

I INTRODUCTION

The combined basins of the Ganges and Brahmaputra rivers in the northern part of the Indian sub-continent (1.38 million square kilometres) constitute the home of some 400 million people, or about 10% of the world's population. By modern standards most of the population of the region has always been poor, but concern about the diminishing welfare of these people, as a result of environmental degradation, has been growing rapidly during the last decade (Eckholm, 1975; Hrabovsky & Miyan, 1987).

A widely held perception of this environmental degradation involves recent massive deforestation in the uplands as a result of a population explosion, leading in turn to catastrophic increases in soil erosion and river sediment loads on the one hand and to greatly increased flooding and siltation in the lowlands, on the other (Bowonder, 1982; Spears, 1982; Myers, 1986). This view is reflected in the frequently quoted statement that a few tens of a million Himalayan hill farmers are holding hostage several hundred million inhabitants of the plains (World Resources Institute, 1985). Naturally, the economic and political implications of the above scenario are enormous (Ives, 1987).

Despite the fact that this view appeals to logic and conventional wisdom alike, it has been challenged in the past few years (e.g. Carson, 1985; Hamilton, 1987). Basically this alternative school of thought stresses that the dramatic geophysical processes, responsible for the very existence of the Himalaya and the plains, are sufficiently impressive and that the effects of the activities of mountain farmers are insignificant in comparison. In this view, whereas the mountain environment is indeed being harmed through loss of forest, - creating grave local problems, this does not appreciably increase flood danger or sedimentation in the densely populated plains. The image of the people living in the lowlands as "hostages" would thus be highly overdrawn.

As pointed out by Ives (1987), the controversy is largely a matter of scale and historical perspective. A crisis of very large dimensions is developing, but the real magnitude of the problem has been disguised by oversimplifications and generalizations. The recent Mohonk Mountain conference (Ives & Ives, 1987) on "the Himalaya-Ganges problem" was intended to expose this simplistic approach, but concluded at the same time that there is an urgent need for a much fuller understanding of Himalaya-Ganges dynamics (Ives, 1987).

The main purpose of the present paper is to shed more light on the above debate by reviewing the evidence with respect to the physical aspects of the matter published to date. The basic question, therefore, is: "What is the role of forest and land-use in the uplands with respect to flooding, dry-season flows and sedimentation in the lowlands?". And, following immediately: "What downstream benefits can be reasonably expected in this regard from upland reforestation?".

By drawing as much as possible on quantitative data actually collected in the region itself, rather than extrapolating results obtained in other (usually less extreme) parts of the world, we hope to lift the discussion from the level of empiricism and subjectivity to a more objective presentation of scientifically established facts. Naturally, the success or failure of such an approach depends to a large extent on the amount and reliability of the information collected.

Before the issue at hand can be addressed in more detail, one needs to have an idea of the spatial and temporal variations of the relevant environmental elements, notably geology and geomorphology, climate, soils and vegetation, as well as their interaction. Chapter II, therefore, describes the physical and biological characteristics of the environment in some detail. Since water is the key element linking atmosphere, plants and soils, this is followed by a discus-

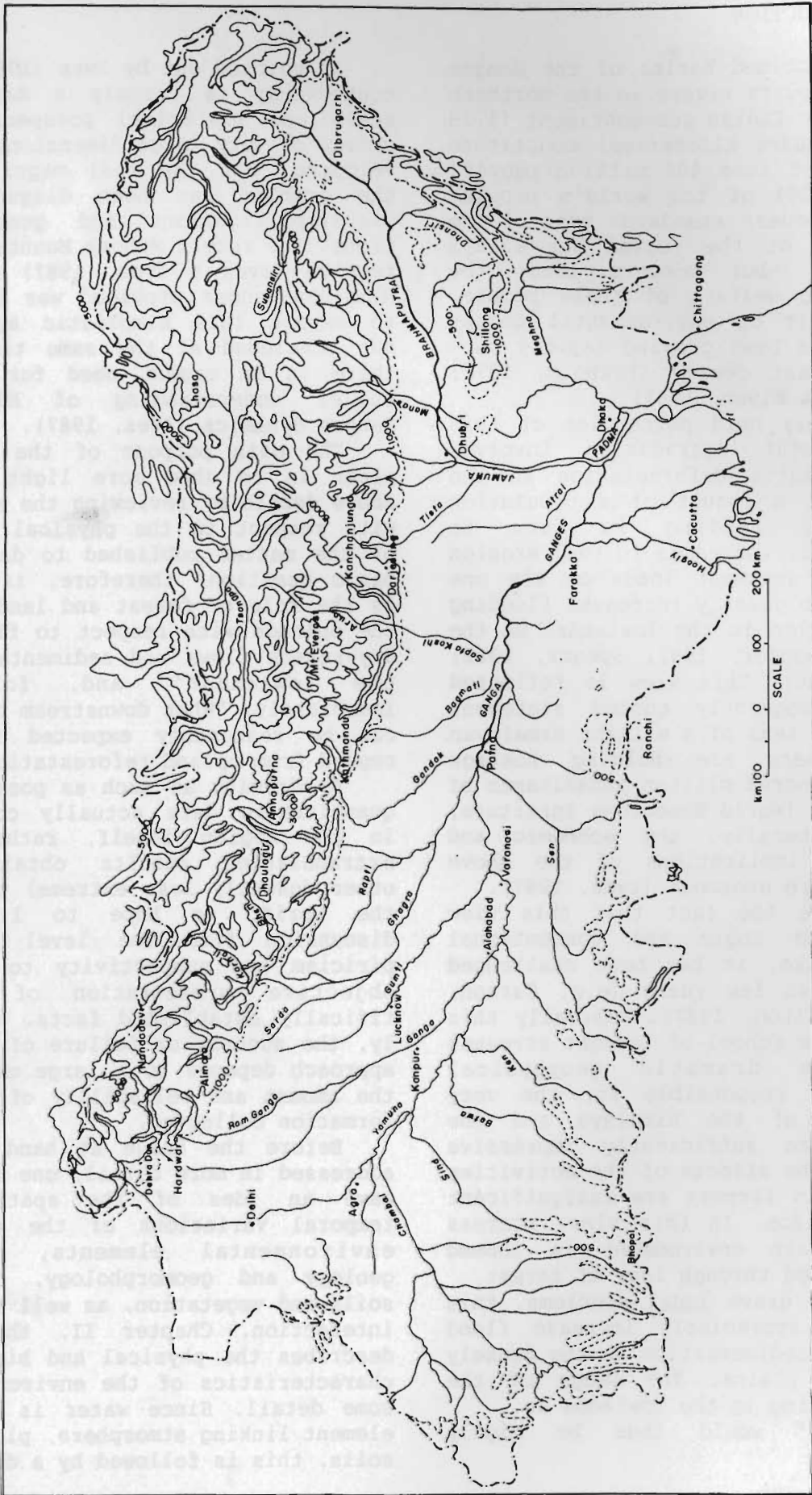


Figure 1. The Ganges-Brahmaputra River Basin: general features.

sion of regional hydrology (Chapter III). Within the framework thus provided, the specific influences exerted by various land-use types on total and seasonal water yields, surface erosion, mass movement

processes and river sediment loads, are dealt with at length in Chapter IV. Based on these findings, conclusions are drawn and gaps in our knowledge indicated (Chapter V).



Figure 2 - Longitudinal profile of the...
Approximate longitudinal profile of the...
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