Application of IRS-1A Data for Delineating Buried Channels in Southern Part of Allahabad District of Uttar Pradesh

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ABSTRACT

Two buried channels were identified in southern part of Allahabad district based on the visual interpretation of IRS-1A LISS II FCC followed by detailed study of aerial photographs and cheks. It has been concluded on basis of the configuration of the channels that these were initially joined forming one channel which flowed from east to west although the present master slope of the area is from west to east. The present reversal of the drainage might have been caused by the neo-tectonic activity in the area. The buried channels provide potential ground water reservoirs in the area as proved by a few boreholes drilled on the channels. Some part of the area has become waterlogged due to the seepage of water from the canals cutting across one of the buried channels.

Introduction

Buried channel is a palaeochannel covered by subsequent sedimentation or other material. Buried channels which are generally potential reservoir of ground water may become very significant in the drought-prone areas. Krishnaswami and Hukku 1969 reported presence of a buried channel having glacial deposits beneath the Belan river bed in the foundation trench of Meja Dam in Mirzapur district. (Khan 1977), while conducting geomorphological study, recorded presence of a 3-km long palaeochannel east of the Tons river in Allahabad district. The present study aims to identify buried channels in parts of Allahabad district having scarcity of water in the area bordering Bundelkhand Plateau using the technique of remote sensing.

Study Area

The area under study lies in the southern part of Allahabad district. Major part of the area is covered by Older Alluvium of the Gangetic plain. In the southern part, sub-horizontal Dhandraul Quartzite belonging to Vindhyan Super Group is exposed forming the northern margin of Vindhyan plateau. Few isolated patches of Dhandraul Quartzite also outcrop in the tract covered by Older Alluvium.

Methodology

Initially, LANDSAT MSS band 4 imagery was studied for identification of buried channels but without any success. Subsequently, the inter-
pretation of IRS-1A LISS II FCC imagery was taken up which led to the identification of the buried channels.

In order to study the buried channels in further details, features like surface slope, direction, position of natural levees and vegetation density, etc. were studied by visual interpretation of aerial photographs. Field checks were carried out for collecting ground truth and to examine the extent of the area affected by waterlogging due to seepage of water into buried channel from canals and also to evaluate the potentiality of buried channels as ground-water reservoirs.

The Buried Channels

Two buried channels were identified in the area south of Allahabad. One lies west of the Tons river and the other east of it. Both the channels trend in WNW-ESE direction with the same alignment. The buried channels are filled by sand and are covered by 3 to 10 m thick sheet-washed clayey sediments as found in fewbore-holes drilled on the channels. On the western channel, the thickness of the soil cover increases from west to east. The buried channels are marked at some places on the ground by a shallow linear depression which is however, imperceptible at most of the places.

The soil in the area occupied by the buried channels has much higher concentration of moisture compared to the surroundings due to accumulation of water in buried channels. The higher moisture content of the soil cover of the buried channels and the resulting vegetation concentration is picked up by satellite imagery and forms the basis of the identification of buried channels.

Band 4 of IRS-1A LISS II imagery belonging to near infra-red part of the electromagnetic (EM) spectrum shows the high-moisture areas as dark due to very little or no infra-red reflectance. As such, IRS-1A LISS II FCC in band 2,3 and 4 picks up buried channels quite successfully. The LANDSAT MSS imagery failed to pick up buried channels because its band 4 has wider range (0.80 1.10 μm) compared to much narrower range of IRS-1A (0.77 to 0.86 μm) making IRS-1A imagery more discrete. The buried channels are seen with light reddish brown to dark blackish brown colour depending upon the moisture content. More the moisture, darker becomes the colour of buried channels in the imagery. The surface drainage could be distinguished by their light greyish blue to dark greyish blue colour. The waterlogged areas show blackish brown colour while the non-waterlogged areas show reddish brown colour.

The western channel which is 68 km long and 100 to 300 m wide (the width increasing from east to west) with a 45 km valley length extends from Pratabpur (25°10'00"N; 81°38'00" E) in the west to Bhunda (25°11'00"N; 81°38'00" E) in the east. The eastern channel is 20 km long extending from east of Khairagarh Fort (25°12'00"N; 82°50'00"E) in the west to Dighia (25°10'00"N; 82°10'00" E) in the east. It is about 125 m wide and lies in a 14 km long valley. The sinuosity index of eastern channel is 1.42 while that of the western channel is 1.51. The sinuo-