driven by enormous water pressure; that can only be provided if vast areas are flooded; and such flooding is simply not popular.

Likewise irrigation. In many countries crop production cannot improve without irrigation. But the water is often not available in the places where it is needed. Is there any alternative to damming a distant river and using the lake to feed long-distance canals?

Then there are the expanding cities, their thirsty populations and panting factories. The over-use of water from nearby sources and from natural underground reservoirs is already leading to supplies drying up or becoming polluted. In Beijing, for example, the water table is dropping by more than a metre a year and one-third of the wells are already dry. Many other cities in Asia are under intolerable water pressure. Can large-scale transfers of water from far-off sources be avoided?

The answer to these questions is: 'perhaps'. Alternative energy sources - wind, solar, tidal and wave power - are at present uneconomic, but if society demands it, the high prices will have to be paid. Alternatively, large hydro-electric projects could be replaced by millions of micro-hydro systems. More expensive for sure, but less disruptive. Franco Celso, from Italian micro-hydro manufacturer Ecowatt, estimates that a 10-kilowatt plant saves the equivalent of 21 tonnes of petroleum per year - not so mention stopping 70 tonnes of carbon dioxide being released into the atmosphere.

On the irrigation front, many successful trials of small-scale irrigation schemes are being reported around the world. These make better use than large reservoirs of the water they collect, as well as distributing their benefits to people more evenly. Rainwater harvesting - trapping rainwater behind low banks before it can flow away as run-off - is being more often employed in arid lands. Whether these techniques, together with better management, can produce enough extra food in the developing world remains to be seen.

In a world without big dams, drinking water will be as crucial a question as any, since supplies at the moment are only just keeping pace with the growing population. More work needs to be done on methods of conservation and recycling. Even the desalination of seawater might become more economic as a higher price is put on water.

Large dams are still being built in places where there are too few inhabitants to complain. But their time is running out. The Western economic machine that drove their construction during the second half of the 1900s will have to come up with new ideas. For as we flow towards the 21st century, water risks becoming the source of huge social and political conflict.

Meanwhile, the environmental clamour is growing...

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The grand embankment

Bangladesh's floods can be devastating. But an ambitious scheme to control the waters is also causing concern, as **Annette Bingham** explains.

No country is as profoundly influenced by water as Bangladesh. The land, culture and lifestyles of the people are shaped by three of the world's most powerful rivers - the Ganges, Brahmaputra and Meghna. These spread their floods across one-third of the countryside each summer.

The great rivers carry soil sediment from the Himalayas which they deposit in a huge, constantly changing delta at the head of the Bay of Bengal. They bring the fertility which supports 110 million of the poorest people on earth and they can also bring disaster to this low-lying land. The raw power of these unstable rivers is difficult to comprehend. Just one breach of the right bank of the Brahmaputra in the 1988 floods inundated 1,000 square kilometres of farmland.

For much of the year there is too little water. When the monsoon breaks, the flat landscape changes completely. Boats replace bicycles as the means of local transport and deepwater rice flourishes with the rising floodwaters. All of this is essential for the farming season. But when rainfall is exceptional and floodwaters rise higher than normal, the effects can devastate.

The farmers of Bangladesh are adept at making the most of their tiny plots of land. But with 11.6 people per cultivable hectare they are already at the extreme. Increased food production in an already hungry land means investing in dry-season agriculture. And this means protection from the floods.

After the disastrous floods in 1988 the Bangladesh government sought to determine whether modern engineering techniques and computer-aided technology could solve the problem. Aid organizations of all shapes and sizes offered flood-control assistance. When the reports were

presented to the Bangladesh government in 1989, the advice was somewhat conflicting.

The French proposal was for embankments up to seven metres high to be built along the length of all the major rivers. They estimated the cost at \$10,000 million up front and \$150 million for annual repair and maintenance. Such expenditure would plunge the country into massive debt and divert money from other programmes.

By no means all the potential investors thought this was the answer. In the end the World Bank was asked to formulate an action plan. They did so, unveiling it in London in December 1989, and the \$150 million needed for pilot schemes immediately became oversubscribed. The plan envisages as a first step finding out what social and technical problems the embankments would cause.

Many informed observers are extremely sceptical about the scheme. Despite assurances from the World Bank's Vice-President for Asia, Atilla Karaosmanoglu, that 'the people of Bangladesh will be consulted at every stage', the British aid agencies involved in disaster relief after the 1988 floods do not believe that people at the grass roots will be adequately involved. By what line of communication can the planners conceivably consult the poor?

Steve Jones, the European Community's advisor on the action-plan team says that the embankments are bound to have a huge social impact. Under the French proposal, around 20,000 hectares of land would be requisitioned and 180,000 people affected. Some households would lose everything, adding their numbers to Bangladesh's already burgeoning landless population.

Jones also points out that the embankments will take decades to complete and other flood-protection measures - improved flood warning, better disaster management - will be needed.

No-one knows more about managing the flood waters than the Bangladeshi people who live perched above them and whose welfare depends upon them. And it is essential that 'experts' brought in to help should be ready to learn from the existing 'experts'. Their ingenuity includes floating hen coops and mesh fences to stop fish escaping from flooded fish ponds. Ideas like these could be more widely promoted.

Meanwhile there will be profound environmental effects from canalizing such vast bodies of water. Every step forward on the grand embankment plan will have to be watched with care.

Annette Bingham is a specialist in water issues and Asian affairs.

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