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Catastrophic flood and forest cover change in the Huong river basin, central Viet Nam: A gap between common perceptions and facts

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ABSTRACT

Recent catastrophic floods in Viet Nam have been increasingly linked to land use and forest cover change in the uplands. Despite the doubts that many scientists have expressed on such nexus, this common view prompted both positive forest protection/reforestation programs and often-unwarranted blame on upland communities for their forest management practices. This study discusses the disparity between public perceptions and scientific evidences relating the causes of catastrophic floods. The former was drawn on the results of a questionnaire and focus groups discussions with key informants of different mountainous communities, whereas the latter was based on GIS and remote sensing analysis of land cover change, including a statistical analysis of hydro-meteorological data of the Huong river basin in Viet Nam. Results indicate that there is a gap between the common beliefs and the actual relationship between the forest cover change and catastrophic floods. Undeniably, the studied areas showed significant changes in land cover over the period 1989–2008, yet, 71% of the variance of catastrophic flood level in the downstream areas appeared related to variance in rainfall. Evidences from this study showed that the overall increasing trends of catastrophic flooding in the Huong river basin was mainly due to climate variability and to the development of main roads and dyke infrastructures in the lowlands. Forest management policies and programs, shaped on the common assumption that forest degradation in the upland is the main cause of catastrophic flood in the downstream areas, should be reassessed to avoid unnecessary strain on upland people.

1. Introduction

Floods in Viet Nam are well known phenomena and occur in all regions of the country, especially in the central coastal region, Mekong delta, and Red River delta (Socialist Republic of Vietnam, 2007). People have had to learn to live with floods, particularly those whose livelihood depends on the productive functions of annual flooding. In central Viet Nam, according to Tran and Shaw (2007), there are strong evidences that unsustainable agricultural practices and inappropriate development programs have contributed to a substantial increase in flood risks. Floods cause damage to natural resources and environmental quality and indirectly contribute to increasing poverty, which in turn add to the vulnerability of both natural and human systems. To reduce flooding, many environmental programs such as reforestation, forest protection, upland fixed cultivation and resettlement have been implemented to reduce flooding since 1990s. These measures have achieved significant results in reducing the negative effects of low magnitude flooding (The Socialist Republic of Vietnam, 2007). However, these measures may not be adequate to reduce the risks of catastrophic floods which are unfortunately increasing both at the local and global level.

Thua Thien Hue province is one the most disaster prone areas of Viet Nam, subjected to both typhoons and floods. These hazards appear to have worsened in recent years, causing devastation to the entire province, particularly to vulnerable populations in mountainous areas and along the coastal zones. For example, the flood that hit the province in November 1999, which killed 780 people, affected around one million residents, and sunk or damaged more than 2100 boats. The economic damage was worth US$364 million (CCFSC, 2006). Various other catastrophic floods, with water levels above alarm level II (see Table 1), also caused severe losses of human lives, assets and infrastructures.

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The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007, p. 5) states that warming of the Earth's climate is now unequivocal. At the continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed, including the frequency of heavy precipitations that have increased over most land areas. Therefore, more intense floods have been observed over wider areas since the 1970s, particularly in the tropics and subtropics (IPCC, 2007, p. 7–8). In Viet Nam, in particular, the IPCC observed that there are more typhoons and floods with higher intensity. The typhoons with abnormal movement often occur simultaneously with floods (MONRE, 2008). Yet, despite these findings, after each catastrophic flood, deforestation and rapid land use changes in the uplands are still blamed as one of the main causes. For example, the Vietnamese Prime Minister announced the implementation of the "five million hectare forest program" to reduce flood risks (Decision 100/2007/QĐ-TTg, 2007). This has become a priority in the central provinces where deforestation was identified as a major cause of the deadly flood. Similarly, the Thua Thien Hue provincial committee for flood and storm control also listed forest protection in the uplands as one of the priorities to reduce the flood risks for the Hue city (PCFSC, 2000). The underlying argument is that these floods were mostly induced or aggravated by human interference in the hydrological system. Consequently, many national and international government programs on natural resource management and economic development have been hard-pressed for forest protection and reforestation and for improving land use practices in the uplands, as important remedies to reduce the catastrophic floods in the lowlands. Evidence can be seen in the United Nations World Food Program (WFP – often identified by the acronym PAM in Viet Nam), the 'fixed cultivation and settlement' program, the Viet Nam government program 327 and the Five Million Hectares Reforestation Program (5MHRP).

Thus, unlike the regular flood-risk-management procedures, which have been developed in Viet Nam for centuries, the more demanding measures necessary to effectively deal with catastrophic floods are more difficult to implement because they are misperceived among local people and decision makers. There are two main problems that challenge the development of effective measures to reduce catastrophic floods. Firstly, the low frequency of such events reduces people's awareness of a flood risk. Secondly, conventional wisdom about the flood-prevention role of forests has clouded the perspectives of decision makers, leading to an overemphasis on reforestation and forest protection at the expense of more holistic watershed and river-basin management.

It becomes evident that it is necessary to understand the mechanisms governing individuals and communities' perception of catastrophic flood risks and how they invest and act to prepare for those events. Hence, this paper studies the disparity between the scientific evidences relating the causes of catastrophic floods and the common perception on the relationship between forest and flood in the Huong river basin of Thua Thien Hue province.

2. Common perception and science on the relationship between forest-cover change and flooding

In many cultures there is a strong belief that forests can prevent or reduce floods (FAO and CIFOR, 2005). A review of Hamilton (1992) on the link between tropical forests and floods reveals that many newspapers and journal articles have blamed devastating floods on logging or firewood cutting in upper watersheds. For instance, both Openshaw (1974) in a flood case in India, and Corvera (1981) in a flood case in the Philippines have supported this contention. Sharp and Sharp (1982) also stated that: "over logging is now officially recognized as the cause of the July 1981 severe flooding of the Yangtze" in China. Reporting on the Bangladesh floods of August 1988, which killed 1600 people and left 30 million homeless, an article from the Knight-Ridder news service (Kaufman, 1988) was entitled "Bangladesh flood disaster blamed on deforestation", and it went on to say: "By almost all accounts, the main environmental problem is the widespread and growing deforestation of the Indian and Nepalese mountains to the north of Bangladesh."

The rationale behind this belief is that all forests tend to have higher evaporation rates than other types of vegetation, and natural forests exhibit higher infiltration rates, due to porous soils and the existence of understorey and humus layers. The combination of these two factors generally contributes to lower runoff (FSIV and IIED, 2002). Therefore, it is often argued that forest covers, compared to most alternative vegetation cover types, will diminish the risks of downstream flooding (FAO and CIFOR, 2005). Not surprisingly, agricultural activities in uplands are also commonly believed to have significant impacts on storm runoff volume, peak magnitude and timing of the peak.

Contrarily to the above described common beliefs, scientists contend that direct links between deforestation and floods are far from certain, and hydrological systems are so complex that it is extremely difficult to disentangle the impacts of land use from those of other natural processes and phenomena (Hamilton and Pearce, 1988; Chomitz and Kumari, 1998; Walker, 2002; Bruijnzeel, 2004; Andreassian, 2004; Kaimowitz, 2004; Enters et al., 2004; FAO and CIFOR, 2005; Calder et al., 2004; Hayward, 2005; Calder and Aylward, 2006). Moreover, from a hydrological perspective, the impact of (i) natural forests, (ii) forest clearing, and (iii) reforestation on water flowing, is different (van Dijk et al., 2009).

Scientific assessments have shown that it is often the management activities associated with forestry, cultivation, drainage or road construction, rather than the presence or absence of forests themselves, to influence the size and frequency of floods (Anderson et al., 1976; Jones and Grant, 1996; van Dijk et al., 2009). Certainly, forest clearing, and other forestry management operations can cause short-term increases in runoff as they are often associated with a reduction in soil infiltration rates and increase in superficial drainage. The literature confirms that heavy storms over small

Table 1
Flood alarm levels used in Viet Nam.

Warning level	Description
Alarm Level I	Possible flood condition – River water level is high; threat to low height embankments; flooding of very low lying areas; infrastructure safe.
Alarm Level II	Dangerous flood condition – Flood plane inundation expected; towns and cities still generally protected by flood defenses; high velocity river flows pose danger of bank and dyke erosion; bridge foundations at risk from scour; infrastructure generally safe.
Alarm Level III	Very dangerous flood condition – All low lying areas submerged, including low lying areas in cities and towns; safety of river protection dykes in jeopardy; damage to infrastructure begins.
Alarm Level III +	Emergency flood condition – General and wide spread uncontrollable flooding; dyke failure a certainty and probably uncontrollable; damage to infrastructure severe.

Source: Central Committee for Flood and Storm Control (CCFSC) available at http://www.ccfsc.org.vn