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by Patrick McCully

Empty Promises:
The Elusive Benefits of Large Dams

For every claim to virtue made by the proponents of big dams there is a clear-cut, factual and demonstrable refutation.

Elmer T. Peterson
Big Dam Foolishness, 1954

THE GREAT ILLUSION: FLOOD CONTROL

Says Tweed to Till -
'What gans ye rin sae still?'
Says Till to Tweed -
'Though ye rin with speed
And I rin slaw,
For ae man that ye droon
I droon twa.'

Anonymous
Two Rivers, Scots rhyme

The US Army Corps of Engineers has spent over $25 billion on 500 dams and 16,000 kilometres of embankments in its war against floods. BuRec, the TVA, and other federal, state and local bodies have spent billions more. Yet the inflation-adjusted annual cost of flood damage in the US has more than doubled since 1937, when the first federal Flood Control Act was passed. The number of people killed in floods each year has remained roughly the same. Flood damage to property in the US in the first half of the 1990s averaged around $3 billion a year. This pattern of rising spending on flood controls being accompanied by rising flood damage is seen around the world. India spent nearly a billion dollars on embankments and river channelization between 1953 and 1980, and many billions more on dams, yet both the area of cropland affected and the cost of damage from flooding rose dramatically over this period.[1]

There are a variety of reasons why flood damages are increasing. The deforestation, degradation and urbanization of watersheds is increasing the speed at which water runs off the land and into rivers; climate change may be increasing the variability, intensity, and

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[1] Ayres, B.D. (1993) 'Flood Revives Debate on $25 Billion in Controls', *International Herald Tribune*, 13 July; Denning, J. (1994) 'When the Levee Breaks', *Civil Engineering*, January, 3; Devine, R.S. (1995) 'The Trouble With Dams', *Atlantic Monthly*, August, 67; Centre for Science and Environment (1982) *The State of India's Environment—1982: A Citizen's Report.* CSE, New Delhi, 62.

frequency of rainstorms. Probably the main factor behind the spiralling costs of floods around the world, however, is that dams and embankments induce a false sense of security. Deliberately or not, people are encouraged to settle on the floodplains, making future floods much more serious than if no controls had been built and the plains had been left undeveloped. Furthermore, the progressive loss of storage capacity to sedimentation reduces the ability of dams to capture flood waters, with the result that year by year the risk to the new floodplain dwellers increases.

Structural controls such as dams and embankments, while they can eliminate 'normal' annual floods, can also worsen the severity of extreme floods. By confining the river and straightening its course, embankments increase both the volume and speed of the river, increasing its capacity to cause damage downstream. Containing the river's sediment load within its banks raises the bed of the river, which means that the embankments must in turn be raised further to compensate. Not only is this constant rebuilding of levees extremely costly, but eventually the river level will rise above the height of the surrounding plain, providing the potential for disastrous flash-floods should the huge embankments break.[2]

A reservoir with sufficient capacity can help alleviate floods downstream by storing some or all of the excess flow after heavy rains. However the very large dams which have the capacity to affect a flood on a major river are usually multipurpose projects, and financial and political pressures mean that frequently keeping the reservoir high to maximize electricity generation and water supply takes precedence over keeping it low to make room for floodwaters. The risk to people living below dams is compounded by the ever-present possibility of dam failure: a dam-burst flood is almost certain to be the most destructive which ever hits a river valley.[3]

High releases from some major hydrodams due to their operating regime can both increase the damage caused during the normal flood season and cause unprecedented out-of-season inundation. According to a team from Argentina's National Council for Scientific and Technical Studies, releases from Itaipú have caused 'recurrent — sometimes catastrophic — floods'.[4] Salto Grande, a 1,890 MW dam on the Uruguay River between Argentina and Uruguay, was supposed to reduce floods but since it was completed flooding has

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[2] See Interagency Floodplain Management Review Committee (1994) *A Blueprint for Change. Sharing the Challenge: Floodplain Management into the 21st Century*. Report of the IFMRC to the Administration Floodplain Management Task Force, Washington, DC, June; Denning (1994) op. cit.; Kusler, J. and Larson, L. (1994) 'Beyond the Ark: A New Approach to US Floodplain Management', *River Voices*, Vol. 4, No. 4, Winter; Williams, P.B. (1994) 'Flood Control vs. Flood Management', *Civil Engineering*, May.

[3] See e.g. Costa, J.E. (1988) 'Floods from Dam Failures', in Baker, V.R. et al. (eds.) *Flood Geomorphology*. Wiley, New York, 439.

[4] Bonetto, A.A., et al. (1989) 'The Increased Damming of the Paraná Basin and its Effects on the Lower Reaches', *Regulated Rivers: Research & Management*, Vol. 4, 341.

increased, with, among other consequences, the forced abandonment of some of the many inhabited islands in the lower Uruguay Basin.[5]

Numerous cases have been recorded of floods which have been made worse because dam operators held back water while the reservoir was filling, and then, when the rains kept on coming, had to open their spillways to maximum capacity to prevent their dam from being overtopped. India's Hirakud Dam was first justified in the name of flood control, yet extreme floods in the Mahanadi Delta between 1960 and 1980 were three times more frequent than before Hirakud was built. In September 1980, hundreds of people were killed after releases from Hirakud breached downstream embankments. Orissa's Chief Minister admitted that panic releases of water from Hirakud were responsible for much of the devastation but argued that if the water had not been discharged as quickly as possible, the dam could have failed.[6]

Many other deadly floods have been blamed on emergency releases from Indian dams. In 1978 nearly 65,000 people in the Punjab were made homeless by floods exacerbated by forced discharges from Bhakra Dam. A member of a committee set up to investigate the floods admitted that Bhakra had been close to being overtopped and stated that 'If something had happened to the dam, then half of Punjab would have been inundated.' Eleven years later a similar flood occurred. This time an official from the agency in charge of managing Bhakra argued that if the water had not been discharged 'one of the worst catastrophes in living memory' would have occurred.[7]

Half a million people living in Sacramento, the state capital of California, narrowly escaped disaster in 1986 when releases from the Folsom Dam almost overtopped the levees protecting the city from the American River. Discharge data from Folsom showed that the dam operators had disregarded their own operating procedures, allowing floodwaters to fill up the reservoir for 36 hours, and then suddenly increasing discharges to beyond their designed maximum when the safety of the dam was threatened.[8]

Flooding to Stop Floods

In many cases, claims that a dam will help reduce flooding appear to be merely tactics to try and skew cost-benefit analyses. A 1980 Congressional subcommittee report on the Tennessee Valley Authority's Columbia Dam, for example, found that 11,130 hectares

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[5] 'Salto Grande no tiene quien le escriba', *Tierra Amiga*, Montevideo, November, 1993, 35.

[6] Abbasi, S.A. (1991) *Environmental Impact of Water Resources Projects*. Discovery Publishing House, New Delhi, 108-9; Dogra, B. (1986) 'The Indian Experience with Large Dams', in *SEELD 2*; Dogra, B. (1988) 'Dams and Floods', *Indian Express*, 21 October; '"Panic" release might have worsened Indian flood', *Water Power and Dam Construction*, November 1980.

[7] Dogra, B. (1992) *The Debate on Large Dams*. New Delhi, 38; Centre for Science and Environment (1982) op. cit., 63.

[8] 'Mismanagement Endangers California Capital', *International Dams Newsletter*, Vol. 1, No. 3, June 1986; Williams, P. (1992) 'Flood Control vs. Flood Management: The Battle over Auburn Dam', *World Rivers Review*, Vol. 7, No. 1, January/February.

above the dam, almost all prime farmland, would be inundated or otherwise affected by the project to provide flood protection for less than a third as many hectares downstream. While the original project documents discussed the benefit of flood control, no mention was made of the multi-million dollar loss of farm production and related businesses to permanent flooding by the reservoir. When the subcommittee tried to identify the 43 buildings TVA claimed would be protected by the dam, they found 'numerous shack-type, abandoned, commercial structures'. Of 11 businesses which the TVA said existed along one section of the river, only five were listed in the local telephone directory.[9]

Claims as to how much flood protection the massive Three Gorges Dam will provide vary, but the most common is that 10 million people will be saved from the threat of flooding. Only floods caused by rain in the upper catchment above the dam would be controlled, however, while many of the severe floods on the middle and lower Yangtze are caused by local storms.[10] To provide this supposed flood control, some 1.3 million people will be permanently flooded out of their homes in the reservoir zone, and a further half million who live in the zone planned to provide emergency water storage will be flooded out in the case of exceptionally high flows. Even if the full emergency storage capacity were utilized, however, the effect on a major flood would be only marginal, the dam being able to store less than a tenth of the water expected in a 1-in-200-year flood.[11]

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[9] Powledge, F. (1982) *Water: The Nature, Uses, and Future of Our Most Precious and Abused Resource*. Farrar, Straus, Giroux, New York, 292; Chandler, W. (1984) *The Myth of TVA: Conservation and Development in the Tennessee Valley 1933-1983*. Ballinger, Cambridge, MA. A 1994 TVA brochure says the Columbia Dam 'is unfinished but has not been cancelled'.

[10] The mid-1995 Yangtze floods, for example, which killed 1,200 people and caused $4.4 billion in damage were mainly due to rainfall below the Three Gorges (O'Donnell, L. (1995) 'China to Pass Law to Stem Flood Havoc', *Reuter European Business Report*, 11 July; Farley, M. (1995) 'In China's Floods, Blame Mankind', *San Francisco Chronicle*, 19 July).

[11] See Williams, P.B. (1993) 'Flood Control Analysis', in Barber, M and Ryder, G. *Damming the Three Gorges: What Dam Builders Don't Want You to Know*. Second Edition, Earthscan, London; Fang, Z. (1993) 'The Flood Protection Function of the Three Gorges Project—Disadvantages Outweigh Advantages', in Shiu-Hung, L. and Whitney, J. (eds.) *Megaproject: A Case Study of China's Three Gorges Project*. M.E. Sharpe, Armonk; Chen, K. (1994) 'The Limited Benefit of Flood Control. An Interview with Lu Qinkan', in Dai, Q. (edited by Adams, P. and Thibodeau, J.) *Yangtze! Yangtze!* Probe International, Toronto and Earthscan, London.