ECOHYDROLOGY OF RIVER BASINS OF NEPAL

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Temporal and spatial variations in the discharge from major river basins of Nepal have been examined on the basis of available records of discharge together with basin characteristics and meteorological data. The specific runoff of each basin has been calculated and mapped (Fig. 1). Downstream changes in the volume of flow, both annual and extreme, have been estimated in order to examine upstream-downstream linkages in the flow of water.

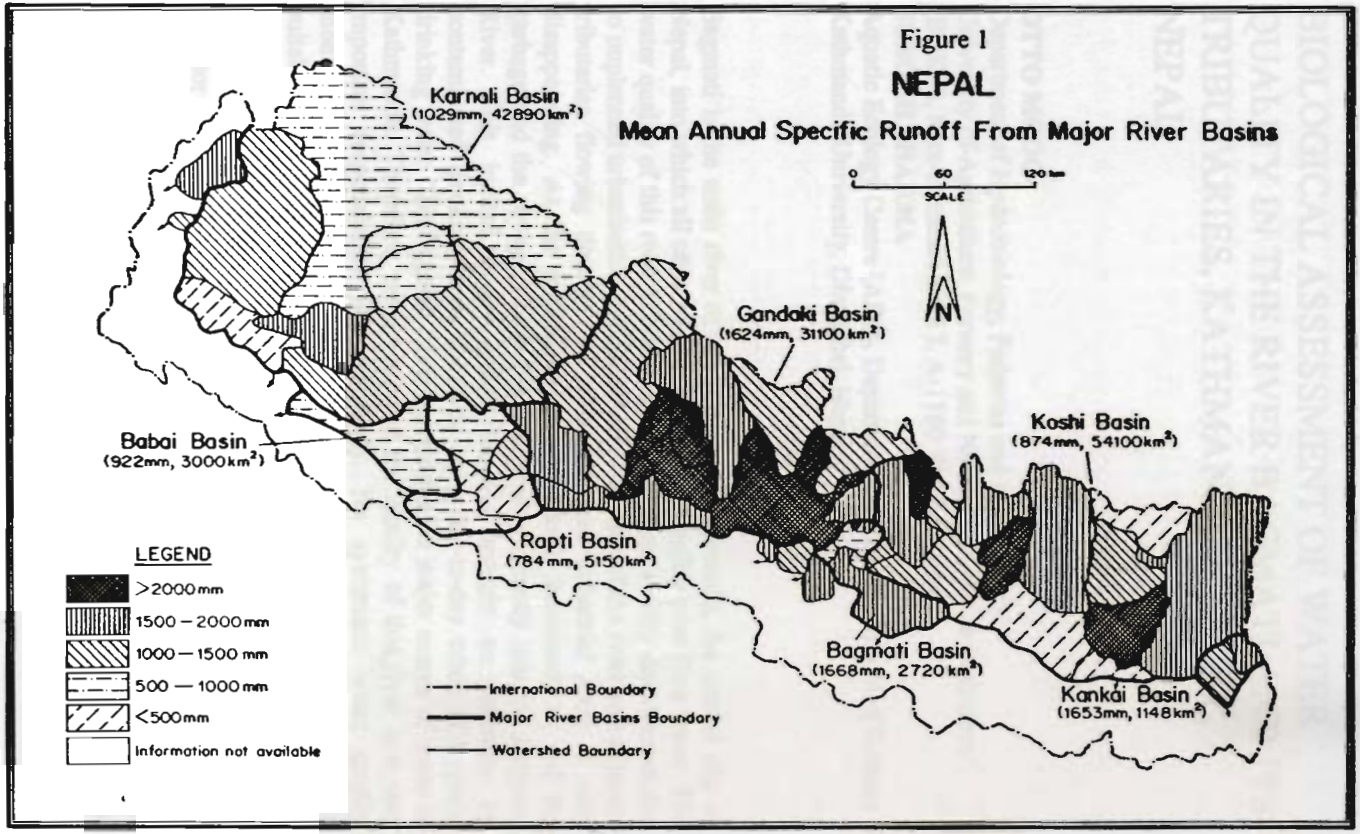
It is known that specific runoff varies generally with space and time, and the general trend in specific runoff in these basins indicates that it is comparatively higher in the central part of the country than in other parts. It is seen that specific runoff ranges from below 1,000mm in the Koshi basin in the east, to more than 1,500mm in the Gandaki basin in central Nepal, to slightly more than 1,000mm in the Karnali basin in the west. Although the total monsoon precipitation in the southern part of the Himalayas, in the Koshi basin (eastern Nepal), is comparatively high, yet a significant portion of the Koshi basin lies on the much drier northern side of the main Himalayas, which results in low specific runoff in this basin. Similarly, the Karnali basin in the west, which receives less precipitation than the central and eastern parts of the country, also has lesser specific runoff as compared to the Gandaki and Koshi basins. The influence of the high Himalayas on the precipitation and, consequently, on specific runoff is evident from the fact that rivers originating from the northern side of the main Himalayas, such as the Arun, Trishuli, Budhigandaki, Kaligandaki, Bheri, and Mugu Karnali, have lesser specific runoffs compared to the rivers originating from the southern side of the

Himalayas, such as the Tamor, Dudhkoshi, Khimti, Likhu, Balephi, Chepe, Madi, Seti, etc. Similarly, the ratio of average maximum to mean average discharge as well as the ratio of maximum to minimum annual average discharge is comparatively higher in the rivers originating in the Siwalik hills in the south, indicating the very flashy nature of runoff in this region.

From the available data on the Koshi basin it is found that, although upstream utilisation and diversion of water are virtually nonexistent, the volume of water decreases in the downstream section near the Kampughat and Chatra areas. This anomaly in downstream discharge needs to be further investigated in order to understand the flow behaviour of these rivers and the causes of such anomalies. It has also been noticed that extreme discharge events generated either by heavy precipitation, landslide damming, or glacial lake outburst floods in the upstream areas are not directly connected with the floods in distant downstream areas.

The impact of intense rainfall events are found to be more damaging on microwatersheds compared to other watersheds. However, the existing network of meteorological stations in Nepal is not sufficient to record such events. Case studies of the impact of such events on microwatersheds could contribute to a better understanding of ecohydrological processes in such watersheds. It is also desirable to improve the existing monitoring network of hydrometeorological stations in the country in order to generate more reliable data.

Figure 1


NEPAL
Mean Annual Specific Runoff From Major River Basins
0 60 120 km
SCALE
N
Karnali Basin
(1029mm, 42890km²)
Gandaki Basin
(1624mm, 31100km²)
Babai Basin
(922mm, 3000km²)
Koshi Basin
(874mm, 54100km²)
Rapti Basin
(784mm, 5150km²)
Bagmati Basin
(1668mm, 2720km²)
Kankai Basin
(1653mm, 1148km²)
LEGEND
>2000mm
1500 — 2000mm
1000 — 1500 mm
500 — 1000mm
<500mm
Information not available
International Boundary
Major River Basins Boundary
Watershed Boundary