



Supported by the International Institute for Environment and Development (IIED)  
and the World Bank, Bank-Netherlands Watershed Partnership Program

## **Review: Extreme climatic events as drivers of change in watershed processes and in land use practices**

Severe storms and flood events in recent years have led to logging bans in China and Thailand, a crack down on illegal logging in the Philippines, and to other restrictions on upstream land use practices throughout Southeast Asia, India and China. They have also brought renewed attention to deforestation in Haiti, and to farming practices in Honduras. At best, restrictions on logging and grazing restrictions, as well as tree planting, offer only a partial solution to a complex problem that may have several contributing factors, among which deforestation is sometimes the least significant. At worst - unless complemented by other strategies, they divert attention away from root causes of watershed degradation that are more politically difficult to address, and from more insidious kinds of threats.

For example, in the eastern Luzon in the Philippines in 2004, flooding and landslides that occurred after 4 otherwise normal typhoons occurred in rapid succession, were attributed to illegal logging. As is discussed in a recent report from the Asia Forest Network by Inoguchi, Soriaga and Walpole (2005), illegal logging is indeed a problem. But more significant causes of damage in this, and in similar previous disasters, have been settlement along river beds, failure to identify and acquire land suitable for relocation of squatters, and the existence of coconut plantations along flood paths that became uprooted and contributed to the flow of debris. It is also important to distinguish between illegal logging by timber traders, and a variety of illegal but often traditional subsistence uses of forest by upland populations who lack formal property rights. Perhaps the most difficult issues to address are the issues of tenure security among upland populations, without which they have no assurance of access to the benefits of either conservation or development, as they will also not be in a position to enter into contractual arrangements designed to protect watershed services, or even to negotiate. Therefore, they will have little incentive to cooperate with any required changes in land use practices or, as in the case of Haiti, to simply allow trees to grow.

Although randomly timed and unevenly distributed over large upper watershed areas that have very diverse biophysical conditions and levels of vulnerability, extreme events should not come as a surprise. Changes in watersheds often only become apparent in response to extreme climatic events, which can also be important elements of a flow regime. However, they may also compound the otherwise gradual but cumulative impacts of land use practices. For example, sedimentation may not become a problem until a major storm fills the reservoir of a dam with sediment. In a 1993 incident at the Kulekhani dam in Nepal - near Kathmandu, more sediment was deposited in the reservoir than had been anticipated over the entire projected lifespan of the dam, following a single storm event that brought 540 mm of rain in a 24 hour period (Dixit and Ahmed 1999). However, it is not clear that there is any silver bullet, or that changes in land use practices would have prevented it. The Himalayas are known for having the highest rainfall in the world and high natural rates of erosion.

Given that extreme events heighten awareness of the services that watersheds provide, in theory, they can also provide an opportunity to build more effective institutions needed to support good watershed management and reduce vulnerability to extreme events in the future. Institutions such as stakeholder associations and other forms of cooperation are often born in a crisis. They also play critical roles in the implementation of payments for watershed services one of which may be

to create the political pressure that is usually necessary to address root causes, such as lack of tenure security.

As has been pointed out by Gordon "Reds" Wolman, momentary crises created by extreme events serve to get attention - which needs to be given to meeting very immediate human needs. However, if the goal is to also reduce vulnerability to extreme events in the future, it is important to also craft and convey a message that promotes a long-term view. In other words, to direct this attention towards the more insidious "slow-creep" kinds of disasters such as land degradation, that tend to be perceived only in retrospect, sometimes, after bringing down entire civilizations.

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Remarks by Gordon "Reds" Wolman were made in his acceptance of a Lifetime achievement award presented to him by the National Council for Science and the Environment, at the Fourth National Conference on Science, Policy and the Environment, January 29-30 2004, and are published in the conference report, [Water for a Sustainable Future](#) (pdf).

**Other links:**

United Nations University, [Institute for Environment and Human Security](#) [Reports and papers on floods, vulnerability and human security]

University of Colorado, Natural Hazards Research and Applications Information Center, [Natural Hazards Library](#), HAZLIT database and search engine. A source of more general publications on disaster research. This site publishes the Natural Hazards Observer, and the Disaster Research e-mail bulletin.

[Benfield Hazards Research Centre](#)

Publications include numerous case studies.

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The Flows Bulletin is produced by Sylvia Tognetti, an independent consultant on environmental science and policy, with the collaboration and support of IIED project on Policy Learning in Action: Developing Markets for Watershed Protection Services and Improved Livelihoods, and the World Bank, through the Bank-Netherlands Watershed Partnership Program.

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