1. INTRODUCTION

1.1 Background

National Capital Region Planning Board prepared the Regional Plan with the perspective year 2021 for the National Capital Region (NCR) as per the provisions under Section 10 of the NCR Planning Board Act, 1985 for balanced and harmonious development of the National Capital Region which was notified on 17th September, 2005.

The geographical area of NCR for which the Regional Plan-2021 was prepared was 34,144 sq. km. (Map 1.1 National Capital Region Regional Plan-2021: Constituent Areas) and includes the National Capital Territory of Delhi and parts of the States of Haryana, Rajasthan and Uttar Pradesh. The Administrative units were as follows:

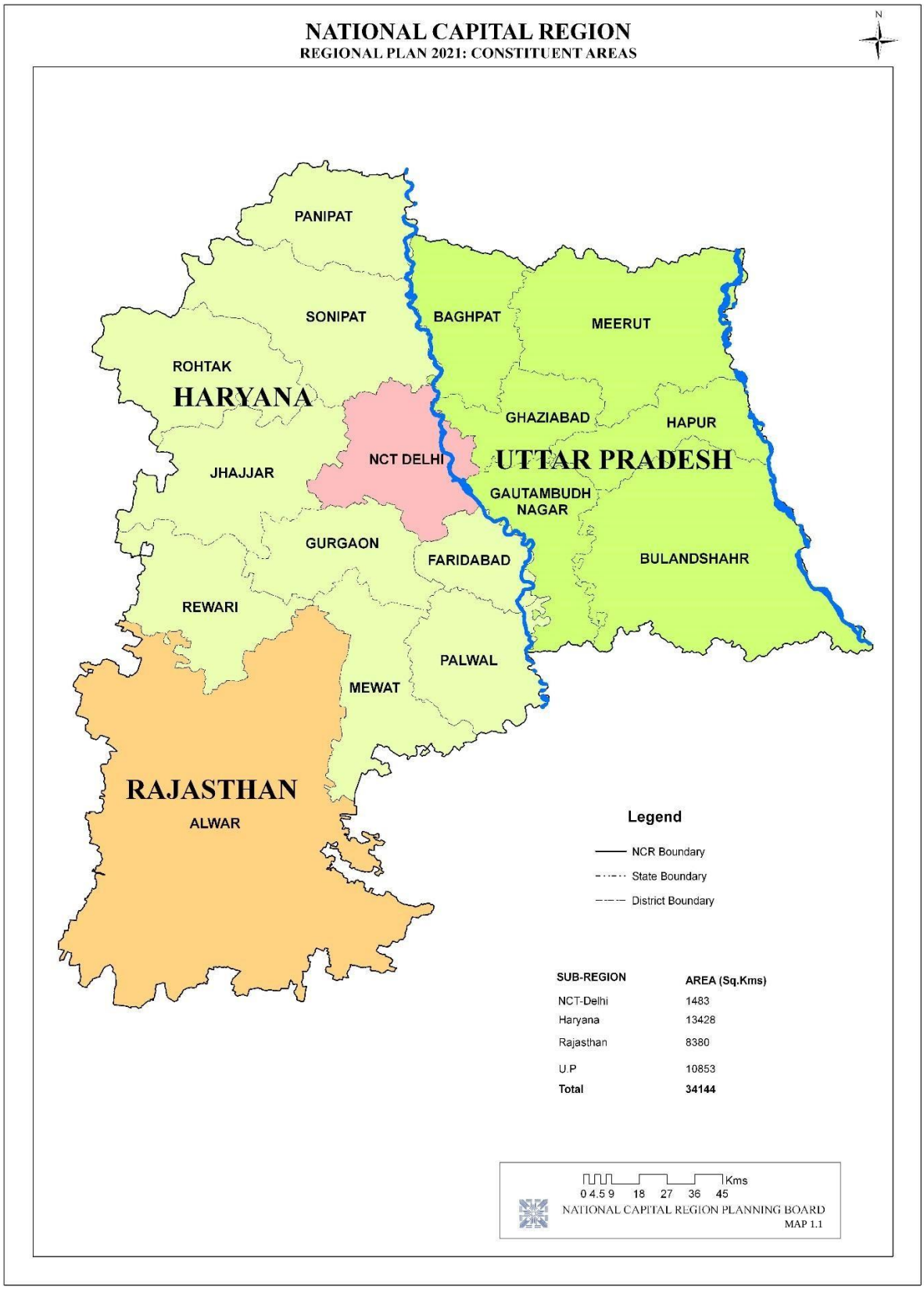
a) National Capital Territory of Delhi has area of 1,483 km^2 and this accounts for 4.4% of the total area of NCR.
b) Haryana sub-region comprises of Faridabad, Gurgaon, Rohtak, Sonepat, Rewari, Jhajjar, Mewat, Panipat and Palwal districts. This has an area of 13,428 km^2, which is 30.3 % of the area of Haryana State and 39.3% of the area of NCR.
c) Rajasthan sub-region comprises of Alwar district. This has an area of 8380 km^2 which is 2.5% area of Rajasthan and 24.5% of the area of NCR.
d) Uttar Pradesh sub-region comprises of five districts namely, Meerut, Ghaziabad, Gautam Buddha Nagar, Bulandshahr and Baghpat. The area of U.P. Sub-region is 10,853 km^2 which is 4.50% of the area of the State and 31.8% of the area of NCR.

Subsequent to the notification of the RP-2021 in 2005, Mahendragarh and Bhiwani districts of State of Haryana and Bharatpur district of State of Rajasthan have been added in NCR vide Notification dated 01.10.2013 and Jind and Karnal districts of State of Haryana and Muzaffarnagar district of State of Uttar Pradesh have subsequently been added in NCR vide Notification dated 24.11.2015. Accordingly, total geographical area of NCR now is 53,817 sq. km and includes entire NCT-Delhi, thirteen districts of Haryana sub-region, seven districts of U.P. sub-region and two districts of Rajasthan sub-region. However, as mentioned earlier, the scope of the Functional Plan is limited to the geographical area of NCR which was included in the Regional Plan-2021 for NCR, presently in force.

Section 16 of the National Capital Planning Board Act, 1985 provides for the preparation of Functional Plan after the Regional Plan has come into operation. It states that the Board may prepare with the assistance of the Committee, as many Functional Plans as may be necessary for the proper guidance of the participating States and of the Union Territory.

As drainage has been one of the important elements as defined in section 10(2) of the NCR Planning Board Act, 1985 and has regional bearing, it is important to prepare Functional Plan on Drainage. Board in its 29th Meeting held on 24.05.2006 decided to prepare a Functional Plan for drainage for NCR.

Map 1. 1 Regional Plan-2021: Constituent Areas of NCR



1.2 Provisions of Regional Plan-2021

In order to improve the regional and local drainage system in NCR, the Regional Plan-2021 has proposed the following strategies and policies:

(i) Regional Approach to Drainage

Integrated Regional Drainage Plan at the regional level and Drainage Master Plans at the district level should be prepared after critically examining each major drainage system under basins/sub-basins of NCR at micro level by the State Governments incorporating the improvement proposals for enhancing the quality of regional and local drains taking into account the present/future development and settlement pattern in the region. All the related works at the regional level should be coordinated by a single agency. The area drainage plan should be considered as an integral part of the Master Plan of the area and this drainage plan shall take into account the land development planning for the region. There is a need to conceptualize a drainage system before any area development program is taken up. No area development project/new town/colonies/industrial complex should be sanctioned or implemented unless integrated drainage plan is conceptualized and cleared by the designated authority. All developments in controlled areas falling in dark and over exploited block declared by CGWB should aim towards zero run off within the controlled areas. The ponds/lakes/wetlands (existing and proposed), bunds/check dams etc. should be developed/protected to increase the run off time of storm water in order to help in ground water recharging.

(ii) Proposed Norms and Standards

The urban drainage system may be designed for maximum rainfall of five years frequency storm for internal as well as peripheral drains and ten years frequency storm for the main drains. The likely time of concentration for each case may be worked out and corresponding storm values adopted. Usually the system is designed for a maximum rainfall of one-hour duration.

a) The rural drainage system may be designed for three days rainfall of five years frequency to be drained in three days. An appropriate area dispersal factor should be adopted for computing the run off.
b) The coefficient of run off may be calculated for areas with composite land use pattern on the basis of anticipated land use in the new areas and existing land use pattern for the areas already developed.
c) Where it is not possible to work out the run off coefficient due to land use policies not indicated, run off coefficient not less than 0.2 may be adopted for rural areas with flat to moderate slopes and 0.4 for steeper slopes. For urban area, run off coefficient not less than 0.6 may be adopted in absence of adequate details of the areas.

(iii) Prevention of Storm Water Drains from Pollution

Measures should be taken to prevent the use of storm water drains for conveying sewage and dumping of solid wastes and sludge in open drains. Enforcement should be ensured under the

Environment Protection Act, 1986. Unauthorized development/encroachment/slum dwellings in the drainage system should be prohibited.

(iv) Irrigation Water

Where irrigation canal escapes including the tail escapes are out falling in the drains or in the neighbouring ponds, the provision for efficient draining of surplus irrigation water by enhancing their capacity should be made during monsoon and non-monsoon period while planning for improvement in the integrated Regional Drainage System.

(v) Provision of Funds

Provision of adequate funds should be made for upgradation and regular maintenance of the drains on the same lines as for the irrigation channels.

(vi) Plan of Action and Phasing of Implementation of Strategies/ Policies/ Proposals

In order to implement the policies of drainage in the region, it is imperative to have a phase wise plan of action so that the implementation of policies and proposals in the Regional Plan can be dovetailed with the five-year plans. Some of the activities which need to be implemented include preparation of Integrated Regional Drainage Plan at the regional level and Drainage Master Plans at the District level to manage regional and local drains, avert mixing of sewage and solid waste in storm water drains, creation of mass awareness, waste minimization through recycling of waste, regular maintenance and upgradation of drains etc.

1.3 Need for a Drainage Plan for NCR

Drainage is an important element of physical infrastructure and constitutes removal and disposal of surplus rain and irrigation water from the land, both in urban and rural areas. It has two aspects mainly flood protection and removal of storm water. NCR in general, is a part of well-integrated drainage system of the Ganga Basin. Though a scientifically designed drainage network exists in and around NCR, yet it has been observed that there are drainage problems, some of them are inter-state in nature. The extremely gentle gradient over the region restricts the development of drainage system. Attempts have been made by various agencies in the past to find solutions but due to lack of coordinated and concerted efforts and agreements among the concerned governments, no lasting solution has been implemented. There are problems of flooding and in extreme flood events damage to property, economic loss and damage to life are quite common. The problem is more severe in urban areas due to high concentration of population, economic activities and international impacts due to flooding of transport hubs like Airport etc. The flooding in urban area is on increase (Box 1.1). Selection of design flood by taking a calculated risk is underlying theme of flood management for ensuring desired level of safety. The idea is to avoid a wasteful over design or an under design. In addition to this, the drains passing through or nearby urban areas get polluted as they carry untreated domestic/industrial sewage. This poses a mammoth problem by polluting the water bodies on the downstream side of the drains carrying sewage. The storm water discharge in NCR is not local but has regional bearing covering areas of NCT-Delhi, Haryana, Rajasthan

and U.P. Hence, it is necessary to plan the drainage system at regional level in an integrated manner with adjoining States.

Box 1.1 Increase the Urban Flooding

Increase in Urban Flooding

- 2005 – 26th July- 944 mm in MUMBAI led to WAKE UP CALL!
- 2006 – 22 Cities disrupted: SURAT worst affected
- 2007 – 35 cities disrupted: KOLKATA - thrice-3/06, 3/07, 23-25/09
- 2008 – Mumbai 162 mm -7th June 2008; Mumbai 142 mm-1st July 2008 (high tide of 4.33 m at 11:01)
- Ranchi/Jamshedpur 338.1 mm on 16th June 2008: also Kharagpur/Orissa
- Kanpur/Lucknow/Allahabad during 05-07 July 2008
- 2009 – Cyclone Aila caused disruption in Kolkata
- Mumbai 172 mm on 14th July 2009 – high tide was 3.89 m » Indore 240 mm on 16 July 2009; Porbandar – army called in
- Delhi 124 mm in 12 hours, peak 40 mm/h 27th July – chaos!
- 2010- Delhi flooded on 7 occasions
- Leh – Severe cloudburst on 6th August 2010; Flash flood caused 172 casualties and severe damage to infrastructure
- 2011- Mumbai, Varanasi, Bhopal, Delhi ……..Economy disrupted, people stranded, transport services severely affected:
- Airport submerged in 2005 - Visakhapatnam, Mumbai
- Vadodara: 2006
- Delhi Airport: 15th September, 2011
- Chennai: 2015
  - Massive disruption of infrastructure/services, widespread damage to property and lives.
  - The flood was necessitated by heavy rainfall in winter season and got aggravated by the blockage of the natural drainage system by excessive urban development.

1.4 Objective and Scope of the Study of preparation of Functional Plan for Drainage

The objective of the study is to prepare Functional Plan for Drainage in NCR. The Functional Plan will focus on the following:

a) Inter-state drains and major district drains out falling into inter-state drains.
b) The existing drainage system to be analyzed for adequacy and pollution level.
c) The study will propose the steps to be taken for improvement in quality of water flowing in drains.

1.5 Approach and Methodology

In the 29th Board Meeting of NCR Planning Board, Member Secretary, NCRPB indicated that Board would take up preparation of Functional Plan related to drainage management system of NCR. This Functional Plan was to be prepared in-house. Natural drainage system of a region is arrangement by nature evolved over centuries to remove the surplus rainwater. Initially the man-made intervention was to control floods. NCR is experiencing floods as well as drought. So, an arrangement is required to make to store the surplus water and use it for irrigation during lean period. The Irrigation and Flood Control Department of State Governments is handling this arrangement. This department has dual responsibility of flood control and irrigation. At the National level, Central Water Commission (CWC) is involved. Considering the federal structure it was necessary to involve the State Government Departments/Agencies and Central Ministries/Agencies dealing with the drainage of NCR. It was felt necessary to constitute a Study Group of Experts from the Departments/Agencies dealing with planning, design, construction and maintenance of drainage in urban and rural areas of NCR. Accordingly, NCR participating State Governments and CWC were requested to nominate Senior Officers as subject expert for the Study Group. The Study Group for preparation of Functional Plan-Drainage for NCR was constituted under the chairmanship of Engineer-in-Chief, Department of Irrigation, Govt. of Haryana and Chief Regional Planner, National Capital Region Planning Board as Co-Chairman with the representative of Central Water Commission, Govt. of India, Chief Engineers of UP Jal Nigam, Delhi Jal Board and Department of Irrigation and Chief Town Planners/Chief Coordinator Planners, Govt. of UP, Haryana, Rajasthan and Delhi as members. The composition of the Study Group is at Annexure-1.1. The scope of work of the Study Group was to identify the drainage system in NCR, identify problems & issues and make recommendations.

The Study Group was also requested to coordinate the data collection in their respective sub-region. There were six meetings of the Study Group in all to discuss and finalize the strategies and to prepare the report. Site visits were also undertaken to get the feel of the drainage problem at town level in NCR.

The detailed methodology for preparation of Functional Plan was discussed. The scope of the Plan was limited to inter-state drain and major district drains which outfall into inter-state drains**.** The drainage map available with NCR was to be updated by the State Government agencies. The study group was also requested to coordinate the data collection in their respective sub-region. The data was collected from the NCR participating State Governments. It was observed that different norms and standards are being followed by the respective State Governments. The norms given in the Regional Plan were different from CPHEEO and CPWD norms. The norms being followed by NCR constituent States were deliberated and feasibility of adopting uniform norms for NCR were also deliberated.

The Study Group observed that the existing drains in NCR are highly polluted causing problems to downstream users. The regional drainage system should be pollution free as its role is limited to removal of surplus rainwater. A polluted drain passing through the urban areas is a cause of concern not only because of foul odour but also due to spread of disease and

pollution of ground water. The Study Group also addressed the issues and cause of pollution. The secondary data from Central Pollution Control Board and State Pollution Control Boards were collected, analyzed and suggested measures to be taken by the State Governments and their agencies for reduction of pollution in rivers and drains.

1.6 Limitation

The Functional Plan has been prepared on the basis of secondary data. The data on drainage system is being maintained by the agencies of the NCR participating State Governments. There is lack of uniformity in the data formats. The river flow data is maintained by CWC and river flow diversion data is maintained by Irrigation Department but the data of rivers Ganga and Yamuna are classified as confidential and hence not easily available. Further, the data on flow of drains is also not available, the data on carrying capacity of the drains is available with Irrigation Departments. The data on pollution levels of Ganga & Yamuna Rivers are available at a few selected locations on the websites of Central Pollution Control Board (CPCB) and State Pollution Control Boards.