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Land Use Influence on the 2014 Catastrophic Flood in the Northeast of Peninsular Malaysia

Authors : Zulkifli Yusop

Abstract : The severity of December 2014 flood on the east coast of Peninsular Malaysia has raised concern over the adequacy of existing land use practices and policies. This article assesses flood responses to selective logging, plantation establishment (oil palm and rubber) and their subsequent management regimes. The hydrological impacts were evaluated on two levels: on-site (mostly in the upstream) and off-site to reflect the cumulative impact at downstream. Results of experimental catchment studies suggest that on-site impact of flood could be kept to a minimum when selecting logging strictly adhere to the existing guidelines. However, increases in flood potential and sedimentation rate were observed with logging intensity and slope steepness. Forest conversion to plantation show the highest impacts. Except on the heavily compacted surfaces, the ground revegetation is usually rapid within two years upon the cessation of the logging operation. The hydrological impacts of plantation opening and replanting could be significantly reduced once the cover crop has fully established which normally takes between three to six months after sowing. However, as oil palms become taller and the canopy gets closer, the cover crop tends to die off due to light competition, and its protecting function gradually diminishes. The exposed soil is further compacted by harvesting machinery which subsequently leads to greater overland flow and erosion rates. As such, the hydrological properties of matured oil palm plantations are generally poorer than in young plantation. In hilly area, the undergrowth in rubber plantation is usually denser compared to under oil palm. The soil under rubber trees is also less compacted as latex collection is done manually. By considering the cumulative effects of land-use over space and time, selective logging seems to pose the least impact on flood potential, followed by planting rubber for latex, oil palm and Latex Timber Clone (LTC). The cumulative hydrological impact of LTC plantation is the most severe because of its shortest replanting rotation (12 to 15 years) compared to oil palm (25 years) and rubber for latex (35 years). Furthermore, the areas gazetted for LTC are mostly located on steeper slopes which are more susceptible to landslide and erosion. Forest has limited capability to store excess rainfall and is only effective in attenuating regular floods. Once the hydrologic storage is exceeded, the excess rainfall will appear as flood water. Therefore, for big floods, rainfall regime has a much bigger influence than land use.

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