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Hydrologic Effects of Environmental Change in Red River Watershed

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Transboundary ecological issues in Red River Watershed have been received increasing attention with the rapid development of economic cooperation between China and Mainland Southeast Asia. This paper uses hydrological data for the watershed (1950s to present), socioeconomic data (1980s to present), water quality assessment data (1994 to present), historical archives, and copious data from field research as a basis for a comprehensive study of Hydrologic effects of Environmental Change in Red River Watershed：(1) The soil erosion in basin-wide has decreased, but the increased sediment transport demonstrates that the soil erosion is still serious in some tributaries. The soil loss in the upstream areas of the main channel, for example, is greater than that in the downstream. (2) Threats from landslides and rockslides showed a tendency to increase continually, with rockslides being of primary concern in the northern part of the watershed, and small- to medium- landslides more prevalent in the south. (3) Since 1990s, the flood season in the mainstream is rather long and flood frequency high. (4) From 1991, the index of organic pollutants, such as toxins and heavy metals, showed a declining trend. (5) Impacts from river bank changes in border watercourse are serious, with 11 waterways and 13 sections (25 km total) in China side needing urgent attention. （6）From 1950s to 2000, the population in Red River watershed increased from 3.50 million to 6.74 million, this led to total water consumption increased from 1.09 billion m3 in 1980 to 1.88 billion m3 in 2000. Yearly increasing rate is 3.6%. Based on this increasing rate, total water consumptions of the basin in China will add up to 2.56, 3.23 and 3.91 billion m3 in the year of 2010, 2020 and 2030 respectively, which will be occupied by 3.2%, 4.0% and 4.8% of annual mean water resource volume. (7) Red River watershed is one of the most serious water and soil loss region in Yunnan province, annual mean sediment load (1980∼2000) in the watershed reached 106.8 million tons, among which mainstream accounted for 57.49 million tons. Sediment concentration of main hydrological stations in the streams assumed a yearly increasing trend.