2

THE REGION

2.1 CONSTITUENT AREAS OF NCR

The Constituent Areas of the National Capital Region are as under:

a) National Capital Territory of Delhi (1,483 sq kms). This accounts for 4.41% of the total area of NCR.

b) Haryana Sub-region comprising of Faridabad, Gurgaon, Rohtak, Sonepat, Rewari, Jhajjar, Mewat and Panipat districts. This accounts for 30.33% (13,413 sq kms) of the area of the State and 39.95% of the area of NCR.

c) Rajasthan Sub-region comprises of Alwar district. The area is 2.29% (7,829 sq kms) of the total area of the State and 23.32% of the area of NCR.

d) Uttar Pradesh Sub-region comprising of five districts namely, Meerut, Ghaziabad, Gautam Buddha Nagar, Bulandshahr and Baghpat. This accounts for 4.50% (10,853 sq kms) of the area of the State and 32.32% of the area of NCR.

Thus, the total area of NCR is 33,578 sq kms as indicated in the Map 2.1 National Capital Region Regional Plan-2021: Constituent Areas.

2.2 PHYSICAL SETTING

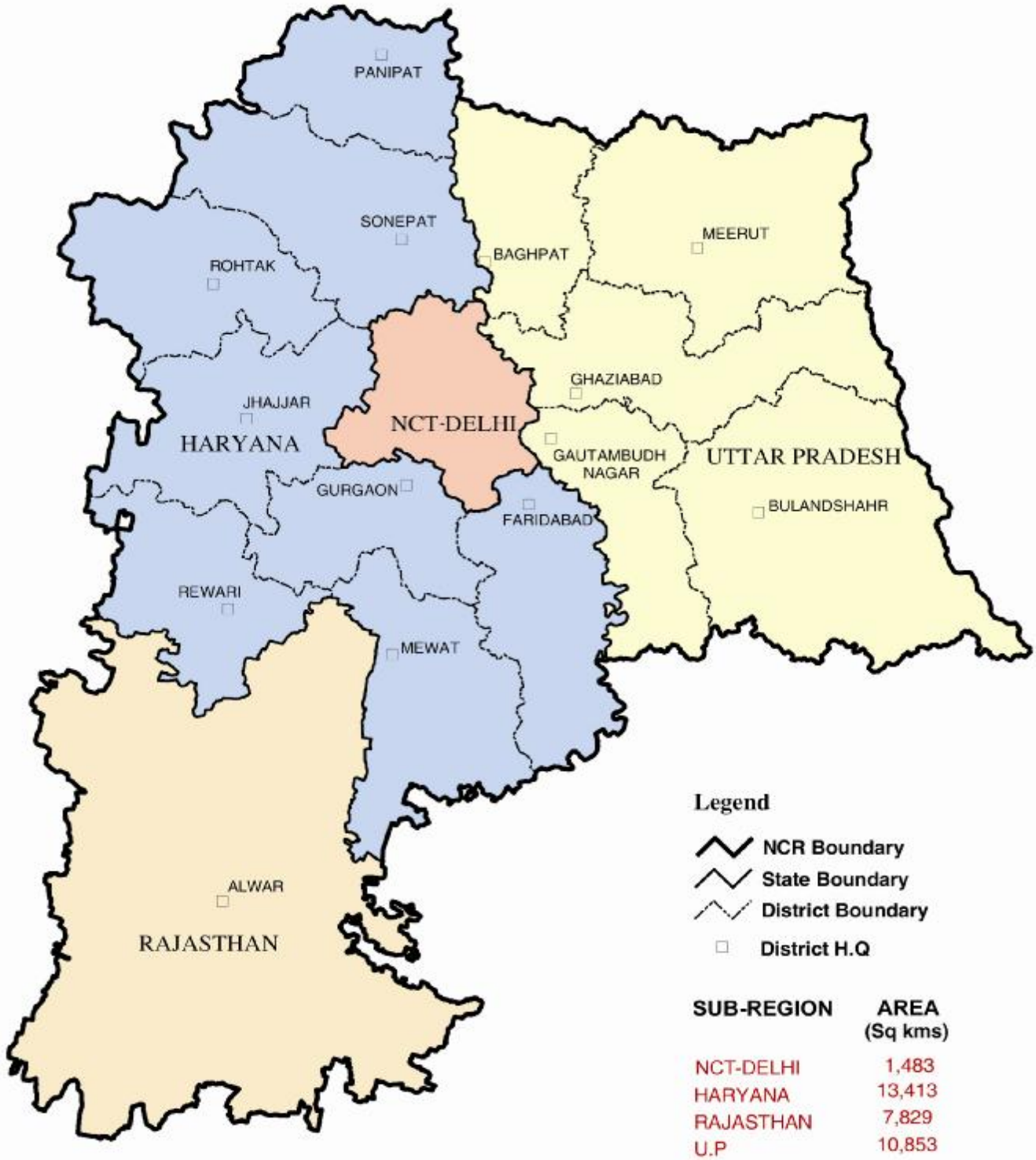
The National Capital Region lies between 27^{o} 03' and 29^{o} 29' North latitude and 76^{o} 07' and 78^{o} 29' East longitude. The region includes the National Capital Territory of Delhi (earlier Union Territory of Delhi) and parts of the States of Haryana, Rajasthan and Uttar Pradesh.

The physiography of the region is characterised by the presence of the Ganga skirting it as its eastern boundary, the Yamuna traversing north-south forming the boundary between Uttar Pradesh and Haryana, and the sand dunes and barren low hills of the Aravalli chain and its outcrops in the west, flat topped prominent and precipitous hills of the Aravalli range enclosing fertile valleys and high table lands in the south-west, and the rolling plains dominated by rain-fed torrents in the south. The rest of the region is plain with a gentle slope of north-east to south and south-west (Map 2.2 National Capital Region: Physiography and Slope).

2.3 GEOLOGY

The rock type exposed in the area belongs to Delhi Super-group of Lower Proterozoic age and consists of Quartzite of the Alwar Group, Phyllite and Slate of the Ajabgarh Group. The Quartzites are massive,

NATIONAL CAPITAL REGION
REGIONAL PLAN-2021:CONSTITUENT AREAS



Legend

- NCR Boundary
- State Boundary
- District Boundary
- District H.Q

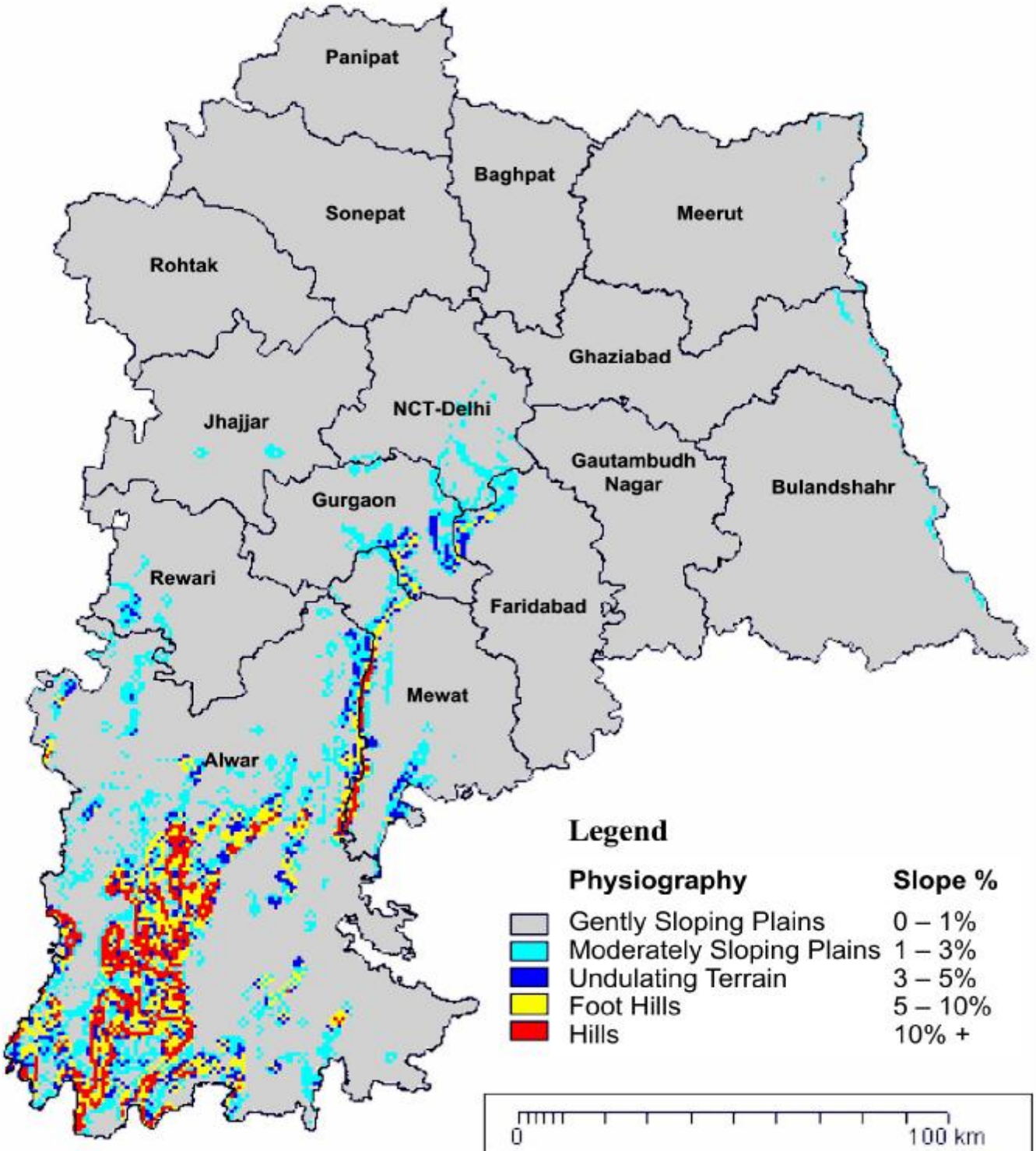
SUB-REGION	AREA (Sq kms)
NCT-DELHI	1,483
HARYANA	13,413
RAJASTHAN	7,829
U.P	10,853
TOTAL	33,578

0 5 10 20 30 40 50 Kms

NATIONAL CAPITAL REGION PLANNING BOARD

MAP 2.1

NATIONAL CAPITAL REGION
PHYSIOGRAPHY AND SLOPE



Source: NRSA Study (Using Global DEM)

thickly bedded, hard, compact and highly jointed and are intercalated with thin beds of Phyllite and Slates.

The strike of the beds is NNE-SSW and dip westerly at moderate angles. These rocks are mostly covered by quaternary sediments and are exposed in isolated residual and structural hills and pediments.

These hills are exposed in south and south-west of Delhi at Delhi, Gurgaon, Rewari and Alwar. The rocks near Delhi consist of narrow strike-ridges and are moderately folded and they are overfolded in the south-east as a series of isoclines (Map 2.3 National Capital Region: Lithology).

2.4 GEOMORPHOLOGY

Topographically the NCR has two major sub-units. The alluvial plains whose monotony is intercepted by isolated hillock or fairly continuous ridges of hard rock and sand dunes not more than 50 metres in elevation from the plain lands surrounding them. NCR terrain around Delhi, Haryana and U.P. constitutes such a plain. Sand dunes are prominent in parts of Haryana and Rajasthan and hard rock ridges bending NE to SW are seen in south and south-west of NCR covering good parts of the Alwar district and Delhi (Map 2.4 National Capital Region: Geomorphic Units).

The Ganga Sub-basin is a major part of the Ganga, Brahmaputra-Meghna basin, the largest river basin in India. The watershed of the Ganga covers almost the entire northern India including Yamuna basin. A clear watershed line divides the area between Ganga basin and Yamuna basin within NCR. The topography of the main Ganga river system varies from rugged hills of the Himalayas to the alluvial plains. The soil generally consists of alluvium deposits in the Gangetic plains.

The Yamuna river system is bounded by the Himalayas on the north and the Vindhyas on the south. In the east, it is separated by the ridge from the main Ganga catchment and on the west by the ridge separating it from the Luni and the Ghaggar basins. Most parts of catchment in Haryana and U.P. lies in the Gangetic alluvial plains.

The important tributary of the Yamuna in NCR is the Hindon, which rises from southern slopes of the Shivalik in Saharanpur district of U.P. and ultimately meets the Yamuna from the left downstream of Okhla. The other tributary which is not having a defined course is the Sahibi river, which rises from the hills in Jaipur district of Rajasthan and after flowing through Haryana enters NCT of Delhi through Dhansa Bund into Najafgarh *Jheel* and then joins the Yamuna in NCT of Delhi. The paleo-channels are confined in between the Ganga and the Yamuna courses in the eastern and the central part of the area.

Prominent structural hills in NCR are noticed around Delhi, Rewari, Gurgaon and Alwar. The residual hills are found in and around Rewari, Alwar and Delhi.

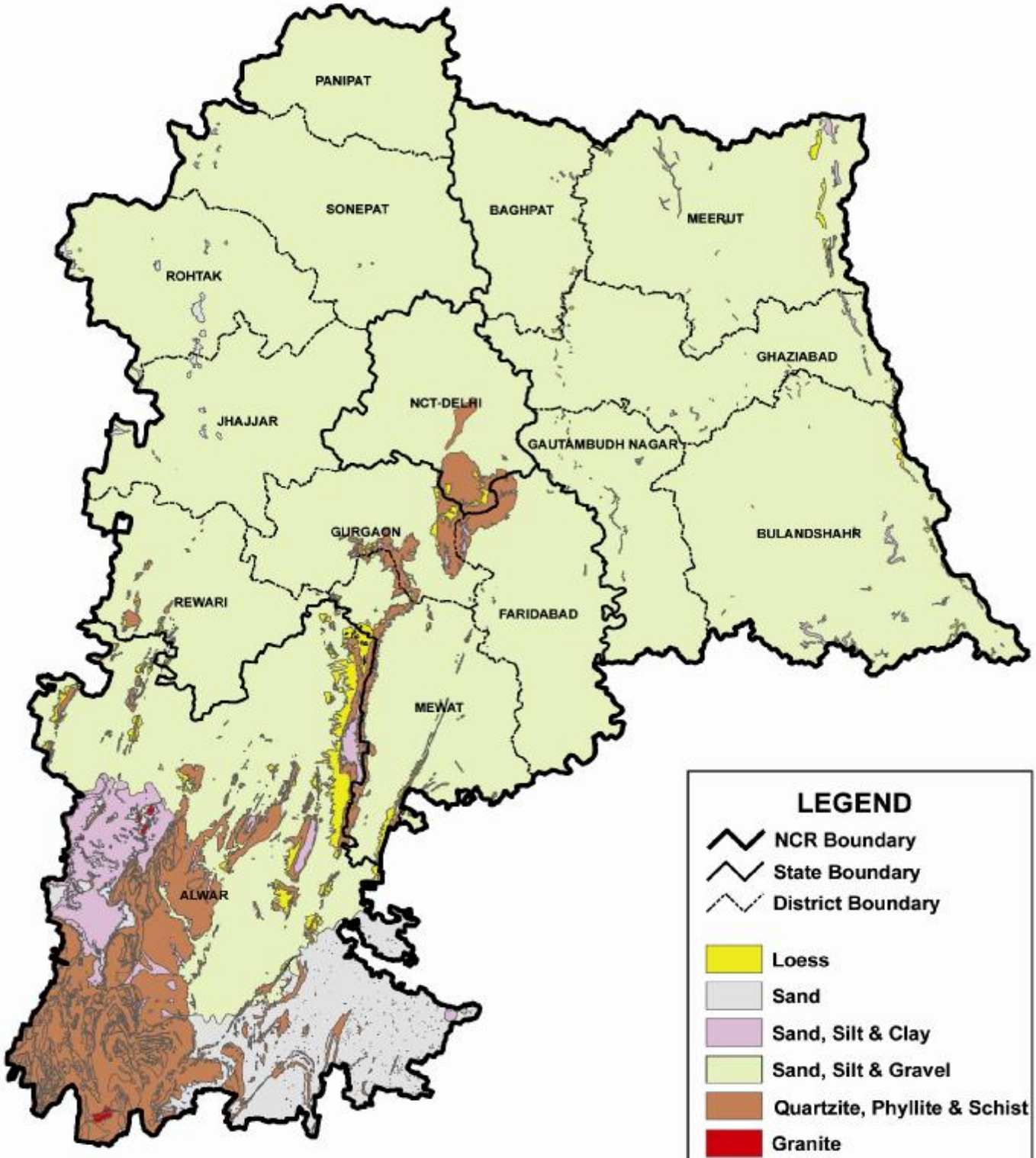
The alluvial plain occupies a major portion of NCR and is formed by the Yamuna and the Ganga rivers. The sand dunes are present around Jhajjar and Rohtak in the western part of NCR.

2.5 HYDROLOGY AND AVAILABILITY OF GROUND WATER

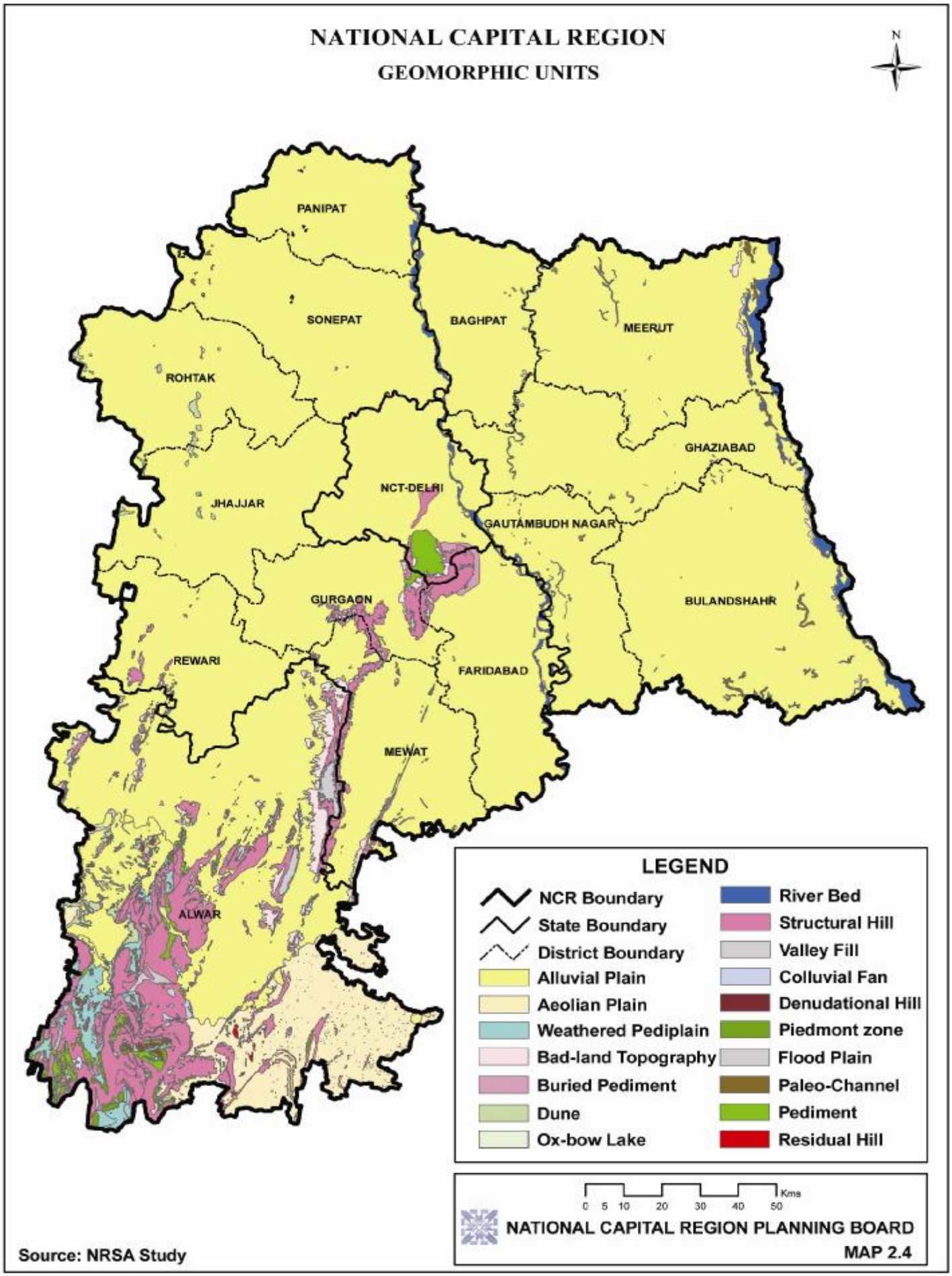
The major rivers in NCR are the Ganga, the Yamuna, Hindon and Kali, which flows from north to south and a small part of Sahibi, which flows in the south-western part. Most of the NCR is also predominantly irrigated through well-developed canal network except Alwar and Gurgaon districts, which are irrigated by ground water.

NATIONAL CAPITAL REGION

LITHOLOGY



Source: NRSA Study


NATIONAL CAPITAL REGION
GEOMORPHIC UNITS
N
PANIPAT
SONEPAT
BAGHPAT
MEERUT
ROHTAK
GHAZIABAD
JHAJJAR
NCT-DELHI
GAUTAMBUDH NAGAR
GURGAON
BULANDSHAHR
REWARI
FARIDABAD
MEWAT
ALWAR
LEGEND
NCR Boundary
State Boundary
District Boundary
Alluvial Plain
Aeolian Plain
Weathered Pediplain
Bad-land Topography
Buried Pediment
Dune
Ox-bow Lake
River Bed
Structural Hill
Valley Fill
Colluvial Fan
Denudational Hill
Piedmont zone
Flood Plain
Paleo-Channel
Pediment
Residual Hill
0 5 10 20 30 40 50 Kms
NATIONAL CAPITAL REGION PLANNING BOARD
MAP 2.4
Source: NRSA Study

The quartzite and its associated rocks of the Delhi series are traversed by joints and are folded, faulted and fractured. The joints persist deeper down often to about 100 metres depth, which is the maximum depth to which most of the tube wells to date exist. The joints and fractures are open, often filled with debris and mutually interconnected; cavities created by the erosion of mica-schist add to the secondary porosity developed by these joints and fractures. Ground water occurs in the consolidated rocks both in confined and semi-confined conditions. Mostly the top water table zone and the deeper semi-confined aquifer have the same static water level surface because of their interconnections. The depth of water table below ground level varies in general between 5-20 metres. A number of ground water structures by way of open wells and shallow tube wells (60-70 metres deep) exist in this formation in different parts of NCR with varying degrees of discharge rates. On the whole, discharges around 2-3 cubic metres per hour and at times even less (down to one cubic metre) or more (upto 4-5 cubic metres), with an average of about 15-20 metres of the aquifer-zone are available.

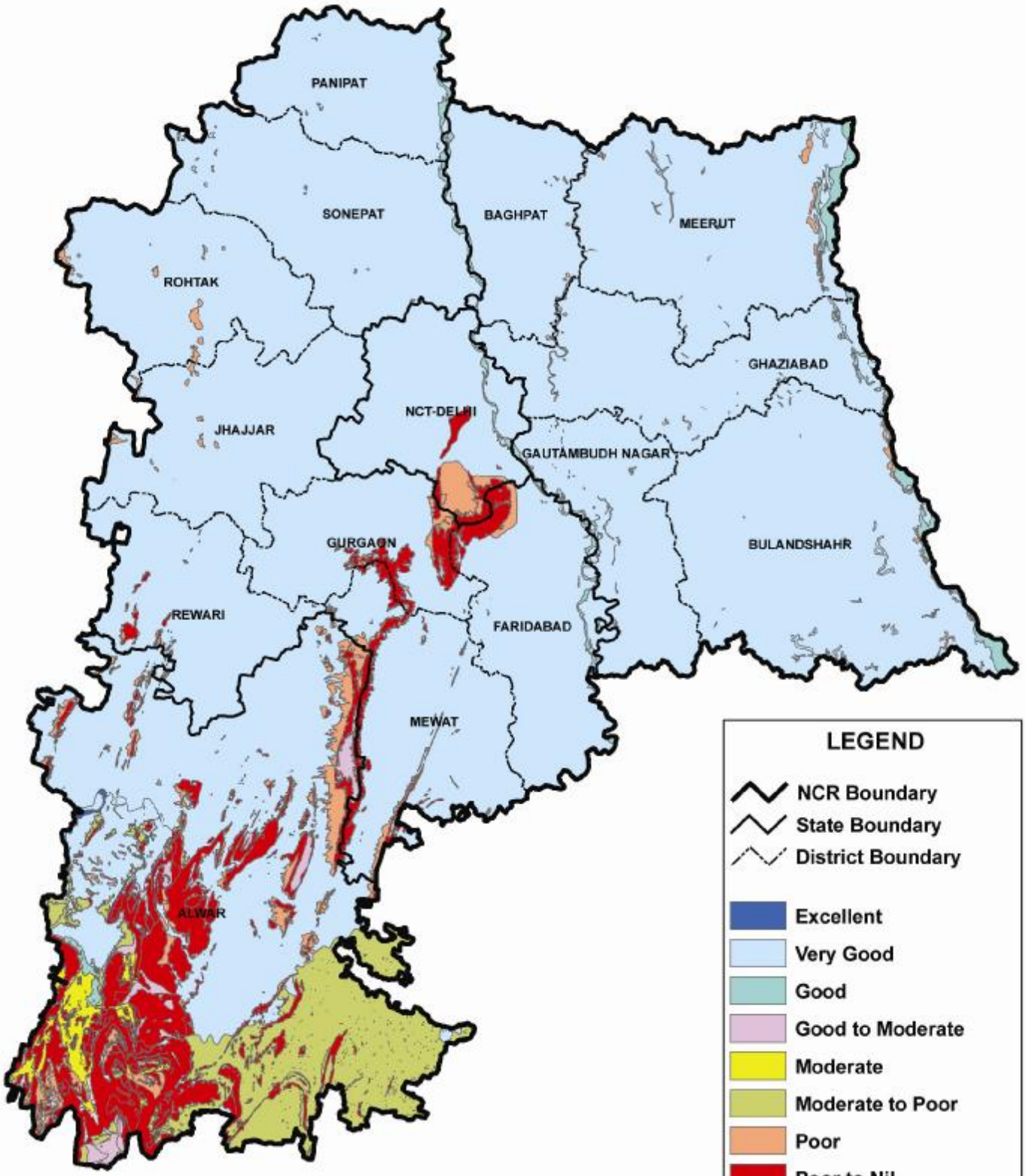
The thickness of the alluvium and the proportion of clean granular zones in aggregate within the same are the two main criteria, which determine the availability of ground water in the alluvium. A major portion of NCR is covered by alluvium, which is fairly thick. It is more than 450 metres thick in some parts of Haryana in the upper Yamuna basin (Sonepat, Panipat, etc.). In general, the thickness increases as we proceed towards the northern and eastern areas of NCR away from the hard-rock outcrops, with modifications resulting from tectonics or the bedrock topography sub-surface. Depending upon the thickness of the alluvium, one or more aquifer zones have been identified in the alluvium. The occurrence of ground water sub-area wise, under water table and confined to semi-confined conditions has been described in the following paragraphs (Map 2.5 National Capital Region: Ground Water Prospects).

Phreatic water surface is generally shallow, about 3 to 5 metres below ground level (m.b.g.l.). It could be even as low as one metre or so, in the newer alluvium along the present day flood plains or the low level terraces. Such shallow water levels may be encountered even in the older alluvium. Deeper confined aquifers or medium deep semi-confined aquifers have their piezometric surfaces within about 20-25 m b.g.l. in general.

Open wells, shallow tube wells, gravity wells and deep tube wells are abundant in the areas covered by the alluvium. Their discharges vary anywhere from 18 to 25 cubic metres per hour for about 2 to 3 metres draw downs in the open wells to about 162 per cubic metre per hour for about 8-12 metres draw downs in the deep tube wells tapping granular zones about 70-100 metres in aggregate thickness. As far as ground water quality is concerned, there are few fresh water pockets in the north-east and the south-east corners of NCR area, otherwise in these areas the Total Dissolved Solids (TDS) are more than the desirable limits and the other quality parameters are within the desirable range. The TDS, nitrate and fluorides are more than the desirable limits in the NCT-Delhi area and most parts of the north-west and south-west portions of NCR. However, in the central part of the north-west zone of NCR, fluorides are within the desirable limits.

NATIONAL CAPITAL REGION

GROUND WATER PROSPECTS



Source: NRSA Study