

# Bihar Industrial Area Development Authority

(A Government of Bihar Undertaking)  
1st Floor, Udyog Bhawan, East Gandhi Maidan, Patna,  
Pin- 800004 Bihar

Letter no - 3218/Gen REQUEST FOR PROPOSAL (RFP) Date - 13/07/26

## Preparation and Submission of Detailed Project Reports (DPRs) for Industrial Parks in Bihar under Bharat Audyogik Vikas Yojana (BHAVYA) Scheme

Ref No: RFQ-RFP/BIADA/02/2026-27

The Bihar Industrial Area Development Authority (BIADA) invites Requests for Proposals (RFP) from its empaneled consultants for the preparation and submission of Detailed Project Reports (DPRs) for Industrial Parks in Bihar under the Bharat Audyogik Vikas Yojana (BHAVYA) Scheme.

Consultants empaneled under Category A & Category B are eligible to submit their financial proposals strictly in the format specified in the RFP documents. The last date for proposal submission is 20th July 2026.

Participating consultants must adhere to the core objectives of the BHAVYA scheme and fulfill all conditions and scopes of work outlined in the RFP.

| Sl No | Scope of Work                                                  | Name and Location of Proposed Industrial Parks | Area (In Acre) | Quoted Amount (in Rs) |          |
|-------|----------------------------------------------------------------|------------------------------------------------|----------------|-----------------------|----------|
|       |                                                                |                                                |                | in Figures            | in Words |
| 1     | Preparation & Submission of DPR under BHAVYA Scheme Guidelines | Darbhanga(Bhadurpur)                           | 385.45         |                       |          |
| 2     |                                                                | Muzaffarpur (Paroo)                            | 700            |                       |          |
| 3     |                                                                | Sitamarhi (Sonvarsha)                          | 253.09         |                       |          |
| 4     |                                                                | Aurangabad(Kutumba)                            | 179.14         |                       |          |
| 5     |                                                                | Madhubani (Loakhi)                             | 460.71         |                       |          |
| 6     |                                                                | Begusarai (Kusmaut)                            | 991            |                       |          |

  
13/7/2026 -  
DGM-Technical  
BIADA, Patna

## 1. Introduction

The Bihar Industrial Area Development Authority (BIADA) invites Requests for Proposals (RFP) from its empaneled consultants for the Preparation and submission of Detailed Project Reports (DPRs) for Industrial Parks in Bihar under the Bharat Audyogik Vikas Yojana (BHAVYA) Scheme.

### 1.1 About BHAVYA Scheme

The Bharat Audyogik Vikas Yojana (BHAVYA) is a Central Government scheme administered by the Department for Promotion of Industry and Internal Trade (DPIIT), Government of India. The scheme is aimed at the development of world-class industrial parks characterized by plug-and-play infrastructure, multimodal connectivity, integrated industrial ecosystems, and investment-ready, sustainable project designs. Submission of a Detailed Project Report (DPR), Master Plan, Presentation, and digital updating on the BHAVYA portal is mandatory for any industrial park seeking project approval and access to Central Government funding.

## 2. Objective of the Project

The primary objective of this assignment is to engage a qualified and experienced consultant to prepare comprehensive Detailed Project Reports (DPRs) for the identified industrial parks in Bihar that:

- Align fully with BHAVYA Scheme Guidelines issued by DPIIT, Government of India.
- Meet all eligibility and technical evaluation criteria as stipulated under the BHAVYA framework.
- Enable project approval by the National Level Screening Committee (NLSC) / DPIIT.
- Demonstrate financial and technical viability of each industrial park.

## 3. Scope of Work

The scope of work will include, but is not limited to, the following key activities:

### 3.1 Site Understanding and Assessment

- Assess all prior site surveys and identify legal constraints, disputed parcels, and landform features based on available records.
- Study revenue maps, base maps, and prior studies; undertake reconnaissance visits to understand terrain, drainage, settlements, access, water bodies, and infrastructure linkages.
- Validate project boundary and demarcation in coordination with the designated DIC Zonal/District office.
- Prepare a Challenge Matrix Dossier covering: connectivity (NH/SH, rail, air, port, MMLP/ICD), existing ecosystem, utilities readiness, policy environment, and environmental & social screening.

### 3.2 Land Suitability and Zoning

- Prepare a screening-level GIS-based land suitability assessment covering terrain/slope, drainage, green buffers, settlements, and access.
- Identify developable land parcels and recommend phase-wise development zoning.
- Prepare an optimal land utilization plan maximizing productive area.

### 3.3 Conceptual Master Plan and Planning-Grade Master Plan

- Develop a Conceptual Master Plan adequate for techno-economic viability assessment including: broad land use zoning, sector-based industrial zones, pre-built/shell factory zones, logistics zones, utilities (CETP, STP, WTP, substations, SWM), ICT/Command & Control, green belts, and worker housing.
- Prepare the final planning-grade Master Plan with delineation of industrial zones (sector-wise), logistics areas, utility zones, open spaces, and land use distribution.
- Prepare a circulation plan including arterial, sub-arterial, and collector street networks, pedestrian circulation, and parking.
- Identify broad locations for infrastructure components including roads, water, sewerage, drainage, power, gas, and telecommunications.

### 3.4 Social Infrastructure

- Design worker-centric facilities: affordable housing, healthcare centres, schools, creches, recreational zones, green spaces, and cultural amenities.
- Provide rental housing plans inside the park or linkages to the urban ecosystem in nearby areas.

### 3.5 Project Cost and Financial Analysis

- Undertake detailed project cost estimation including land cost, development costs, and all infrastructure capital expenditure components.
- Structure appropriate means of finance; identify equity, debt, and other financing instruments; evaluate eligibility for government grants.
- Prepare a comprehensive financial viability analysis including revenue projections, cash flow statements, and key financial indicators (IRR, NPV, DSCR, payback period).
- Present a clear land pricing framework ensuring investor affordability.

### 3.6 Assisting in Preparation of Compliance Documents

- Provide assistance in preparation and compliance with the criteria elaborated under the Grading Methodology framework as per the evaluation criteria mentioned in the scheme.

### 3.7 DPR Quality and Industrial Competitiveness

Ensure high quality and industrial competitiveness by focusing on:

- Integrated master planning with preference to sectoral parks.
- Access to worker housing and social infrastructure.
- Plug-and-play and common infrastructure facilities.
- Underground common utility infrastructure.
- Digital infrastructure.
- Skill ecosystem integration.
- Testing labs (preferably through convergence with Government schemes).
- Start-up hubs (as per market demand).
- Operations and maintenance (O&M) framework.
- Alignment with sectoral demand assessment.
- Financial viability and investor affordability through a clear land pricing framework.

## 4. Payment Schedule and Deliverables

The payment as per the rate quoted in the Financial Bid submitted by the consultant shall be made in accordance with the following schedule. The total timeline for the assignment is 28 days (four weeks) from the date of the Letter of Award (LOA).

| S.No. | Deliverable             | Description                                                                                                                                        | Timeline from LOA   | Payment (%) |
|-------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------|
| D1    | Inception Report        | Site visit notes, data inventory, work plan, and methodology confirmation.                                                                         | Within 1 Week       | 25%         |
| D2    | Draft DPR               | Draft DPR with Master Plan, Financial Model, and Challenge Matrix Dossier and other necessary deliverables.                                        | Within 3 Weeks      | 30%         |
| D3    | Final DPR               | Final DPR incorporating all review comments, BHAVYA portal updating including submission of editable files in Word, Excel, CAD, GIS, PDF, and PPT. | Within 4 Weeks      | 30%         |
| D4    | Approval & Presentation | Presentation to DIC / stakeholders and approval from NLSC / DPIIT.<br>(Note: Released upon submission and approval by Central Govt / NLSC).        | After NLSC approval | 15%         |

## 5. Bid Submission Guidelines and Reservation of Rights

### 5.1 Mode of Submission and Address

The bidders shall submit their completed Financial Bid Proposal strictly in a sealed/closed envelope. The proposal must be delivered in physical hard copy format to the following address before the designated due date and time:

Bihar Industrial Area Development Authority (BIADA),  
3rd Floor, Udyog Bhawan, East Gandhi Maidan,  
Patna – 800004, Bihar.

## 5.2 Deadline and Late Submissions

Any proposal received after the prescribed due date and time, for any reason whatsoever (including postal delays), shall be rejected unconditionally and returned unopened to the bidder.

## 5.3 Modifications, Amendments, and Corrigenda

Any modifications, clarifications, amendments, or corrigenda to this Request for Proposal (RFP) document, if any, shall be published exclusively on the official BIADA web portal: <https://biada1.bihar.gov.in>. Bidders are advised to visit these websites regularly. No separate individual communication or newspaper advertisement will be issued regarding such amendments, and any changes posted on the website shall be fully binding on all participating agencies.

## 5.4 Reservation of Rights

BIADA reserves the absolute and unilateral right to accept or reject any or all proposals, to annul the entire bidding process, or to reject all bids at any time prior to the award of the contract, without assigning any reason or incurring any liability or obligation toward the affected bidders.

# 6. General Conditions of Contract (GCC)

- 6.1 Bidding Process:** Under this competitive procurement process, only Financial Bids are invited from the BIADA's empaneled Consultants. The procurement will follow the standard guidelines of BIADA and the Bihar Financial Rules.
- 6.2 RFP Download:** The complete details for the RFP can be downloaded from the official web portal of BIADA at [<https://biada1.bihar.gov.in>]. Interested bidders are advised to regularly visit the website to keep themselves updated with regard to any changes, clarifications, or additional information related to the RFP.
- 6.3 Submission Deadline:** Proposals must be submitted strictly in hard copy at the address specified in the RFP document and within the mentioned deadline. Any bid received after the stipulated closing date and time shall be summarily rejected.
- 6.4 Pre-Bid Meeting:** BIADA will hold an online/offline pre-bid meeting with prospective bidders through the link and schedule specified in Section-I of this document.
- 6.5 Selection Evaluation:** The Financial Bids of the Category A & Category B empaneled consultants will be opened, and the L1 bidder will be declared the successful bidder.
- 6.6 Earnest Money Deposit (EMD):** An Earnest Money Deposit (EMD) amounting to two percent of the total quoted price must be submitted along with the physical proposal.
- 6.7 Bid Validity:** All bids will remain strictly valid for a period of 90 days from the final date of bid submission.
- 6.8 Information Clarification:** BIADA reserves the absolute right to solicit any additional relevant information from Bidders individually or collectively during the entire selection process.
- 6.9 Reservation of Rights:** BIADA reserves the right to reject bid(s) from any agency or agencies resorting to unethical practices, or those against whom investigation/enquiry proceedings have been initiated by Government Investigating Agencies, Vigilance Cells, or a court of law.
- 6.10 Confidentiality:** All information contained in this RFP document, or provided during subsequent discussions or disclosures, is proprietary and strictly confidential. No data or project information may be shared by the bidder with external organizations or agencies.

- 6.11 Branding Restrictions:** The selected Agency shall not use its company name, logo, or any other unauthorized promotional branding/publicity on any content created under the scope of work spelled out in this RFP on any corporate platforms of BIADA.
- 6.12 Data Protection:** The firm must guarantee complete data protection (secrecy) and ensure that no project data, spatial layouts, or financial models are leaked to any person not expressly authorized by BIADA.

## **7. Integration with Empanelment Contract**

This assignment is subject to the master terms and conditions of the empanelment contract previously executed between BIADA and the Category A & Category B empaneled consultants. All terms and conditions governing the consultant's empanelment shall continue to remain in full force and apply to this project. In the event of an omission or silence on any specific condition in this RFP, the provisions of the executed Empanelment Contract Agreement shall strictly apply.

## **8. Financial Bid Format**

The bidder must quote the total professional fee as a lump-sum amount in Indian Rupees (INR), excluding GST, in the format specified in Annexure-1.

## **9. Enclosures**

- 9.1 Guidelines for implementation of Bharat Audyogik Vikas Yojna (BHAVYA)
- 9.2 Guidance Document for Preparation of DPR

**FINANCIAL BID**  
**(On the letter head of the bidder)**

Dated:.....

To,

DGM Technical,  
 Bihar Industrial Area Development Authority  
 1<sup>st</sup> Floor, Udyog Bhawan, East Gandhi Maidan  
 Patna – 800004  
 Bihar

**Subject: Financial Bid for Request for Proposal (RFP) for the Preparation and Submission of Detailed Project Reports (DPRs) for Industrial Parks in Bihar under the BHAVYA Scheme.**

Sir/Madam,

We, the undersigned, offer to provide our professional consulting services for the preparation and submission of Detailed Project Reports (DPRs) for the identified Industrial Parks in Bihar in strict accordance with your Request for Proposal (RFP).

We hereby submit our Financial Bid for the assignment. Our quoted professional fee represents the comprehensive fixed total cost in Indian Rupees (INR) for the complete execution of the scope of work outlined in the RFP guidelines, strictly excluding GST.

The location-wise financial breakdown is submitted below in the prescribed format:

| Sl No | Scope of Work                                                  | Name and Location of Proposed Industrial Parks | Area (In Acre) | Quoted Amount (in Rs) |          |
|-------|----------------------------------------------------------------|------------------------------------------------|----------------|-----------------------|----------|
|       |                                                                |                                                |                | in Figures            | in Words |
| 1     | Preparation & Submission of DPR under BHAVYA Scheme Guidelines | Darbhanga(Bhadurpur)                           | 385.45         |                       |          |
| 2     |                                                                | Muzaffarpur (Paroo)                            | 700            |                       |          |
| 3     |                                                                | Sitamarhi (Sonvarsha)                          | 253.09         |                       |          |
| 4     |                                                                | Aurangabad(Kutumba)                            | 179.14         |                       |          |
| 5     |                                                                | Madhubani (Loakhi)                             | 460.71         |                       |          |
| 6     |                                                                | Begusarai (Kusmaut)                            | 991            |                       |          |

*Note: In case of any discrepancy between the amount quoted in figures and words, the amount specified in words shall govern.*

We understand that BIADA is not bound to accept any proposal received and reserves the right to reject any or all bids without assigning any reasons thereof.

Yours faithfully,

**(Signature of Authorized Signatory)**

**Name:** [Insert Name]

**Designation:** [Insert Designation]

**Name of Firm/Agency:** [Insert Firm Name]

**Seal of the Firm:**

No.- 32026/2/2024-MIIUS (Comp. No. -202438)

Government of India/भारत सरकार

Ministry of Commerce and Industry/वाणिज्य एवं उद्योग मंत्रालय

Department for Promotion of Industry and Internal Trade/

उद्योग संवर्धन और आंतरिक व्यापार विभाग

(MIIUS Section/एम.आई.आई.यूस अनुभाग)

Vanijya Bhawan, New Delhi

Dated the 23<sup>rd</sup> May, 2026

**OFFICE MEMORANDUM**

**Subject: General and Operational Guidelines of Bharat Audyogik Vikas Yojna (BHAVYA) – reg.**

The undersigned is directed to refer to the above mentioned subject and to say that the BHAVYA Scheme had been notified on 10.04.2026. In this regard, the general and operational guidelines of Bharat Audyogik Vikas Yojna (BHAVYA) are enclosed for information and necessary action.

2. In the first phase, a total of upto 50 proposals would be selected as per guidelines. The first phase will comprise of two rounds of selection. The window for first round of selection will open on 01.06.2026 and close on 31.07.2026. In the first round, upto 20 proposals may be selected. The window for second round of selection will open on 01.08.2026 and close on 30.09.2026. An applicant whose proposal is not selected in first round, may also submit the proposal with suitable improvements/modifications for consideration in the second round.

3. The web address of the application portal will be notified on <https://www.dpiit.gov.in>.

4. This issues with the approval of Competent Authority.

**Encl: As above.**



(Arun Kumar Vishwakarma)

Under Secretary

Tel. no. – 011-23060628

Email: [akumar.v13@nic.in](mailto:akumar.v13@nic.in)

To,

1. The Chief Secretary (all State/ UT Governments)
2. The Secretary (all Ministries/Departments of Government of India)

Copy to:

1. OSD to Secretary, DPIIT
2. PPS to Joint Secretary (GT)
3. PPS to Director (AG)

## **Guidelines for implementation of Bharat Audyogik Vikas Yojna (BHAVYA)**

### **1. Introduction**

- 1.1.** Bharat Audyogik Vikas Yojna (BHAVYA) Scheme has been notified vide DPIIT Notification 106 [CG-DL-E-10042026-271698] [F. No. P-32026/2/2024-MIUS] dated 10th April, 2026; hereinafter referred to as the 'Scheme'. The following guidelines are being issued in pursuance of paragraph 11 of the Scheme Notification.
- 1.2.** The objective of the Scheme is to develop investment-ready, world-class industrial infrastructure to enable investors to ground investment with ease, thereby adding to the manufacturing capacity in the country. The Scheme is designed to further the objective of transforming the country into a globally competitive manufacturing hub by providing supportive industrial ecosystems with proximity to cities, connectivity to multi-modal logistics facilities and industrial hubs. The industrial parks developed under the Scheme would facilitate investment for manufacturing growth to cater to domestic and global value chains, and deepen supply chains within the country, increasing employment and value addition in the country.

### **2. Definitions**

- 2.1.** The following definitions will be used for the purpose of Scheme guidelines:

- i) Application:** The proposal seeking approval for development of industrial parks by the Sponsoring Agency on the Scheme portal in the prescribed format.
- ii) Brownfield Park:** A brownfield park, for the purpose of this Scheme, is an existing industrial park with an unallotted, unencumbered, contiguous land area as per eligibility criteria.
- iii) Central Public Sector Enterprise (CPSE):** A "CPSE" shall mean a body corporate where Government of India has controlling interest as per paragraph 4.1 of the Department of Investment & Public Asset Management (DIPAM) O.M. No. 5/2/2016-Policy dated 27.05.2016 regarding Capital Restructuring of Central Public Sector Enterprises (CPSEs).
- iv) Department:** Department refers to the Department for Promotion of Industry and Internal Trade (DPIIT).
- v) Detailed Project Report (DPR)** refers to the document that outlines all aspects of a proposed project including project's scope, objectives, technical specifications, financial analysis, cost estimates, marketing plan, demand and risk assessment, operational framework, timelines and resource allocation.

- vi) **Greenfield Park** refers to a new industrial park proposed for development on an undeveloped land parcel.
- vii) **Industrial Park** refers to a designated area of land that is specifically planned and developed with plug-and-play facilities exclusively or predominantly for manufacturing, such that an allottee can commence manufacturing operations without delay. It is developed and professionally managed by a single accountable entity.
- viii) **NICDIT** refers to the National Industrial Corridor Development and Investment Trust, constituted vide DPIIT Order no 11/1/2016-IC dated 22<sup>nd</sup> December, 2016.
- ix) **NICDC** refers to National Industrial Corridors Development Corporation Limited is a company under the administrative control of DPIIT.
- x) **National Level Steering Committee (NLSC)** refers to the Committee constituted vide DPIIT Order no. 32026/2/2024-MIIUS (Comp. No. - 202438) dated 10th April, 2026.
- xi) **Private developer** refers to any legal entity, including a company, or a consortium of companies, which undertakes, either independently or in association with the State Government and/or its agencies, the planning, development, financing, and implementation of an industrial park, with or without construction of buildings thereon, for the purpose of allotment, sale, lease, or transfer of developed plots or built-up spaces to prospective allottees in accordance with the provisions of the policy.

In the context of this Scheme, a Private Developer may also participate as a co-promoter in a Special Purpose Vehicle (SPV) and may act as an anchor investor, subject to such terms and conditions as prescribed under the Scheme. (Refer Annexure VI)

- xii) **Project** refers to the project for development of industrial park considered and/or approved under the Scheme.
- xiii) **Project Management Agency (PMA)** refers to the agency responsible for providing secretarial, managerial, technical and other support as required by DPIIT and NLSC for the purposes of implementing the scheme.
- xiv) **Special Purpose Vehicle (SPV)** refers to the company formed under Companies Act, 2013 in accordance with the requirements of the Scheme.
- xv) **Sponsoring Agency/ Authority** refers to the State/UT Government or CPSE submitting the proposal under the Scheme.
- xvi) **State Nodal Agency/ Authority** refers to the agency/authority designated by the State Government for the development of the industrial park and represents the State Government on the SPV, and may be the State

Industrial Development Corporation, State Industrial Development Authority or such other government agency/authority mandated to develop industrial areas.

**xvii) State Level Committee (SLC)** refers to the Committee constituted by the State Government and chaired by Chief Secretary of the concerned State/UT Government to perform the functions and discharge the responsibilities as laid down under the scheme.

### **3. Scope of the Scheme**

- 3.1.** BHAVYA is a Central Sector Scheme. The total financial outlay for the scheme is ₹ 33,660 crore. This includes administrative fund for ₹ 60 crore.
- 3.2.** Financial assistance will be provided under the scheme for development of 100 industrial parks. The industrial parks to be developed shall be selected in two or more phases. In the first phase, 50 projects shall be taken up. Each phase may have one or more rounds of selection.
- 3.3.** The duration of the Scheme is for a period of 6 years, from financial year 2026-27 to 2031-32.

### **4. Eligibility Criteria**

- 4.1.** The following mandatory criteria shall have to be satisfied for consideration of an application for the competitive stage under the Scheme.

#### **4.2. Land area requirement**

- i) In non-hilly states, for consideration of an industrial park for selection under the scheme, it must have a minimum 100 acre of contiguous land available for development.
- ii) Non-contiguous, adjoining or connected parcels (not exceeding 2) with a minimum area of 100 acre each located within a radius of 2 kms may be considered.
- iii) In hilly states, northeast region, union territories and states having population less than 1 crore, namely, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim, Andaman & Nicobar Islands, Chandigarh, Dadra & Nagar Haveli and Daman & Diu, Delhi, Jammu & Kashmir, Ladakh, Lakshadweep, Puducherry and Goa, the minimum area requirement is 25 acre of contiguous land available for development.
- iv) Out of the one hundred industrial parks to be developed, up to twenty industrial parks may have a development area between 500 acre to 1000 acre. For proposals where the sponsoring agency proposes to develop larger parks in phases, funding will be limited to an upper cap for 1000 acre.

#### **4.3. Land ownership and mode of acquisition**

- i) Land shall be provided by the State Government, a Private Developer, jointly by the State Government and a Private Developer, or a Central Public Sector Undertaking, as the case may be.
- ii) The sponsoring agency/authority will be responsible to ensure that 90% encumbrance-free land is in possession of the concerned agency at the time of submission of application.
- iii) Proposals wherein land is made available for development through land pooling/aggregation or town planning schemes, would be given additional weightage during evaluation.
- iv) The land transferred to the SPV shall be treated as equity contribution in all cases, including the projects proposed by sponsoring authority, which involve partnership with private developers.
- v) The ownership of land shall be transferred to the SPV within 3 months from the date of the approval of the project.
- vi) In the event of delay in transfer of land to the SPV within stipulated period as provided in (v) above, the approval shall be deemed to have been annulled. However, in case of bonafide reasons or genuine circumstances, an additional period of 3 months may be granted for such transfer by the NLSC.

#### **4.4. Planning and Development Powers**

- i) Planning and development powers, to ensure effective single-window clearances, shall be delegated to the SPV by the State/UT Government.
- ii) Formal delegation of such powers shall be a prerequisite to transfer of any funds for the project.

**4.5.** The above mandatory criteria will be applicable for both greenfield and brownfield parks. For the purposes of clarity, it is specified that brownfield parks will be considered on a case-to-case basis subject to availability of minimum area of unencumbered, litigation-free, contiguous and unallotted land as per eligibility criteria 4.2 above.

### **5. Selection process for development of Industrial Parks**

**5.1. Application:** Applications under the scheme shall be invited in two or more phases. In the first phase, up to 50 projects may be considered for approval.

**5.2.** The application shall be submitted by the sponsoring agency/authority in prescribed format through the designated portal. A separate application shall be submitted for development of each industrial park, and more than one application

may be submitted by the sponsoring agency/authority. Each application shall be accompanied by a Detailed Project Report (DPR) prepared in accordance with indicative template provided at Annexure II, along with such other documents and information as may be specified in this regard.

In case the State Government is the sponsoring authority, the application shall be submitted after due consideration and with clear recommendation of the State Level Committee (SLC). In case a Central Public Sector Enterprise (CPSE), is the sponsoring agency/authority, the application shall be submitted with the approval of the Board of CPSE and in compliance with applicable instructions of the Government of India.

- 5.3.** Applications under this scheme will be received and processed through an online portal developed and managed by Project Management Agency (PMA). The portal shall be opened for submission of applications for a specified period, following due public notice.
- 5.4. Consideration of applications in Challenge mode:** Applications meeting the mandatory eligibility criteria will be taken up for evaluation and scoring in accordance with the prescribed evaluation criteria. The highest-ranking applications scoring above the benchmark threshold shall be shortlisted and their DPR shall be examined and evaluated for further consideration and approval.
- 5.5.** An appraisal report in respect of shortlisted applications will be prepared by PMA and presented before the NLSC for approval.

## **6. Evaluation criteria**

- 6.1.** The evaluation matrix shall comprehensively assess proposals based on criteria across the entire life cycle of an industrial park, encompassing site selection and logistics planning in alignment with PM Gati Shakti principles, planning, and development, operational readiness and long-term sustainability.
- 6.2.** The proposal so received shall be evaluated on the following dimensions:
  - i) Multi-modal connectivity, and Site suitability
  - ii) Quality of core, value-added and social infrastructure in DPR
  - iii) Industrial ecosystem
  - iv) Policy enablers
- 6.3.** NLSC may specify an upper limit to the number of projects that can be allotted to a state/UT based on objective parameters.
- 6.4.** The detailed criteria and weightages for each dimension shall be specified in **Annexure I.**

## **7. Implementation by Special Purpose Vehicle (SPV)**

- 7.1.** Each industrial park approved under the Scheme shall be implemented by a Special Purpose Vehicle (SPV) incorporated under the Companies Act 2013. An SPV may be constituted for one or more industrial parks, subject to approval by the competent authority. The SPV shall be responsible for planning, appraisal, financing, approval of requisite layout plan, building plans, master plan, etc. monitoring, evaluation, allotment of plots and lease thereof, and operation and management of the Industrial Park. Development of core infrastructure shall be undertaken through EPC mode.

However, for private developer led parks alternative procurement modes may be adopted with prior approval of SPV. Private Developer shall follow the technical specifications, quality parameters, milestones, and timelines according to the DPR as sanctioned by the NLSC.

- 7.2** In States/UTs where an SPV already exists between NICDIT and the State Nodal Agency, such SPV may be utilised for implementation of projects under the Scheme, subject to the condition that the existing shareholding arrangements, shareholder agreements, and State Support Agreements—originally structured for specific corridor-based projects shall not be altered or diluted.

For projects undertaken under this Scheme, a clear project-level ring-fencing mechanism shall be adopted within the existing SPV to ensure that the financial structure, funding pattern, and obligations under the Scheme remain distinct from those applicable to corridor-based projects. In particular, provisions relating to equity contribution linked to land valuation and loan funding by NICDIT, as applicable under corridor projects, shall not be extended to projects approved under this Scheme, which shall be governed strictly by the funding framework prescribed herein.

In exceptional cases, where implementation through an existing SPV is not feasible, a separate SPV may be considered by NLSC for implementation of projects under the Scheme. (Refer **Annexure V**)

- 7.3.** In States, where there is no existing SPV between NICDIT and the State Nodal Agency, a new SPV shall be incorporated jointly by NICDIT and the State Nodal Agency in accordance with the provisions of the Companies Act, 2013 and in line with the approved SPV structure. (Refer **Annexure V**)
- 7.4.** In cases, where projects are undertaken in collaboration with private developers, a project-specific SPV shall be constituted as a joint venture between the State Nodal Agency, NICDIT, and private developer. The private developer's equity contribution shall primarily be in the form of land, duly valued in accordance with the prescribed norms, and reflected appropriately in the SPV's shareholding structure. (Refer **Annexure VI**)

- 7.5.** The equity participation of NICDIT in any SPV shall not exceed 50% of the paid up equity capital. For SPVs formed between NICDIT and the State Government/State Nodal Agency (without private participation), the shareholding pattern shall not be altered.
- 7.6.** In case, where private developer participates as an anchor investor it may be permitted to allot to itself up to 25% of the developed land within the industrial park. The remaining developed land being not less than 75% shall be allotted to other industries/ units in a transparent and non-discriminatory manner by the SPV. (Refer **Annexure VI**)
- 7.7.** Transfer of land ownership to the SPV shall be a precondition for release of funds. Upon such transfer, financial assistance shall be provided by the Central Government through NICDIT in the form of equity, in tranches linked to achievement of predefined milestones.
- 7.8.** In private developer-led projects, transfer or sale or disinvestment of equity share would be permissible after a period of five years from the date of completion and operationalization of the project. (Refer **Annexure VI**)
- 7.9. O&M Corpus Fund:** The SPV shall be permitted to set aside up to five percent (5%) of the gross allotment premium into a dedicated O&M Corpus Fund, which shall be maintained in a separate escrow account. The O&M Corpus Fund shall be utilised exclusively for meeting the operational deficit of the SPV during the first five years post-completion, including but not limited to: operation of effluent treatment plants, sewage treatment plants, and solid waste management facilities; maintenance of internal roads, streetlights, and utilities; security and housekeeping; and replacement of short-life assets. Drawdown from the O&M Corpus Fund shall require approval of the SPV Board (including the nominee directors of NICDIT and the State Nodal Agency). Any surplus remaining in the O&M Corpus Fund after five years shall be transferred to the SPV's general reserves.
- 7.10.** The roles, responsibilities, governance structure, and operational framework of the SPV is detailed in Annexure IV, and shall be incorporated in the Articles of Association of the SPV. Wherever the constitution of existing SPVs require amendments to undertake the projects sanctioned under the scheme, the same shall be amended suitably.

## **8. Valuation of land for equity contribution**

- 8.1.** Land proposed to be provided by the sponsoring agency through land pooling/aggregation, town planning, or land acquisition shall be valued in accordance with the provisions set out herein, for the purpose of equity contribution to the SPV.

**8.2.** Where land is made available by the State/UT Government through land pooling/aggregation and town planning schemes, the valuation of such land shall be higher of:

- i) the applicable circle rate or DLC, as the case may be; or
- ii) the Fair Market Value of the reconstituted and serviced land parcels, as determined by a valuation committee comprising of one registered valuer appointed by NICDIT, one registered valuer appointed by the State/UT government, and an independent registered valuer jointly appointed by both parties.

Such valuation shall be based on the condition of the land post-reconstitution and provisioning of infrastructure, and supported by appropriate documentation.

**8.3.** Where land is made available by the State/UT government through land acquisition, the cost of acquisition shall mean the compensation paid or payable by the State/UT government to the persons from whom the land has been acquired under applicable law, including statutory interest as per Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013. The cost of acquisition shall not include:

- i) any premium, development charge, administrative charge or land pooling charge;
- ii) any enhanced compensation arising subsequent to acquisition and transfer to SPV due to disputes, litigation, or judicial/administrative orders;
- iii) stamp duty and registration charges payable on transfer of land to the SPV;
- iv) any interest, fee or charges payable to banks or financial institutions in respect of borrowings undertaken for land acquisition or related purposes.

**8.4.** In case of private developer led industrial parks, where land is contributed by a private developer to the SPV as equity contribution, the value of such land shall be the higher of:

- i) the applicable circle rate or DLC, as the case may be; or
- ii) the Fair Market Value determined by a valuation committee comprising one registered valuer appointed jointly by NICDIT (or any agency nominated by NICDIT) and the State Government, one registered valuer appointed by the Private developer, and an independent valuer jointly appointed by both.

**8.5.** In all cases, where valuation is undertaken by a valuation committee, the valuation shall be carried out using accepted and standard valuation methodologies, with a report duly recorded and signed by all members of the committee.

## **9. Funding under the Scheme:**

- 9.1.** Financial assistance under the Scheme shall be provided by the Central Government through NICDIT in the form of equity contribution and, where specifically approved, debt. The equity contribution shall be linked to the value of land transferred to the SPV and shall not exceed the value of such land. Further, the equity contribution of NICDIT shall, in no case, exceed fifty percent (50%) of the paid-up equity capital of the SPV.
- 9.2.** Subject to approval of the competent authority, maximum funding of up to ₹1 crore per acre shall be provided for each project except for private developer led industrial park projects. In case of projects in collaboration with private developers, funding shall be provided in the form of equity only and shall be limited to ₹ 50 lakh per acre or 50% of infrastructure cost, whichever is lower. For this purpose, “infrastructure cost” shall mean the total cost of development of eligible core infrastructure, value-added infrastructure, and social infrastructure components as approved in the DPR, excluding the cost of land, preliminary and pre-operative expenses, interest capitalized, and any costs attributable to built-up spaces constructed for commercial sale or lease.
- 9.3.** The funds provided under the Scheme shall be utilized exclusively for the development of approved components of core infrastructure, value-added infrastructure, social infrastructure, and/or external infrastructure, as specified in the DPR and approved by the NLSC. The details of the components eligible for funding is provided in **Annexure III**.
- 9.4. Ineligible components:** The following components are not admissible for funding under the Scheme:
- i) Land acquisition and development cost
  - ii) Commissioning fees
  - iii) Royalty
  - iv) Preliminary & pre-operative expenses
  - v) Interest capitalized
  - vi) Transportation equipment/vehicles
  - vii) Working capital; and
  - viii) Any other component as decided by NLSC.
- 9.5.** Out of the total funding approved for each industrial park, up to 25% may be allocated towards development of the external infrastructure works required for last-mile connectivity.

Provided that, funding under the Scheme for such external infrastructure shall be limited to a maximum of twenty-five percent (25%) of the total cost of such external infrastructure works. The balance cost shall be borne by the State/UT Government or the private developer, as applicable. State Support Agreement (SSA) shall include a mandatory financial commitment by the State/UT

Government to fund the balance 75% of external infrastructure cost. If the external infrastructure is not completed within the committed timeline through no fault of the SPV, the milestone conditions for Tranche II and Tranche III relating to external infrastructure shall be deemed satisfied for the purpose of fund release, subject to a certificate from the State Nodal Agency confirming that the delay is attributable solely to external infrastructure pending on the State's part.

**9.6. Release of Funds:** Funds shall be released in three tranches over a period of three years in the ratio of 40:40:20. Release of each tranche shall be subject to achievement of predefined milestones in each tranche, as specified below:

| Tranche     | Pre-conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Percentage |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Tranche I   | a. Approval by NLSC<br>b. Transfer of 90% encumbrance-free land to SPV<br>Clarification: Transfer of the initial 90% encumbrance-free land parcel is sufficient to trigger Tranche I release. The remaining 10% of land must be transferred to the SPV before release of Tranche II<br>c. Delegation of development, planning and other powers to SPV, required to provide single window clearance.<br>d. Allocation of power & water by the State/UT government for the industrial park | 30%        |
|             | e. Environmental clearance obtained<br>f. Commencement of work                                                                                                                                                                                                                                                                                                                                                                                                                           | 10%        |
| Tranche II  | a. Utilization of 75% of 1st tranche<br>b. Proportionate physical progress<br>c. Land allotment to at least two manufacturing units (with investment commitment of ₹ 50 crore in non-hilly states and ₹ 10 crore in others)                                                                                                                                                                                                                                                              | 40%        |
| Tranche III | a. Utilization of 90% of 1st and 2 <sup>nd</sup> tranche<br>b. Proportionate physical progress<br>c. Completion of external infrastructure components<br>d. Commencement of construction of at least two independent manufacturing facilities                                                                                                                                                                                                                                            | 10%        |

| Tranche | Pre-conditions                        | Percentage |
|---------|---------------------------------------|------------|
|         | e. Certification for final completion | 10%        |

**9.7.** The States/ UTs may access other sources of funds for components not funded for a project under the Scheme. These sources may be other Central Government schemes and State Government schemes. SPVs may also decide on implementation of components at the stage of the proposal itself, or where such components are not part of the approved project under the Scheme, through PPPs.

**9.8.** The funding approved under the Scheme shall not be revised at any stage.

## **10. Timelines under the Scheme**

**10.1.** The selection process for first phase will be completed within one year from the date of notification of the Scheme.

**10.2.** The SPV shall complete all development work for the approved project within 24 months. For projects having an area between 500 to 1000 acre, the timeline for development works may be allowed beyond 24 months by the NLSC based on justified project requirements.

## **11. Maintenance/ Ownership of Assets**

**11.1.** SPV shall be responsible for operation, maintenance and management of assets created under the Scheme.

**11.2.** The assets created by the SPV out of the Central Government fund shall not be disposed, encumbered or utilized for any purposes other than those for which such fund has been sanctioned and released.

**11.3.** The SPV shall maintain a comprehensive register of all assets created out of Central Government funds, in accordance with the provisions of the General Financial Rules (GFR), as amended from time to time.

**11.4.** In case of liquidation of the SPV for any reason, DPIIT will have the first right to recover the equity contribution released for the project.

## **12. Convergence with other Government Schemes**

**12.1.** The SPV, State/UT Government, and other implementing agencies shall endeavour to leverage and converge benefits available under relevant Central and State Government schemes for the development of industrial parks, particularly for components not funded or only partially funded under this Scheme.

- 12.2.** Convergence with existing Government schemes may be undertaken for development of external infrastructure, last-mile connectivity, utilities, logistics infrastructure, skill development, and sustainability-related components, including renewable energy, water management, waste treatment facilities, and for proving facilities/labs.
- 12.3.** Funding for components approved under this Scheme shall not be duplicated under any other Central or State Government scheme. Appropriate safeguards shall be put in place to ensure that there is no double counting or double financing of the same component.
- 12.4.** The State/UT Government shall facilitate convergence by aligning approvals, timelines, and funding support from relevant departments and schemes, and by ensuring effective inter-agency coordination.
- 12.5.** The SPV shall identify potential areas for convergence at the DPR stage and incorporate the same in the project design and financing plan, subject to approval of the NLSC.

### **13. Project Monitoring**

- 13.1.** The National Level Steering Committee (NLSC), headed by Secretary DPIIT and comprising of representatives of relevant Ministries/ Departments of Government of India shall approve the project proposals, monitor their progress and oversee the release funds under the scheme.
- 13.2.** Sponsoring Agency shall ensure submission of periodical progress reports, preferably on quarterly basis or as and when required to DPIIT and/or PMA, covering physical, financial, land allotment, and commencement of commercial production.
- 13.3.** The PMA shall review the progress of the projects under the scheme and submit periodic appraisal reports to the NLSC on a quarterly basis or at such intervals as may be directed.
- 13.4.** The performance of the Scheme and the projects thereof shall be monitored by the NLSC. NLSC may recommend modifications in the Scheme Guidelines from time to time to ensure effective implementation of the Scheme.
- 13.5.** The SPV shall ensure monitoring and transparency in project implementation through the use of GIS-based tracking systems, periodic third-party evaluations, and appropriate public disclosure mechanisms.
- 13.6.** The SPV shall undertake periodic assessment of demand for the industrial park through market studies and stakeholder consultations, and take appropriate measures to align the project with evolving industry requirements, including facilitating integration with domestic and global value chains and leveraging incentives available under relevant State/UT Government policies.

#### **14. State Level Committee (SLC)**

**14.1.** A State Level Committee (SLC) shall be constituted in each State/UT, chaired by the Chief Secretary and comprising of Administrative Heads of Departments of Industries & Commerce, Finance, Urban Development & Housing, Revenue, Environment and Forests and such other departments as may be required for effective and smooth implementation of the Scheme. An officer not below the rank of Deputy Secretary/ Director shall be nominated by DPIIT to participate in the SLC review meeting of the approved projects.

**14.2.** The State Level Committee (SLC) shall:

- i) Consider and recommend projects to the NLSC, including those involving private sector, after due assessment of compliance with the prescribed eligibility conditions, conditions precedent, and evaluation criteria under the Scheme;
- ii) identify and facilitate development and funding of external infrastructure, including through convergence and prioritisation of resources under ongoing Central and State Government schemes and ensure inter-departmental coordination for timely implementation of such infrastructure;
- iii) review implementation progress, milestone achievement, and utilisation of fund for the approved projects, and provide necessary directions for timely completion; and
- iv) facilitate integration of state-specific policies and incentives for attracting investors and ensure efficient utilisation of the infrastructure created under the Scheme.

#### **15. Project Management Agency (PMA)**

**15.1.** National Industrial Corridor Development Corporation (NICDC) is the designated PMA for the scheme.

**15.2.** PMA will assist NLSC in the implementation of the scheme as per the responsibilities below:

- i) Deployment of dedicated manpower resources for effective implementation and monitoring of the scheme.
- ii) Development and maintenance of a web portal for receipt of applications, project evaluation and monitoring.
- iii) Conducting seminars/ workshops for creation of awareness of the scheme, and assessment of training needs of various stakeholders at the state level, including government officials, agencies, and investors.

- iv) Preparation of appraisal report for each project application as per laid down evaluation criteria.
- v) Extend support to NLSC and DPIIT in evaluating the proposals received and securing the final decision from the NLSC for the approval of projects.
- vi) Submission of financial requirements/ demand of funds required for the approved projects to DPIIT, and equity participation in the SPVs.
- vii) Submission of quarterly progress reports and such other reports as may be sought by DPIIT/ NLSC.
- viii) Conducting baseline survey and mid-term evaluation of the proposed scheme.
- ix) Monitoring physical and financial progress for each component on a periodical basis.
- x) Collecting and analysing information and data from SPVs and prepare reports to monitor the status of the scheme.
- xi) Conduct financial reviews to track the scheme's progress on behalf of DPIIT.
- xii) Any other tasks assigned by DPIIT/ NLSC.

## **16. Dispute Resolution Mechanism for Private Developer-led SPVs**

**16.1.** In the event of a deadlock or dispute within the Board of a Private Developer-led SPV that cannot be resolved within 30 days of the first meeting at which the matter was raised, the following escalation mechanism shall apply:

- (i) Either party may refer the matter to the State Level Committee (SLC) which shall attempt conciliation within 30 days of referral;
- (ii) Pending resolution of any dispute, the SPV shall continue all project development and allotment activities without interruption.

## **17. Other conditions**

**17.1.** Wherever model frameworks/ policies have been developed under the National Industrial Corridor Development Program, the same may be used for implementation under the Scheme.

**17.2.** The accounts of the Special Purpose Vehicle (SPV) and the Project Management Agency (PMA) shall be open to inspection by DPIIT and shall be subject to audit by statutory authorities, in accordance with applicable laws and rules.

- 17.3.** DPIIT may, as deemed necessary, shall also have the right to appoint a third-party or independent agency to undertake performance evaluation of the project and/or the SPV.
- 17.4.** Upon completion of the project, the Sponsoring Agency shall undertake post-project evaluation, including social and community impact assessments, to assess inclusive development outcomes.
- 17.5.** The decision of the NLSC on grant of approval/ rejection of the project proposals under the scheme shall be final and binding.
- 17.6.** In the event that the Government of India is of the opinion that the implementation of the project or operations of the SPV is not satisfactory, it may, after providing an opportunity of being heard to the concerned parties, take appropriate action including cancellation of the project.

## Annexure I

### Evaluation Criteria

| S. No | Criteria                                                                                                                                                                                                                                                                                        | Grading methodology                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Max marks |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| (1)   | (2)                                                                                                                                                                                                                                                                                             | (3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | (4)       |
| 1     | <p>a) Distance from external boundary of nearest Urban Local Body (ULB)* with a minimum population of 1,00,000 (Non-Hilly states)</p> <p>b) Distance from external boundary of nearest ULB* with a minimum population of 50,000 (NE/Hilly states/UTs/states with less than 1 Cr population)</p> | <p>Proportionate marks shall be awarded considering the twin factors of:</p> <p>(i) population of the qualifying Urban Local Body (ULB); and</p> <p>(ii) distance of the proposed park from the external boundary of such ULB.</p> <p>For proposed parks located at a similar distance, parks located with reference to cities having larger population shall receive higher marks compared to parks located with reference to cities having smaller population.</p> <p>Also, for the proposal located with reference to the same ULB, a park situated closer to the ULB boundary shall receive higher marks compared to parks situated farther away.</p> <p>Proposals where the qualifying ULB has population less than 1 lakh shall not be eligible for marks under this criterion.</p> <p>ULBs having population greater than 10 lakh shall be treated equally for evaluation under category (a). For category (b), such population threshold shall be 1 lakh.</p> | 10        |
| 2     | Mode of land acquisition                                                                                                                                                                                                                                                                        | For land made available through land pooling or town planning schemes, 5 marks will be awarded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 5         |
| 3     | Proximity to any one - existing/ongoing NH or SH or sea port or cargo airport or ICD or MMLP                                                                                                                                                                                                    | <p>Full marks shall be awarded to a park proposed within, -</p> <p>(a) 10 km of a National Highway (NH);</p> <p>(b) 5 km from a State Highway;</p> <p>(c) 15 km from an MMLP or ICD; or</p> <p>(d) 25 km from sea port or cargo airport.</p> <p>Satisfaction of any one of the above shall be sufficient for award of full marks.</p> <p>Beyond the above threshold distances, marks shall be reduced by 2 marks for every additional 10% increase in threshold distance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 10        |

|   |                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 4 | Available or proposed connectivity to the proposed park site from the NH, SH, sea port or cargo airport or ICD or MMLP, identified in 3 above | Minimum RoW of 24 m in non-hilly states and RoW of 18 m in Hilly states. Existing road of good quality, all weather meeting IRC standards for urban roads, and in case of proposed connectivity, adequate land in possession/ acquired, with plan for construction and its financing of similar standard as prescribed above within a reasonable time period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 5  |
| 5 | Confirmation of availability of uninterrupted power supply & assured water supply                                                             | i) Confirmation of availability of both as per projected demand, meeting industrial standards for the identified sectors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 10 |
|   |                                                                                                                                               | ii) Either one or none available.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0  |
| 6 | DPR Quality and industrial competitiveness                                                                                                    | <p>Marks shall be awarded based on the comprehensiveness, implementation readiness, and investor-oriented quality of the proposed industrial park.</p> <p>Evaluation shall include scoring on the following parameters (not necessarily in the order of priority):</p> <ul style="list-style-type: none"> <li>(i) integrated master planning with preference to sectoral parks;</li> <li>(ii) access to worker housing and social infrastructure;</li> <li>(iii) plug-and-play and common infrastructure facilities;</li> <li>(iv) underground common utility infrastructure;</li> <li>(v) digital infrastructure;</li> <li>(vi) skill ecosystem integration;</li> <li>(vii) testing labs (preferably through convergence with Government schemes)</li> <li>(viii) start-up hubs (as per demand)</li> <li>(ix) operations and maintenance framework;</li> <li>(x) alignment with sectoral demand assessment; and</li> <li>(xi) financial viability and investor affordability through a clear land pricing framework.</li> </ul> | 25 |
| 7 | Demand validation based on vacancy in nearest competing industrial areas, parks/ clusters (Non-SEZ) within 100 kms                            | i) Less vacancy ( $\leq 15\%$ ) – 5 marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5  |
|   |                                                                                                                                               | ii) Moderate vacancy (between 15 to 30 %) – 3 marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
|   |                                                                                                                                               | iii) High vacancy ( $\geq 30\%$ ) – 0 marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| 8 | Proposed Demand assessment study for                                                                                                          | i) Comprehensive assessment with supportive documentation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | industries vis-à-vis existing Industrial Ecosystem in vicinity                                                                                                                                                                                                                     | ii) Demand assessment without supporting analysis                                                                                                                                                                                                                                                                                                                                                                                |    |
| 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Whether the following compliances are digitally mapped on the Single Window Clearance System proposed at the SPV level:<br>a) e- Land Management<br>b) Building Construction<br>c) Utilities<br>d) NOC - Fire, Pollution, gas<br>e) Labour license<br>f) Inspectorate of Factories | Marks shall be awarded based on the degree of integration, functionality, and implementation readiness of the above compliances within the proposed Single Window Clearance System.                                                                                                                                                                                                                                              | 10 |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Industrial Power Tariff Competitiveness and Renewable Energy Facilitation                                                                                                                                                                                                          | Proportional marks will be awarded based on the relative differential between the power tariffs for industries as compared to domestic tariff. Lesser relative differential committed for a longer period, for the proposed industrial park or for the entire industrial sector in the state, will earn higher marks.<br><br>Availability of renewable energy at competitive rates shall be preferred, within a maximum 3 marks. | 10 |
| 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Actual time taken for industrial land allotment from the date of application till issuance of allotment letter in last calendar year                                                                                                                                               | i) within 60 days                                                                                                                                                                                                                                                                                                                                                                                                                | 5  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                    | ii) $\geq 60$ days but less than 120 days                                                                                                                                                                                                                                                                                                                                                                                        |    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                    | iii) beyond 120 days                                                                                                                                                                                                                                                                                                                                                                                                             |    |
| 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Project proposed in certain states                                                                                                                                                                                                                                                 | A maximum of 10 marks may be given for States whose per capita income is less than national average.                                                                                                                                                                                                                                                                                                                             | 10 |
| <p>a. Maximum marks that could be availed: 100</p> <p>b. Supporting documents like government orders, notifications, screenshots of PM Gatishakti portal, extract from DPRs etc. must be provided with the application.</p> <p>c. All pending issues, including delegation of power and external connectivity-related matters, in Integrated Industrial Parks funded by Government of India, such as NICDP and PM-MITRA parks, must be resolved before submission of the application.</p> <p>* Present boundary of ULB with total population of enclosed area as per 2011 census would be considered</p> |                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |

### Template for Detailed Project Report (DPR)

| Section Name                      | Details required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Executive Summary                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Introduction                      | <ol style="list-style-type: none"> <li>1. Project Background</li> <li>2. Project Proponent</li> <li>3. Project Rationale</li> <li>4. Structure of Detailed Project Report</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Industrial Park at XXX location   | <ol style="list-style-type: none"> <li>1. Proposed site for Industrial Park</li> <li>2. District/ Region Profile</li> <li>3. Industrial Scenario of the region</li> <li>4. Promoters' Details</li> <li>5. Development Mode (Private, Public, PPP)</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Location Details and Connectivity | <ol style="list-style-type: none"> <li>1. Location of the Industrial Park</li> <li>2. External Connectivity to the Location-Rail, Road, Air, Port</li> <li>3. Site Analysis</li> <li>4. Environmental Clearance</li> <li>5. Site features</li> <li>6. External Infrastructure and Utilities –Water, Power, etc.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Proposed Park Master Plan         | <ol style="list-style-type: none"> <li>1. Proposed Master Plan</li> <li>2. Planning Concept <ol style="list-style-type: none"> <li>2.1. Integration</li> <li>2.2. Flexibility</li> <li>2.3. Zoning</li> <li>2.4. Access &amp; Greens</li> </ol> </li> <li>3. Infrastructure Components</li> <li>4. Land Use Distribution</li> <li>5. Site Development &amp; Compound Wall <ol style="list-style-type: none"> <li>5.1. Site Development</li> <li>5.2. Compound Wall</li> </ol> </li> <li>6. Road Network <ol style="list-style-type: none"> <li>6.1. Right of Way (RoW)</li> </ol> </li> <li>7. Storm Water Drainage System <ol style="list-style-type: none"> <li>7.1. Existing Drainage System</li> <li>7.2. Design Parameters</li> <li>7.3. Design of Drains</li> <li>7.4. Proposed Drainage System</li> </ol> </li> <li>8. Water Supply System <ol style="list-style-type: none"> <li>8.1. Water Demand</li> <li>8.2. System Design</li> </ol> </li> </ol> |

| Section Name       | Details required                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <ul style="list-style-type: none"> <li>8.3. Raw Water Sump</li> <li>9. Water Treatment Plant</li> <li>10. Water Storage Reservoirs and Pump House</li> <li>11. Internal Water Supply Distribution</li> <li>12. Sewage Collection and Treatment System               <ul style="list-style-type: none"> <li>12.1. Sewage/Effluent Flows, Pipes and Manholes</li> <li>12.2. Sewage Treatment System</li> </ul> </li> <li>13. Integrated Solid Waste Management</li> <li>14. Power Transmission &amp; Distribution</li> <li>15. Telecom &amp; IT Infrastructure</li> <li>16. Landscaping</li> <li>17. Support Services/Common Amenities</li> <li>18. Warehousing</li> <li>19. Worker Housing</li> <li>20. Administrative Setup</li> <li>21. Engineering and Construction Management</li> <li>22. Sustainability measures including renewable energy infrastructure</li> </ul> |
| Project Costing    | <ul style="list-style-type: none"> <li>1. Estimated Project cost</li> <li>2. Cost of Land</li> <li>3. Means of Finance</li> <li>4. Eligible Grant</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Financial Analysis | <ul style="list-style-type: none"> <li>1. Appraisal Framework and Objective</li> <li>2. Financial Assessment of the Project</li> <li>3. Key Operational and Financial Assumptions</li> <li>4. Revenue Assumptions</li> <li>5. Expenditure Assumptions               <ul style="list-style-type: none"> <li>5.1. Manpower Requirement and Expenses</li> <li>5.2. Power Consumption</li> <li>5.3. Water Consumption</li> <li>5.4. Sewage Treatment Costs</li> <li>5.5. Estimate of Total Expenditure</li> </ul> </li> <li>6. Other Assumptions</li> <li>7. Depreciation</li> <li>8. Operations and Maintenance Plan               <ul style="list-style-type: none"> <li>8.1. Framework for O&amp;M</li> <li>8.2. Framework for recovery of O&amp;M Expenses</li> </ul> </li> <li>9. Key Financial Indicators</li> </ul>                                                     |

| Section Name                    | Details required                                                                                                                                                                                                                                                                                                   |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Implementation Strategy | <ol style="list-style-type: none"> <li>1. Project Conceptualization</li> <li>2. Project Formulation</li> <li>3. Stakeholders and their Responsibilities</li> <li>4. Project Execution</li> <li>5. Allotment of Plots</li> <li>6. Land/ Shed Allotment</li> <li>7. Project Implementation and Monitoring</li> </ol> |
| Demand Assessment               | <ol style="list-style-type: none"> <li>1. Industry sectors identified for investment grounding</li> <li>2. Demand validation</li> <li>3. Manpower/human resource assessment</li> </ol>                                                                                                                             |
| Project Impact                  | <ol style="list-style-type: none"> <li>1. Private Investment Grounded</li> <li>2. Number of Expected Units</li> <li>3. Estimated Employment Generation</li> </ol>                                                                                                                                                  |
| Project Impact                  | <ol style="list-style-type: none"> <li>4. Private Investment Grounded</li> <li>5. Number of Expected Units</li> <li>6. Estimated Employment Generation</li> </ol>                                                                                                                                                  |

**Components Eligible for funding under the Scheme**

| <b>S.No</b> | <b>Component</b>                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | Core Infrastructure                                | <ul style="list-style-type: none"> <li>i. Internal road network with pedestrian pathway</li> <li>ii. Underground utilities such as water, sewerage, treated water, gas and power supply distribution network</li> <li>iii. Storm water drainage and structures</li> <li>iv. Streetlight for roads and common areas</li> <li>v. Area landscaping</li> <li>vi. CETP (Central Effluent Treatment Plant)</li> <li>vii. WTP (Water Treatment Plant)</li> <li>viii. STP (Sewage Treatment Plant)</li> <li>ix. Solid Waste Management</li> <li>x. ICT network, security infrastructure</li> <li>xi. Administrative block and fire safety systems</li> </ul> |
| 2           | Value-added Infrastructure                         | <ul style="list-style-type: none"> <li>i. BTS (Built to Suit) facilities</li> <li>ii. Storage and warehousing facilities</li> <li>iii. Sector specific support infrastructure including research &amp; development centers, testing labs, training centers, etc. (preferably on PPP basis)</li> <li>iv. Renewable energy infrastructure</li> </ul>                                                                                                                                                                                                                                                                                                   |
| 3           | Social Infrastructure<br>(preferably on PPP basis) | <ul style="list-style-type: none"> <li>i. SAFE worker housing</li> <li>ii. Common Facility Centres</li> <li>iii. On-site day care facilities including health services</li> <li>iv. Skill Development Centre</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4           | External Infrastructure                            | <ul style="list-style-type: none"> <li>i. Last mile connectivity – link road connecting the site to major NH (National Highway) /SH (State Highway) /rail heads /logistics hub.</li> <li>ii. Power transmission line from nearest substation.</li> <li>iii. Water supply pipeline from nearest source reservoir.</li> <li>iv. Access to Gas supply from nearest source</li> </ul>                                                                                                                                                                                                                                                                    |

**Responsibilities of the SPV**

The SPV shall:

- a. Undertake planning, procurement, and execution of all eligible infrastructure components.
- b. Implement various interventions as outlined and approved in DPR.
- c. Maintain compliance with applicable regulations (environmental, urban planning, labour, etc.).
- d. Prepare and implement an Investment Promotion strategy/plan for attracting investors and facilitate development of a robust industrial ecosystem;
- e. Prepare a revenue model for financial independence and sustainability
- f. Develop partnerships with private players for social infrastructure, value-added facilities and other components.
- g. Prepare a report for each stage of implementation.
- h. Submit Utilization Certificates (UCs), audit reports, and progress updates to DPIIT via PMA.
- i. Ensure operations and maintenance post-completion through user charges, PPP models, or other sustainable mechanisms.
- j. Prepare a Management Plan for the Industrial parks after the completion of infrastructure development, at the time of submission of project proposal.
- k. Undertake periodic demand assessment through market studies and stakeholder consultations, and align the project with evolving industry requirements, including integration with domestic and global value chains and leveraging relevant State/UT incentives;
- l. ensure timely allotment of land and operationalization of industrial units in line with approved timelines and objectives of the Scheme;
- m. ensure operation, maintenance, and management of all assets created under the Scheme in a sustainable and efficient manner; and

**Salient Provisions of Shareholders' Agreement for SPVs**

Shareholders' Agreement (SHA) for implementation of industrial parks approved under BHAVYA shall set out the rights and obligations of shareholders of the project implementing Special Purpose Vehicle (SPV). SHA shall broadly cover the following matters, along with any other provisions required, project approval conditions and applicable laws:

- 1. Parties to SHA:** SHA shall be executed between shareholders of the SPV, including National Industrial Corridor Development and Implementation Trust (NICDIT), State Nodal Agency or CPSE, wherever applicable.
- 2. Formation of SPV:** Where SPV between NICDIT and the State Nodal Agency exists, an addendum to the existing SHA shall provide for separate maintenance of BHAVYA project funds, assets, liabilities, obligations, revenues and accounts.

Where no such SPV exists, a new SPV shall be incorporated jointly by NICDIT and the State Nodal Agency in accordance with the Scheme.

- 3. Shareholding, Capital Contribution and Project Land:** SHA shall set out SPV's shareholding pattern and contribution to be made by each shareholder, including any further funding or capital contribution.

SHA shall provide that project land transferred by State Nodal Agency to SPV shall be treated as its equity contribution and valued in accordance with the BHAVYA Guidelines. NICDIT's equity contribution shall be linked to the value of project land transferred and shall not exceed 50% of the paid-up equity capital of the SPV.

SHA shall also set out the key land-related obligations, including transfer of land to SPV, encumbrance-free possession, valuation and use of the land only for the approved project and related purposes.

- 4. Funding and Utilisation of Funds:** SHA shall set out SPV's funding structure, including each shareholder's contribution and treatment of any additional funding as equity, debt or shareholder loan.

SHA shall provide that funds received under BHAVYA shall be utilised only for the project components approved under the Guidelines, approved DPR and project approval conditions and shall not be diverted for any other purpose.

SHA shall also provide for tranche-wise release of funds, utilisation requirements, reporting, audit and monitoring of fund usage, in accordance with the BHAVYA Guidelines.

- 5. Obligations of SPV, State Nodal Agency and NICDIT:** SHA shall set out the responsibilities of SPV including planning, procurement and execution of eligible infrastructure components; implementation of interventions approved in the DPR; compliance with applicable regulations; preparation and implementation of investment promotion strategy; preparation of a revenue model for financial independence and sustainability; submission of utilisation certificates, audit reports and progress updates; operation and maintenance post-completion; and management of assets created under the Scheme.

SHA shall set out the responsibilities of State Nodal Agency, including facilitation of land transfer, encumbrance-free possession of land, external infrastructure and utilities, coordination with State Government departments and performance of obligations under the Guidelines, approved DPR, project approval conditions, State Support Agreement and applicable law.

SHA shall also provide that the State Government shall facilitate delegation of planning, development and other powers to the SPV, as required for single-window clearances and effective implementation of the project. Formal delegation of such powers shall be a prerequisite for release of funds.

NICDIT's rights shall include nomination of directors, participation in Board decisions, monitoring of utilisation of funds, access to project information and approval rights in respect of reserved matters.

- 6. Role of National Industrial Corridor Development Corporation (NICDC) as PMA:** SHA shall recognise that NICDC is the designated Project Management Agency (PMA). SHA shall provide that the SPV shall furnish to PMA such information, records, utilisation certificates, audit reports, progress updates and other project-related details as may be required for appraisal, monitoring and implementation of the project.

- 7. State Support Agreement:** SHA shall provide that a State Support Agreement (SSA) shall be executed between NICDIT, the concerned State Government and State Nodal Agency.

SSA shall cover State obligations relating to planning and development powers, external infrastructure, single-window clearances, utilities, State support and other project commitments. SHA shall provide that SSA shall be read together with SHA and BHAVYA Guidelines.

- 8. Governance, Management and Reserved Matters:** SHA shall provide for Board composition, nomination rights, Chairperson, quorum, voting, notice, agenda and conduct of Board and shareholder meetings in accordance with BHAVYA Guidelines and Companies Act, 2013.

The CEO/Managing Director of SPV shall be responsible for day-to-day operations and management, subject to direction, supervision and control of the Board.

SHA shall specify reserved matters requiring affirmative consent of the relevant shareholders or their nominee directors, as applicable. Reserved matters shall include, at minimum, amendment to Memorandum and Articles of Association of the SPV; change in the core purpose of the SPV or diversion of funds; creation of encumbrance on assets of the SPV other than project financing approved in the DPR; merger, amalgamation, demerger or winding up of the SPV; and issuance of new shares or securities. Additional reserved matters may be included if consistent with the Guidelines, project approval conditions and applicable law.

- 9. Implementation, O&M, Accounts and Monitoring:** SHA shall provide that project procurement, implementation, allotment of plots and lease thereof shall be undertaken by SPV in accordance with BHAVYA Guidelines, approved DPR, approved land allotment and pricing policy of the SPV and applicable law.

SHA shall provide that development of core infrastructure shall be undertaken through EPC mode, as provided under the Guidelines.

SPV shall be responsible for operation, maintenance and management of assets created under the Scheme. Where an O&M Corpus Fund is created, the SHA shall provide for its maintenance in a separate escrow account and utilisation in accordance with the Guidelines.

SHA shall also provide that SPV shall maintain proper books of account and separate records for BHAVYA funds. The accounts of SPV shall be open to inspection by DPIIT and shall be subject to audit by statutory authorities, in accordance with applicable laws and rules.

SHA shall also provide that assets created out of Central Government funds shall not be disposed of, encumbered or used for any purpose other than the purpose for which such funds have been sanctioned and released.

- 10. Revenue and Receipts:** SHA shall provide for the manner in which project revenues, user charges, receipts from allotment/lease of plots, maintenance charges and other receipts of the SPV shall be collected, accounted for and utilised.

SHA shall also provide that such revenues shall be applied towards implementation, operation, maintenance and management of the approved project, including O&M arrangements.

- 11. Transfer, Default and Dispute Resolution:** SHA shall contain restrictions on transfer of shares in accordance with the Scheme, Companies Act, 2013 and applicable law. It shall provide for lock-in, permitted transfers, right of first refusal or right of first offer, change in control restrictions and deed of adherence by transferees, as applicable.

SHA shall define events of default and consequences thereof in accordance with the Scheme, project approval conditions and applicable law. In case of liquidation of SPV, DPIIT shall have the first right to recover the equity contribution released for the project, as provided under the Guidelines.

SHA shall provide a mechanism for resolution of deadlocks and disputes. Pending resolution of any dispute, the SPV shall continue project implementation and related activities.

- 12. Standard provisions:** SHA shall also include standard provisions relating to representations and warranties, confidentiality, force majeure, term and termination, notices, governing law, jurisdiction, amendment, assignment, waiver, severability and survival of obligations.

**Additional Provisions for Private Developer led Industrial Parks**

**1. Definition (Reference 2.1 (xi))**

For the purposes of this Scheme, a Private Developer shall satisfy the following minimum eligibility conditions at the time of submission of application:

- (a) The Private Developer shall be incorporated or registered in India under Companies Act, 2013. In case of a consortium or joint venture, each member shall be incorporated or registered in India, and the consortium shall designate a Lead Member which shall hold not less than 26% (twenty-six percent) equity in the consortium and shall be primarily responsible for all obligations under the Scheme. The Lead Member shall execute a Power of Attorney in favour of an authorised representative for all Scheme-related actions.
- (b) Net Worth: The Private Developer (or, in the case of a consortium, the Lead Member individually, or all members collectively) shall have a minimum positive net worth of 15% of the project cost, as certified by a Chartered Accountant, based on the audited financial statements for the preceding financial year.
- (c) Technical Experience: The Private Developer (or at least one member of the consortium) shall have demonstrable experience in development of industrial estates, industrial parks, logistics parks, SEZs, or large-scale real estate/infrastructure projects with a minimum developed area of 50 acre in at least one completed project in the preceding ten years. The experience shall be evidenced by completion certificates, allotment records, or equivalent documentation.
- (d) Litigation and Debarment: The Private Developer shall not be debarred or blacklisted by any Central or State Government authority during last 3 years and it should not subsist as on the date of application.
- (e) In the event the Private Developer is a Special Purpose Vehicle or project company specifically formed for this purpose, the eligibility criteria shall be assessed at the level of the promoter(s) or sponsor(s) holding not less than 51% equity in such entity.

**2. Additional provisions regarding SHA (Reference 7.4)**

The following provisions shall govern the constitution, shareholding structure, and governance of project-specific SPVs in cases involving Private Developers:

- (a) Shareholding Structure: The shareholding in the SPV shall be structured as follows:

- (i) The Private Developer shall hold a minimum of 26% (twenty-six percent) equity in the SPV. The maximum equity that may be held by the Private Developer shall be determined based on the value of land contributed and/or additional equity infused in cash. The Private Developer's equity contribution shall primarily be in the form of land duly valued as per prescribed norms. In addition, the Private Developer may infuse cash equity for the purpose of funding infrastructure development.
  - (ii) The State Nodal Agency's equity shall be as per the mutual agreement between the Private Developer and the state.
  - (iii) The equity holding of the NICDIT shall be equal to the infrastructure cost within the overall ceiling of ₹ 50 lakh per acre.
- (b) Shareholders' Agreement (SHA): A Shareholders' Agreement (SHA) shall be executed among all shareholders of the SPV within 60 (sixty) days of approval of the project by the NLSC. The SHA shall, at minimum, contain provisions relating to:
- (i) Governance and board composition;
  - (i) reserved matters requiring affirmative vote/consent of NICDIT or its nominee and the State Nodal Agency;
  - (ii) dividend and profit distribution policy;
  - (iii) restrictions on transfer of shares;
  - (iv) dispute resolution mechanism;
  - (v) exit rights and buyout provisions;
  - (vi) reporting requirements for utilization and monitoring of funds and access to information including books of account, records, etc. not to be used for pursuit of business interests outside of SPV and subject to confidentiality provisions;
  - (vii) restrictions on related party transactions unless unanimously approved by the parties in writing;
  - (viii) step-in rights of Government in case of default.
- (c) Board Composition and Governance: The Board of Directors of the SPV shall comprise of not less than 5 (five) directors. NICDIT and the State Nodal Agency shall together have the right to nominate not less than 2 (two) directors in aggregate, including at least 1 (one) nominated by the State Nodal Agency. The Private Developer shall have the right to nominate not more than 2 (two) directors. At least 1 (one) independent director shall be

appointed in accordance with the Companies Act, 2013 and such director shall be acceptable to all shareholders. The Chairperson of the Board shall be a nominee of the State Nodal Agency. Quorum for Board meetings shall require the presence of at least one nominee director each of the State Nodal Agency and NICDIT.

(d) **Reserved Matters:** The following matters shall require prior written consent of the State Nodal Agency and nominee of NICDIT, and shall constitute reserved matters under the SHA:

- (i) amendment to the Memorandum and Articles of Association of the SPV;
- (i) change in the core purpose of the SPV or diversion of funds;
- (ii) creation of encumbrance on any assets of the SPV, other than project financing approved in the DPR;
- (iii) merger, amalgamation, demerger, or winding up of the SPV; and
- (iv) issuance of any new shares or securities.

(e) **State Support Agreement:** The State Government shall execute a State Support Agreement (SSA) with the SPV and NICDIT within 90 (ninety) days of project approval, committing to:

- (i) delegation of planning and development powers to the SPV as required;
- (i) provision of external infrastructure connections (road, water, power) within agreed timelines;
- (ii) facilitation of single-window clearances; and
- (iii) provision of viability gap funding or fiscal incentives as applicable under State policy. The SSA shall be a condition precedent to release of the second tranche of funding under the Scheme.

### **3. Anchor investor (Reference 7.6)**

An anchor investor means an investor which establishes its own unit, which in turn will require supplier/vendor units to be established independently by other investors.

For the purposes of this Scheme, the following additional conditions shall apply to an Anchor Investor:

- (a) The Anchor Investor shall commit to establishing a manufacturing or processing unit within the industrial park with a minimum investment of ₹ 50 crore (in non-hilly states) or ₹ 10 crore (in hilly states, NE states, UTs, and

states with population below 1 crore), as certified by the Private Developer in the DPR.

- (b) The self-allotment of up to 25% of developed land by the Anchor Investor shall be subject to execution of a formal allotment agreement with the SPV, on terms not more favourable than those available to other allottees at the time of allotment. The allotment price shall be based on the approved allotment policy of the SPV and shall be transparent and auditable.
- (c) The Anchor Investor shall commence construction of its unit and achieve commercial production within prescribed timelines in the land allotment policy. Failure to meet these timelines shall make the self-allotted land liable to resumption by the SPV.

#### **4. Exit Provisions (Reference 7.8)**

The exit provisions for Private Developers in project-specific SPVs shall be governed by the following framework:

- (a) Lock-In Period and Definition: The lock-in period of five (5) years shall be calculated from the date of issuance of the Completion Certificate by the designated authority (as specified in the SHA), certifying that all core infrastructure components approved under the Scheme have been developed and the industrial park is operational. For avoidance of doubt, “completion and operationalization” shall mean:
  - (i) completion of all core infrastructure as per approved DPR;
  - (ii) commencement of allotment of plots/built spaces to at least five (5) independent industrial units; and
  - (iii) at least two (2) such units having commenced commercial production. The SPV Board shall issue the Completion Certificate after third-party verification.
- (b) Permitted Transfers within Lock-In Period: Notwithstanding the lock-in, the following transfers shall be permitted within the lock-in period:
  - (i) Transfer to an Affiliate of the Private Developer, provided such Affiliate satisfies the eligibility criteria applicable to Private Developers under the Scheme and the Private Developer continues to be jointly and severally liable for all obligations under the SHA;
  - (ii) Transfer pursuant to an internal group restructuring, provided that the ultimate beneficial ownership and control does not change;
  - (iii) Transfer required pursuant to an order of a court or regulatory authority.

- (c) Right of First Refusal (ROFR): After expiry of the lock-in period, and before any proposed transfer to a third party, the Private Developer shall first offer its equity shares to the existing shareholders (State Nodal Agency and NICDIT) at the proposed transfer price or Fair Market Value (FMV), whichever is higher. The existing shareholders shall have a period of 90 (ninety) days from receipt of the offer notice (ROFR Notice) to exercise their right of first refusal. If both the State Nodal Agency and NICDIT decline or fail to exercise ROFR within 90 days, the Private Developer may proceed to transfer to the proposed third party at a price not less than the price offered under ROFR, within a period of 180 (one hundred and eighty) days from expiry of the ROFR period.
- (d) Eligible Transferees: Post lock-in transfers shall only be made to entities that:
- (i) satisfy the eligibility criteria applicable to Private Developers under the Scheme. Institutional investors (SEBI-registered REITs, Category II/III AIFs, pension funds regulated by PFRDA/IRDA) shall be treated as eligible transferees post-lock-in without requiring the full private developer eligibility criteria, provided they execute an undertaking to assume all O&M obligations and appoint a qualified facility management company acceptable to the SPV Board;
  - (ii) are not debarred or blacklisted by any Central or State Government authority; and
  - (iii) commit in writing to assume all outstanding obligations of the transferor under the SHA and State Support Agreement.
- (e) Change of Control: Any direct or indirect change in the ultimate beneficial ownership or effective control of the Private Developer that would result in a change in the entity(ies) controlling the Private Developer shall be treated as equivalent to a transfer of equity shares and shall be subject to the same restrictions and approvals as applicable to a direct transfer, including the lock-in requirement and ROFR mechanism.
- (f) Distress Exit and Step-In Rights: In the event of financial distress of the Private Developer including initiation of insolvency proceedings under the Insolvency and Bankruptcy Code, 2016, or material default under any project financing agreement that has been notified to the SPV, the following provisions shall apply:
- (i) The Private Developer shall immediately notify the SPV Board;
  - (ii) State Nodal Agency shall have the right (but not the obligation) to “step in” and assume operational control of the SPV for a period not exceeding 24 (twenty-four) months to ensure continuity of project development;

- (iii) During the step-in period, State Nodal Agency shall have the right to appoint a Project Management Consultant to manage day-to-day operations;
- (iv) The Private Developer's equity shall be valued at the lower of cost or FMV for the purpose of any buyout during the distress period;
- (g) Transfer Pricing and Valuation: In all cases of transfer of equity, the Fair Market Value (FMV) of the equity shall be determined by an independent registered valuer jointly appointed by the transferring and receiving parties and approved by the SPV Board. The cost of valuation shall be borne by the transferring party.
- (h) Taxation and Stamp Duty: All costs, taxes, and duties arising out of any permitted transfer of equity shall be borne by the transferring party, unless otherwise agreed between the parties in writing and disclosed to the SPV Board.
- (i) Continuity of Operations: Notwithstanding any transfer or exit proceedings, the Private Developer shall ensure that project development activities and allotment operations of the SPV continue without interruption. Any proposed transfer shall not be consummated until the incoming transferee has provided written undertakings to the NLSC and State Nodal Agency to this effect.



## **NATIONAL INDUSTRIAL CORRIDOR DEVELOPMENT CORPORATION LIMITED (NICDC)**



### **Guidance Document for Preparation of Detailed Project Report (DPR)**

**May 2026**

**INDICATIVE DOCUMENT FOR REFERENCE ONLY**

## Contents

|                                                                    |           |
|--------------------------------------------------------------------|-----------|
| <b>Chapter 1: Introduction .....</b>                               | <b>6</b>  |
| 1.1 INTRODUCTION .....                                             | 7         |
| 1.2 NEED FOR THE GUIDEBOOK: .....                                  | 7         |
| 1.3 HOW TO READ THE GUIDEBOOK .....                                | 8         |
| 1.4 GUIDEBOOK APPROACH: .....                                      | 9         |
| 1.5 DISCLAIMER .....                                               | 10        |
| <b>Chapter 2 Master Planning .....</b>                             | <b>11</b> |
| 2.1 INTRODUCTION .....                                             | 12        |
| 2.2 METHODOLOGY OF PLANNING .....                                  | 13        |
| 2.3 MARKET DEMAND AND INDUSTRIAL POSITIONING .....                 | 23        |
| 2.4 TECHNICAL ASPECTS OF THE MASTER PLAN .....                     | 27        |
| 2.5 BUILT TO SUIT (BTS) & READY-BUILT SHEDS (RBS) .....            | 32        |
| 2.6 DEVELOPMENT CONTROL REGULATIONS & URBAN DESIGN FRAMEWORK ..... | 33        |
| 2.7 IMPLEMENTATION STRATEGY & EXECUTION FRAMEWORK .....            | 36        |
| <b>Chapter 3: Roads &amp; Transportation System .....</b>          | <b>39</b> |
| 3.1. ABOUT THIS CHAPTER: .....                                     | 40        |
| 3.2 CONCEPT NOTE: .....                                            | 40        |
| 3.3 DESIGN BASIS .....                                             | 41        |
| 3.4 INDICATIVE REFERENCES: .....                                   | 43        |
| 3.5 ADOPTED DESIGN STANDARDS & NORMS .....                         | 44        |
| 3.6 TRAFFIC DEMAND ASSESSMENT .....                                | 45        |
| 3.7 MAJOR PROJECT COMPONENTS .....                                 | 46        |
| 3.8 O&M FRAMEWORK .....                                            | 50        |
| 3.9 CAPEX & OPEX ASSESSMENT .....                                  | 50        |
| 3.10 CHECKLIST FOR MANDATORY DELIVERABLES. ....                    | 51        |
| <b>Chapter 4: Water Supply .....</b>                               | <b>53</b> |
| 4.1 ABOUT THIS CHAPTER: .....                                      | 54        |
| 4.2 CONCEPT NOTE: .....                                            | 54        |
| 4.3 DESIGN BASIS .....                                             | 55        |
| 4.4 SERVICE LEVEL BENCHMARKS .....                                 | 58        |
| 4.5 ADOPTED DESIGN STANDARDS & NORMS .....                         | 58        |
| 4.6 WATER DEMAND ASSESSMENT .....                                  | 61        |
| 4.7 MAJOR PROJECT COMPONENTS .....                                 | 65        |
| 4.8 O&M FRAMEWORK .....                                            | 69        |
| 4.9 CAPEX & OPEX ASSESSMENT .....                                  | 70        |
| 4.10 CHECKLIST FOR MANDATORY DELIVERABLES. ....                    | 70        |
| <b>Chapter 5: Sewerage &amp; Industrial Effluent System .....</b>  | <b>73</b> |
| 5.1 ABOUT THIS CHAPTER: .....                                      | 74        |
| 5.2 CONCEPT NOTE: .....                                            | 74        |
| 5.3 DESIGN BASIS .....                                             | 75        |
| 5.4 SERVICE LEVEL BENCHMARKS .....                                 | 81        |
| 5.5 ADOPTED DESIGN STANDARDS & NORMS .....                         | 83        |
| 5.6 DESIGN OF MAJOR PROJECT COMPONENTS .....                       | 86        |
| 5.7 O&M FRAMEWORK .....                                            | 94        |
| 5.8 CAPEX & OPEX ASSESSMENT .....                                  | 95        |
| 5.9 CHECKLIST FOR MANDATORY DELIVERABLES. ....                     | 96        |

|                                                               |            |
|---------------------------------------------------------------|------------|
| <b>Chapter 6: Drainage &amp; Storm Water Management.....</b>  | <b>98</b>  |
| 6.1 ABOUT THIS CHAPTER: .....                                 | 99         |
| 6.2 CONCEPT NOTE: .....                                       | 99         |
| 6.3 DESIGN BASIS .....                                        | 100        |
| 6.4 SERVICE LEVEL BENCHMARKS .....                            | 105        |
| 6.5 ADOPTED DESIGN STANDARDS & NORMS .....                    | 106        |
| 6.6 DESIGN OF MAJOR PROJECT COMPONENTS .....                  | 109        |
| 6.7 PROJECT COST ESTIMATION & LIFECYCLE O&M ASSESSMENT: ..... | 115        |
| 6.8 CHECKLIST FOR MANDATORY DELIVERABLES. ....                | 116        |
| <b>Chapter 7: Solid Waste Management.....</b>                 | <b>119</b> |
| 7.1 ABOUT THIS CHAPTER: .....                                 | 120        |
| 7.2 CONCEPT NOTE: .....                                       | 120        |
| 7.3 DESIGN BASIS .....                                        | 122        |
| 7.4 SERVICE LEVEL BENCHMARKS .....                            | 123        |
| 7.5 ADOPTED DESIGN STANDARDS & NORMS .....                    | 124        |
| 7.6 WASTE GENERATION ASSESSMENT .....                         | 125        |
| 7.7 MAJOR PROJECT COMPONENTS.....                             | 130        |
| 7.8 O&M FRAMEWORK .....                                       | 139        |
| 7.9 CAPEX & OPEX ASSESSMENT .....                             | 140        |
| 7.10 CHECKLIST FOR MANDATORY DELIVERABLES. ....               | 141        |
| <b>Chapter 8: Environment Guidelines.....</b>                 | <b>142</b> |
| 8.1 BACKGROUND - ENVIRONMENT FRAMEWORK .....                  | 143        |
| 8.2 ENVIRONMENTAL CLEARANCE .....                             | 143        |
| 8.3 CLASSIFICATION OF EC APPLICATION .....                    | 144        |
| 8.4 STEPS INVOLVED IN THE EC PROCESS ARE AS UNDER: .....      | 144        |
| 8.5 ADVERTISEMENT OF GRANT OF ENVIRONMENTAL CLEARANCE .....   | 145        |
| 8.6 STATUTORY COMPLIANCE .....                                | 146        |
| 8.7 STATUTORY OBLIGATION STIPULATED UNDER EC .....            | 146        |
| 8.8 APPLICABLE LEGAL & POLICY FRAMEWORK.....                  | 147        |
| <b>Chapter 9: Power System.....</b>                           | <b>151</b> |
| 9.1 ABOUT THIS CHAPTER: .....                                 | 152        |
| 9.2 CONCEPT NOTE: .....                                       | 152        |
| 9.3 DESIGN BASIS .....                                        | 153        |
| 9.4 SERVICE LEVEL BENCHMARKS .....                            | 155        |
| 9.5 ADOPTED DESIGN STANDARDS & NORMS .....                    | 155        |
| 9.6 POWER DEMAND ASSESSMENT .....                             | 156        |
| 9.7 MAJOR PROJECT COMPONENTS.....                             | 158        |
| 9.8 O&M FRAMEWORK .....                                       | 159        |
| 9.9 CAPEX & OPEX ASSESSMENT .....                             | 159        |
| 9.10 CHECKLIST FOR MANDATORY DELIVERABLES. ....               | 161        |
| <b>Chapter 10: ICT Infrastructure .....</b>                   | <b>162</b> |
| 10.1 INTRODUCTION .....                                       | 163        |
| 10.2 ICT VISION & OBJECTIVES.....                             | 163        |
| 10.3 ICT MASTER PLANNING APPROACH .....                       | 165        |
| 10.4 PASSIVE ICT INFRASTRUCTURE .....                         | 166        |
| 10.5 ACTIVE ICT INFRASTRUCTURE .....                          | 168        |
| 10.6 INTEGRATED COMMAND & CONTROL CENTRE (ICCC) .....         | 170        |
| 10.7 DATA CENTRE & DISASTER RECOVERY INFRASTRUCTURE .....     | 171        |

|                                                                     |            |
|---------------------------------------------------------------------|------------|
| 10.8 SMART SURVEILLANCE SYSTEM .....                                | 172        |
| 10.9 ACCESS CONTROL & VISITOR MANAGEMENT SYSTEM .....               | 174        |
| 10.10 SMART PARKING MANAGEMENT SYSTEM .....                         | 175        |
| 10.11 SMART UTILITY METERING & SCADA.....                           | 175        |
| 10.12 BUILDING MANAGEMENT SYSTEM (BMS) INTEGRATION .....            | 176        |
| 10.13 ENVIRONMENTAL MONITORING SYSTEM.....                          | 177        |
| 10.14 PUBLIC WI-FI INFRASTRUCTURE .....                             | 177        |
| 10.15 CYBERSECURITY FRAMEWORK.....                                  | 178        |
| 10.16 SMART POLES & IOT INFRASTRUCTURE.....                         | 179        |
| 10.17 GIS & DIGITAL TWIN READINESS.....                             | 180        |
| 10.18 AI-BASED ANALYTICS READINESS .....                            | 180        |
| 10.19 SUSTAINABILITY & GREEN ICT .....                              | 181        |
| 10.20 STANDARDS & COMPLIANCE FRAMEWORK.....                         | 182        |
| 10.21 IMPLEMENTATION PHASING .....                                  | 183        |
| 10.22 O&M FRAMEWORK AND SERVICE LEVEL AGREEMENTS .....              | 184        |
| <b>Chapter 11: Project Financing &amp; Implementation.....</b>      | <b>185</b> |
| 11.1 IMPLEMENTATION STRATEGY & EXECUTION FRAMEWORK .....            | 186        |
| 11.2 IMPLEMENTATION MECHANISMS & PHASING .....                      | 186        |
| 11.3 COST ESTIMATES, REVENUE GENERATION AND FUNDING MECHANISM ..... | 187        |
| 11.4 PROJECT COST ESTIMATES.....                                    | 187        |
| <b>Annexure 1.....</b>                                              | <b>205</b> |
| <b>ANNEXURE 2.....</b>                                              | <b>207</b> |
| <b>Annexure 3.....</b>                                              | <b>221</b> |
| <b>Annexure 4.....</b>                                              | <b>222</b> |
| <b>Annexure 5.....</b>                                              | <b>223</b> |

---

## Chapter 1: Introduction

---

## 1.1 Introduction

BHAVYA Scheme (Bharat Audyogik Vikas Yojna) is a Government of India initiative implemented through the National Industrial Corridor Development Corporation (NICDC) for the development of next-generation plug-and-play industrial parks across the country. Aligned with national programmes such as *Make in India*, *PM GatiShakti*, *Atmanirbhar Bharat*, and the National Industrial Corridor Development Programme (NICDP), the scheme aims to create globally competitive manufacturing ecosystems supported by integrated physical, digital, social, and environmental infrastructure. The scheme promotes investment-ready industrial regions with multimodal connectivity, smart infrastructure systems, sustainable planning principles, and ease of doing business to enhance industrial growth, employment generation, logistics efficiency, and regional economic development.

BHAVYA Scheme has been conceived as a Central Sector Scheme for the development of approximately 100 world-class industrial parks with plug-and-play infrastructure capable of supporting manufacturing, logistics, warehousing, MSMEs, and associated industrial activities. The scheme operationalizes the vision of transforming India into a globally competitive manufacturing hub through integrated industrial infrastructure, logistics connectivity, urban ecosystems, and supply chain integration.

The scheme emphasizes:

- Development of investment-ready industrial parks with integrated infrastructure.
- Adoption of PM GatiShakti principles for multimodal connectivity and logistics efficiency.
- Provision of core, value-added, and social infrastructure.
- Promotion of sustainable, resilient, and smart industrial ecosystems.
- Enhancement of ease of doing business through streamlined approvals and investor-friendly frameworks; and
- Development of future-ready industrial ecosystems through integrated planning, digital infrastructure, and efficient governance mechanisms.

Under BHAVYA framework, industrial parks are envisaged as integrated economic growth centres incorporating industrial infrastructure, environmental safeguards, smart utility systems, worker-centric urban amenities, and sustainable planning principles to support long-term industrial competitiveness and regional development.

## 1.2 Need for the Guidebook:

To ensure consistency, technical robustness, and implementation readiness across all proposed industrial parks, this DPR Guidance Document has been prepared as a comprehensive framework for the preparation of Master Plans and Detailed Project

Reports (DPRs) under BHAVYA Scheme. It serves as a common reference for State Governments, consultants, Special Purpose Vehicles (SPVs), and implementing agencies to prepare technically sound, investment-ready, sustainable, and regulation-compliant industrial development proposals.

Specifically, the guidebook is intended to:

- Establish planning principles, development strategies, and infrastructure design criteria for integrated industrial parks and manufacturing clusters.
- Provide guidance on infrastructure demand assessment, engineering methodologies, utility planning, and spatial planning approaches.
- Define mandatory Service Level Benchmarks (SLBs), statutory clearances, environmental safeguards, and regulatory compliance requirements.
- Standardize the preparation of technical studies, engineering drawings, DPR components, financial assessments, and implementation strategies.
- Facilitate the development of resilient, climate-responsive, and resource-efficient industrial ecosystems.
- Support the creation of smart and digitally enabled industrial infrastructure incorporating ICT, SCADA, IoT, ICCC, and Digital Twin readiness.
- Enable transformation of fragmented land parcels into cohesive industrial growth centres through integrated master planning and phased implementation strategies.

### **1.3 How to Read the Guidebook**

The guidebook is organized into thematic and sector-specific chapters covering major planning and infrastructure domains. To ensure consistency in interpretation and preparation of DPRs, each chapter follows a structured format comprising the following components:

#### **1.3.1 Purpose**

Defines the objective, planning intent, and expected outcomes of the respective infrastructure or planning sector. This section clarifies the deliverables and performance expectations to be demonstrated within the DPR.

#### **1.3.2 Required Project Components**

Identifies the mandatory infrastructure elements, planning components, engineering studies, surveys, and design requirements that must be included in the project formulation process.

### **1.3.3 Methods, Standards, Sources, and References**

Specifies the applicable national and international standards, guidelines, manuals, codes, and reference frameworks to be adopted during planning and design. These may include IRC, CPHEEO, BIS, MoEF&CC guidelines, CEA standards, PM GatiShakti principles and relevant State regulations.

### **1.3.4 Planning and Design Methodology**

Provides guidance on analytical methods, assessment procedures, design approaches, modelling techniques, and planning methodologies to be adopted during preparation of the Master Plan and DPR.

### **1.3.5 Deliverables, Formats, and Design Checks**

Provides indicative templates, schedules, checklists, calculations, drawings, and design validation requirements to ensure completeness, consistency, and technical quality of DPR submissions.

## **1.4 Guidebook Approach:**

The guidebook shall be interpreted as an integrated planning and engineering framework in which all infrastructure sectors are interconnected and collectively contribute to the development of sustainable, efficient, resilient, and investment-ready industrial ecosystems.

The preparation of industrial park Master Plans and DPRs requires a balanced integration of engineering systems with socio-economic, environmental, financial, institutional, and governance considerations. Accordingly, this guidebook incorporates both technical and non-technical aspects essential for holistic and comprehensive industrial infrastructure development.

The guidebook promotes:

- Efficient project execution and phasing.
- Financial viability and funding readiness.
- Statutory and environmental compliance.
- Infrastructure integration and utility coordination.
- Monitoring and governance mechanisms; and
- Long-term operation and maintenance planning.

The framework established through this guidebook is intended to support the development of high-quality industrial infrastructure aligned with national industrial development objectives, global manufacturing standards, and sustainable urban-industrial growth principles.

## **1.5 Disclaimer**

This document is intended to serve as an indicative framework for preparation of the Detailed Project Report (DPR) for the proposed scheme/project. The Consultant/Agency shall suitably incorporate all project-specific, site-specific, and area-specific requirements, investigations, studies, designs, approvals, and statutory provisions as necessary for the respective project.

The DPR shall be prepared in accordance with the latest applicable codes, standards, guidelines, and statutory requirements issued by relevant authorities. In case of any discrepancy, the applicable statutory provisions and approved standards shall prevail. The responsibility for completeness, accuracy, adequacy, and technical soundness of the DPR shall solely rest with the PMNC/Agency preparing the DPR.

---

## Chapter 2 Master Planning

---

## **2.1 Introduction**

Master Planning forms the foundation of the DPR by converting the approved Master Plan layout into implementable, market-responsive and phase-wise development components.

This chapter establishes the planning framework for preparation of the Industrial Park Master Plan by defining the project context, development vision, regional setting, existing site conditions, and planning considerations. The chapter provides an understanding of the strategic importance of the project area, its regional connectivity, physical characteristics, land availability, infrastructure context, and development potential to support preparation of integrated and sustainable development proposals.

### **2.1.1 Background**

Master planning ensures that industrial development is undertaken in a sustainable and organised manner, minimizing risks to natural resources, the environment, biodiversity, climate resilience and surrounding communities, while maintaining adequate provisions for infrastructure, traffic management, waste and wastewater systems, buffer zones, worker amenities and eco-efficient mobility. A well-planned industrial area promotes economic efficiency, environmental quality, social well-being, operational efficiency, reduced compliance risks, and improved public and market perception.

This section outlines the project context, institutional framework, and administrative background associated with the development of the industrial node. It establishes the strategic significance of the project within regional and national industrial and infrastructure development initiatives.

The section shall include:

- Details of the project location, planning area, and development intent.
- Identification of the nodal agencies, implementing authorities, and stakeholder institutions involved in project development and implementation.
- Reference to relevant industrial corridors, economic zones, infrastructure programs, and regional development initiatives associated with the project.
- Key administrative and planning milestones including project initiation, stakeholder consultations, surveys, and planning studies undertaken during DPR preparation.

## 2.1.2 Planning Process

It is also pertinent to understand and follow the required planning processes in order to develop the site master plan for industrial areas. State Town & Country Planning Acts and Urban and Regional Development Plan Formulation and Implementation Guidelines (URDPFI) should be used in order to design and develop any spatial plans in the urban/regional context. The same processes should be followed while preparing sustainable site master plans of new industrial areas or for retrofitting any existing areas.

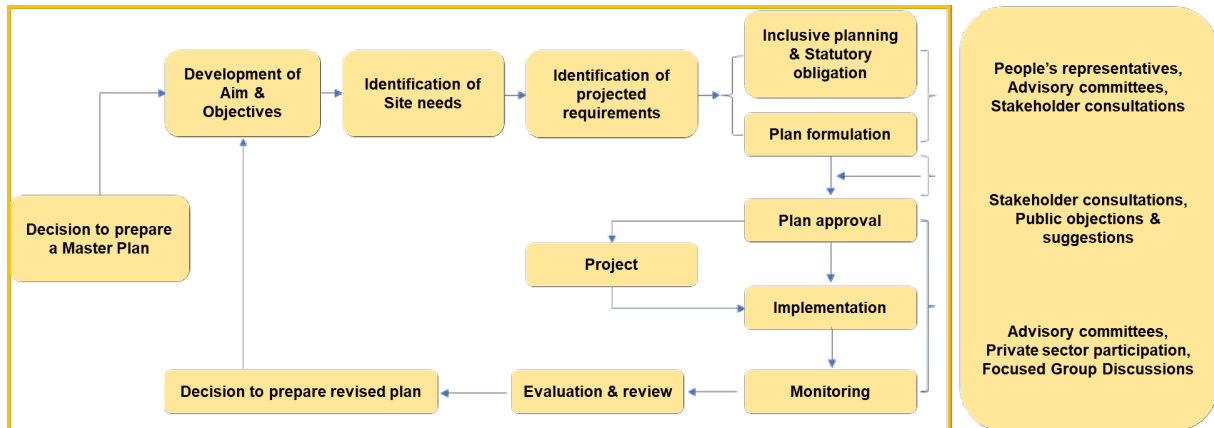


Figure 2.1: Planning Process

## 2.2 Methodology of Planning

The preparation of the Master Plan for Industrial Park shall be undertaken through a phased and structured approach to establish a comprehensive spatial, physical, environmental and socio-economic development framework for sustainable development. The study shall include assessment of existing conditions, growth trends, infrastructure requirements, investment potential, and development opportunities through spatial analysis, field investigations, stakeholder consultations, and data-driven planning approaches.

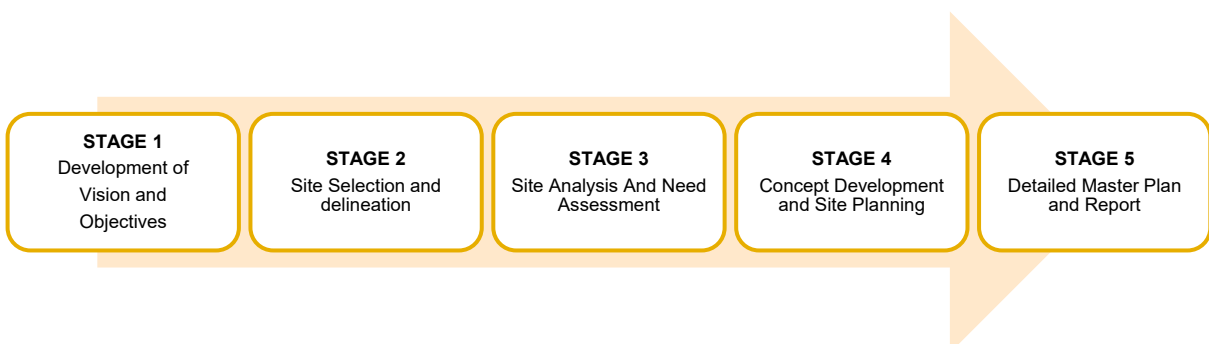


Figure 2.2: Methodology of Planning

## **Stage 1: Vision & Development Framework**

It is essential to define the overall development vision for the industrial area at the very beginning of the project so that its requirements can be addressed in a more organized, planned, and sustainable manner. While preparing the vision and objectives for the industrial area, key questions must be answered, such as what types of industries will be accommodated, how the zones will be structured, and what expectations the different stakeholders may have.

Since the main purpose of any industrial area is to support and strengthen the economic development of the region, the planning process should also focus on achieving the following targets:

- Total investments
- Tax revenues for the government
- Total employment generation
- Employment opportunities for local residents

A master plan is a long-term blueprint outlining specific proposals for how an area should develop. The vision is the central guiding principle of the entire plan, formulated from understanding the local context, benchmarking studies, and aspirational goals. The formulation of the vision, objectives and spatial approach is a critical phase that sets the long-term direction for the Industrial Park.

Define the Planning Approach Considering that a Master plan is a macro-level, long-term plan, the following approaches must be integrated into the framework:

- Robust Framework Approach: A flexible block-concept approach that adapts to changing market trends and technologies, ensuring plots can be amalgamated or sub-divided without disrupting the core road/utility structure.
- Sustainable Framework Approach: An approach prioritizing the "Live-Work-Play" concept, mitigating environmental impacts through Eco-models, green buffers, and preserving natural terrain.
- Implementable Approach: The plan must be realistic, featuring clear phasing, actionable projects, and distinct Development Control Regulations (DCRs) to ensure "Ease of Doing Business".

## **Stage 2: Site selection and delineation**

As per the development requirements of the proposed industrial area, suitable sites should be identified. A detailed site analysis should be carried out to examine the physical characteristics of each site, covering aspects such as topography, drainage, soil quality, meteorology, hydro-geomorphology, and other relevant parameters.

Before final selection and delineation/acquisition, the shortlisted site should undergo an Environmental Impact Assessment (EIA) in accordance with the provisions of the Environment (Protection) Act, 1986 and the rules framed thereunder. Conducting an EIA is also recommended for smaller sites, even where the provisions of the Environment (Protection) Act, 1986 and related rules may not be mandatorily applicable.

The planning boundary shall be delineated based on a comprehensive assessment of regional connectivity, economic linkages, infrastructure networks, environmental conditions, settlement patterns, and development potential. The delineation process shall establish a balanced planning framework that supports industrial growth, logistics integration, sustainable infrastructure development, and regional economic integration.

### **Stage 3: Site Analysis and Need Assessment**

A comprehensive assessment of the project area is required to understand its physical, environmental, infrastructure, socio-economic, and planning characteristics before preparing the industrial park master plan. This stage helps determine the development potential of the site, identify constraints, define infrastructure requirements, and ensure that future planning is aligned with sustainability standards.

The assessment should begin with the **delineation of the planning boundary**, considering administrative limits, revenue records, regional industrial influence, logistics corridors, connectivity, natural features, and future expansion potential. This ensures that the planning area is logically defined and suitable for long-term industrial development.

A GIS-based base map should be prepared by integrating satellite or UAV imagery, cadastral maps, transport networks, utility infrastructure, settlements, administrative boundaries, and environmental features. This provides a reliable spatial foundation for analysing the site and preparing development proposals.

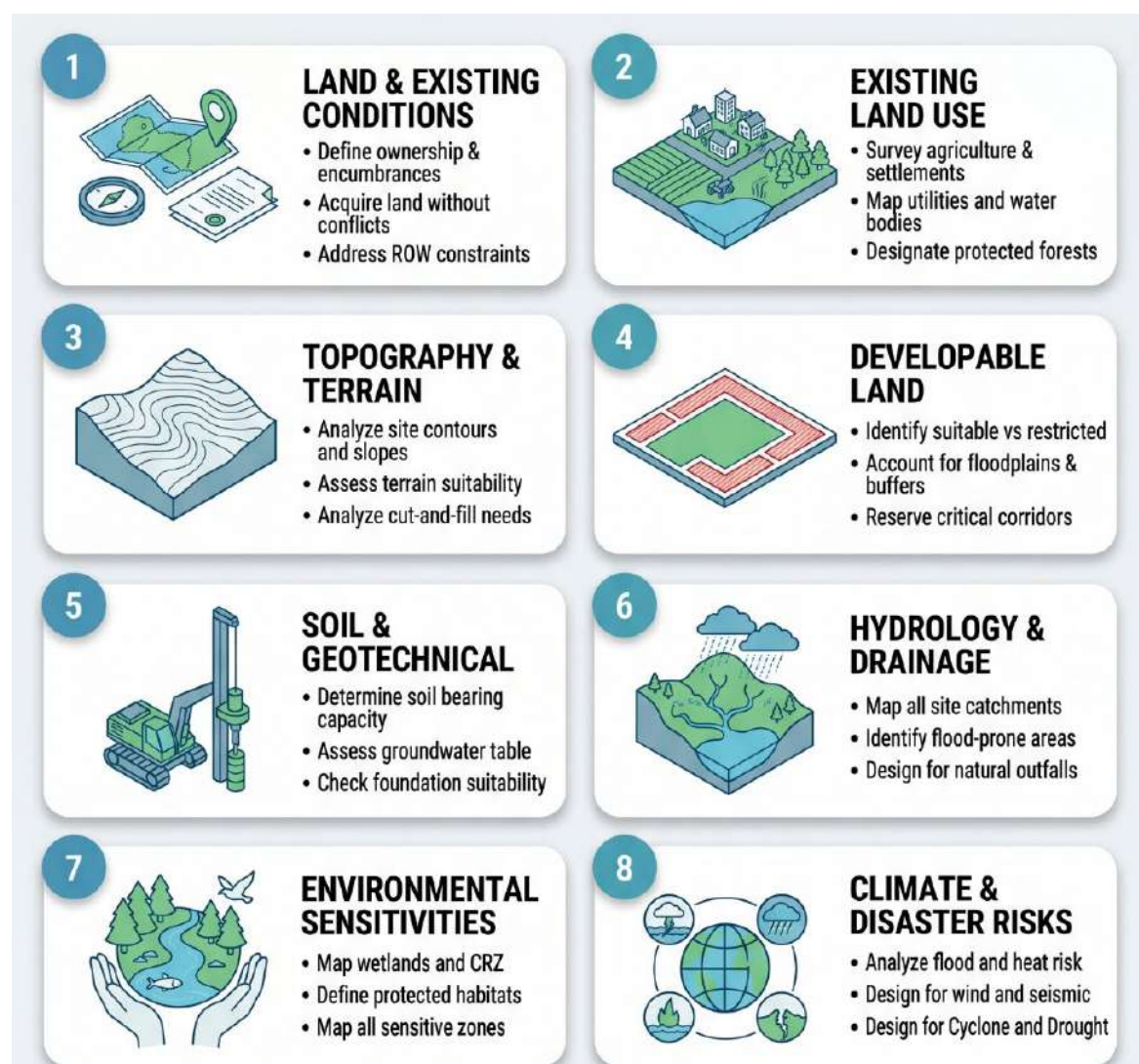
The physical and environmental features of the site should be carefully examined, including topography for hilly and non-hilly areas, slope, drainage, hydrology, natural features, soil conditions, floodplains, wetlands, water bodies, drainage corridors, geological stability, CRZ restrictions, protected areas, utility easements, and statutory buffers. This helps identify **developable and non-developable areas**, protect environmentally sensitive zones and integrate natural systems into the planning framework.

The analysis of topography and slope helps determine land suitability for infrastructure and industrial development. Gentle slopes may be suitable for development, while steep or unstable terrain may require conservation, slope protection, or restricted

development. Similarly, drainage and hydrology studies help identify natural water flow, flood-prone areas, recharge zones, and drainage constraints, which are critical for stormwater management and flood-resilient infrastructure planning.

The assessment should also document natural and ecological features such as forests, vegetation, agricultural land, water bodies, rocky outcrops, biodiversity zones, protected forests, wetlands, wildlife corridors, and conservation buffers. This ensures that environmentally sensitive planning principles are adopted and ecological impacts are minimized.

In addition, the assessment should review existing land use, industrial activities, infrastructure systems, environmental conditions, socio-economic characteristics, workforce profile, housing demand, and development trends through surveys, secondary data, stakeholder consultations, and spatial analysis. This helps understand both the current situation and future development needs of the industrial area.



Scenario building, population estimation, and area requirement assessment help determine the future development needs of the industrial park. Economic trend analysis and market demand assessment are used to identify target industries and prepare different growth scenarios, such as base case and high-growth case. These scenarios help estimate industrial land demand, land absorption, infrastructure needs, and revenue potential.

Population trend and area estimation support the planning of housing, utilities, amenities, transport, and social infrastructure based on projected workforce, demographic patterns, and trip generation. This ensures that the master plan is not limited to industrial land allocation alone but also addresses the supporting residential and infrastructure requirements.

This directly correlates with industrial park planning as it provides a demand-based foundation for deciding land use, infrastructure sizing, service provision, and phased development, thereby ensuring balanced, sustainable, and economically viable industrial growth.

#### Regional Context & Connectivity

This section evaluates the strategic geographic positioning of the site and its integration into wider economic and transportation networks.

- **Macro Location:** Define the site's position relative to major economic corridors and metropolitan areas.
- **Trunk Infrastructure:** Map the site's direct external linkages. Detail the specific national and state highways providing access.
- **Multi-modal Logistics:** Provide distances to critical transit hubs, such as the nearest railway stations, adjacent airports and regional seaports for freight export.
- The proposed industrial park to be assessed within its wider regional context, including surrounding economic corridors, industrial clusters, logistics networks, urban settlements, labour markets, raw material sources, and utility systems. The assessment shall identify existing and proposed connectivity to highways, expressways, railway lines, ports, airports, inland container depots, multimodal logistics parks, freight corridors, power grid infrastructure, water sources, gas pipelines and digital networks.
- The PM Gati Shakti National Master Plan Portal should be used to examine existing and proposed multimodal infrastructure, such as Rail siding, Sea port, ICD, MMLP, etc., and identify missing links, assess planned projects, and support coordinated infrastructure augmentation. Findings from the portal to be cross-verified with field surveys, satellite imagery, state agency data, utility providers and stakeholder consultations.
- External infrastructure interventions should be identified to make the industrial park operational and investment ready. Each intervention to be mapped with

concerned implementing agency, estimated cost, timeline, approval requirement & project dependency.

#### **Stage 4: Concept Development and Site Planning**

The formulation of schematic or conceptual proposals serves as a blueprint for transforming fragmented land parcels into cohesive urban areas. It translates the findings from the existing situation analysis and the vision into tangible master plan options.

Planning and design considerations are to be elaborated. This covers the following aspects:

- i) Zoning concepts with division of different industrial uses and facilities,
- ii) Area programme with proposed land use distributions, provisions for infrastructure etc.
- iii) Measures for compliance with development controls/ bye-laws
- iv) Thematic maps/layers of – land use plan, zoning plan, traffic and transportation plan, areas and open spaces, infrastructure- social, technical, environmental
- v) Usually, several different design concepts as 2D concepts or better as 3D visualizations of- road cross- sections, road avenues, integration of rain water harvesting in landscaped areas, entrance zones, landmarks, signage, public spaces, bus stops, shelters/health posts and social infrastructure, etc. are required to figure out the optimum layout of the industrial area.

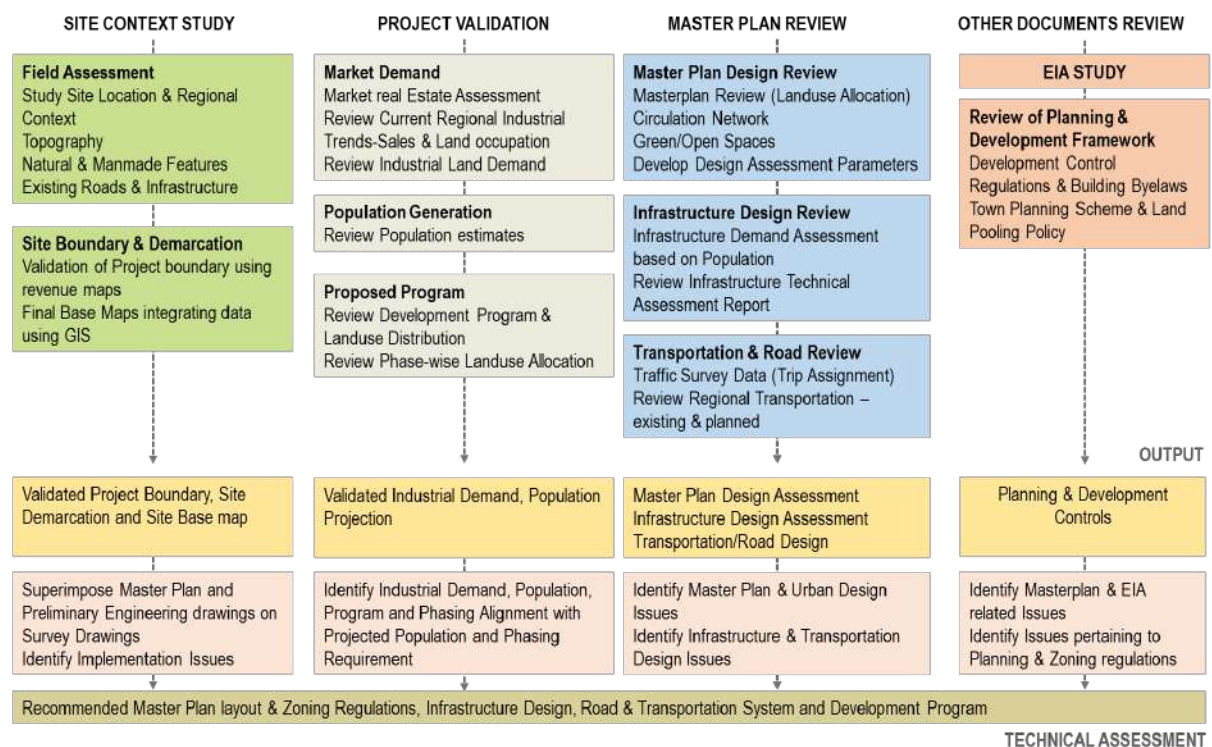
The Site Master Plan is prepared as a comprehensive document that can guide the development of the Industrial Park. The key contents of the report are:

- Overview – location, total area of the site, expected number of industries, expected number of service-related industries supporting the main industry, project cost, expected employment generation, targeted investments etc.
- Land use break-up of the site, assignment of specific functions to individual areas.
- Designation of areas/sites for industries according to types and relative environmental impact etc. Elaboration of permissible industries and restricted industries.
- Basic infrastructure (road network, electricity, water supply, gas, eco–friendly transportation, security, fencing, fire and disaster management etc.).
- Technical infrastructure (green factory buildings, renewable energy/energy efficiency provisions, business centre, warehouses, training centre, design centre, incubators etc.).
- Environmental infrastructure (storm water drainage (separate from wastewater network), sewerage/wastewater conveyance, wastewater treatment and

disposal facilities, solid waste management facilities, green/open spaces/ landscapes, environmental monitoring, etc.).

- Social infrastructure (food and beverages facilities, training/entrepreneurship development facilities, recreational facilities, gender specific infrastructure – provisions for women employees, barrier free infrastructure to enable people with disabilities, guest house, public toilets, health centre etc.
- Management structures for developing the industrial area and operating the infrastructure and services.
- Design concepts and visualisations (2D/3D drawings) of the features suggested in the Site Master Plan.
- Statement on compliance with applicable standards, legal requirements, criteria, guidelines, procedures etc. (including environmental considerations/criteria, “green” criteria, environmental clearances etc.).
- Use of GIS-based spatial analysis, remote sensing, thematic mapping, and participatory approaches to support evidence-based planning and proposal preparation.

Based on the comparative assessment alternative options are developed considering Specialized Clustering, Mixed-Use Zoning or the Mixed-Industry Clustering).



## Stage 5: Detailed Master Plan and Report

Detailed Master Plans are developed for Industrial Parks to designate different land uses and plan the required infrastructure. These plans serve as the foundation for the

overall development of the industrial park. Therefore, it is essential to incorporate Sustainability Standards at the planning stage.

**Step 1:** include undertaking detailed assessment of the site allocated for the industrial park. The important thematic layers to be prepared to assess the existing situation and undertake gap analysis are given below.

- i) Base map including natural and man-made features on site and in its immediate surroundings, in an appropriate scale.
- ii) Land use plan showing all the uses of the land within site as per the standards area distribution.
- iii) Zoning plan showing demarcation of zones for different industrial uses wherein units producing similar products and needing similar infrastructure are co-located in a zone and optimal block/zone size and sub-zone sizes and orientation at the site as per the site development objectives, topography and climate.
- iv) Transportation plan including road network showing hierarchies of road-widths as per the estimated passenger car units (PCU) counts, turning radii of suitable width for the commercial vehicles, typical geometric design for each road cross sections or roundabouts, standard road cross sections for all hierarchies including utility corridors (foot paths, bicycle tracks, sewage, storm water drainage, broad band lines, waste-bins, toilets, street lights etc.) where required, provision of bus stops for internal mobility of the employees and visitors from public spaces to identified zonal drop points, parking plan for commercial and domestic (motorised and non-motorised) vehicles, railways and terminal facilities, if required, pedestrian and bicycling routes and infrastructure.
- v) Stormwater management plan including stormwater drains as per natural drainage flow, rain water harvesting systems, ground water recharge systems etc.
- vi) Wastewater management plan including provisions for conveyance lines for industrial waste water effluent to CETP, contour-based location of CETP, decentralised waste water treatment systems.
- vii) Environmental infrastructure plan including provisions for waste collection, common disposal points, disposal points for hazardous waste etc., sites for composting facilities as per estimated biodegradable waste, distribution of areas, buffer zones along the site boundary, surrounding highly polluting industries and also surface water bodies, landscape design of the areas, road avenues and rain water harvesting ponds with biodiversity preservation, selection of indigenous species of flora and fauna, provisions for urban heat island mitigation and fresh air corridors, usage of green spaces for functional use with economic value, example restaurants, kiosks, horticulture, commercial plantation.
- viii) Physical infrastructure plan including provisions for power infrastructure, energy efficiency and usage of non-renewable sources of energy at industry and industrial park level.

- ix) Social infrastructure plan showing provisions for medical facilities, training facilities, specific provisions for promoting women in industrial park, child-care centres, public toilets, fire and disaster management services, canteens, driver and worker accommodation etc.
- x) Business and other specific infrastructure plan like warehouses, decentralised waste water treatment plant, steam distribution, piping racks for solvent, pipelines for treated water for reuse, high TDS & low TDS pipelines for industrial wastewater, fire hydrant lines, incubators, training centres, meeting rooms, conference halls, guest houses, weigh bridges, automobile service stations, product testing facility etc.
- xi) Mapping should preferably be done in GIS (Geographic Information System) with spatial and attribute data. This will make analysis and future updating of the maps and master plan easy.

**Step 2:** Detail out design concepts that can be used during implementation of the site master plan. 2D/3D visualisations to be provided. This includes for example:

- i) Landscaping concept
- ii) Building concept
- iii) Streetscape
- iv) Energy and renewable energy systems
- v) Infrastructure & services
- vi) Passive design - Passive design maximises the use of 'natural' sources of heating, cooling and ventilation to create comfortable conditions inside buildings. It harnesses environmental conditions such as solar radiation, cool night air and air pressure differences to drive the internal environment.
- vii) Urban design – this can make a decisive contribution to the quality and significance of buildings and industrial districts alike. Recommendations may be expressed by the Industrial Park Management paired with a fixed percentage of the construction costs to be spent for art. Local artists or design colleges in close proximity can help to maintain a high level of creativity while keeping costs low.
- viii) Design quality - design of open space / amenity, design of architecture, art on location, design of all measures that are to be implemented etc.
- ix) Unique skyline - skylines serve as unique fingerprints. A district's unique skyline, comprising buildings with different heights, designs, uses, as well as parks or mountains etc., may be of great benefit to the district by attracting tourism and thereby increasing land value and creating job opportunities.

**Step 3:** Detail out financial viability aspects and infrastructure and services delivery mechanisms for various provisions made in the site master plan.

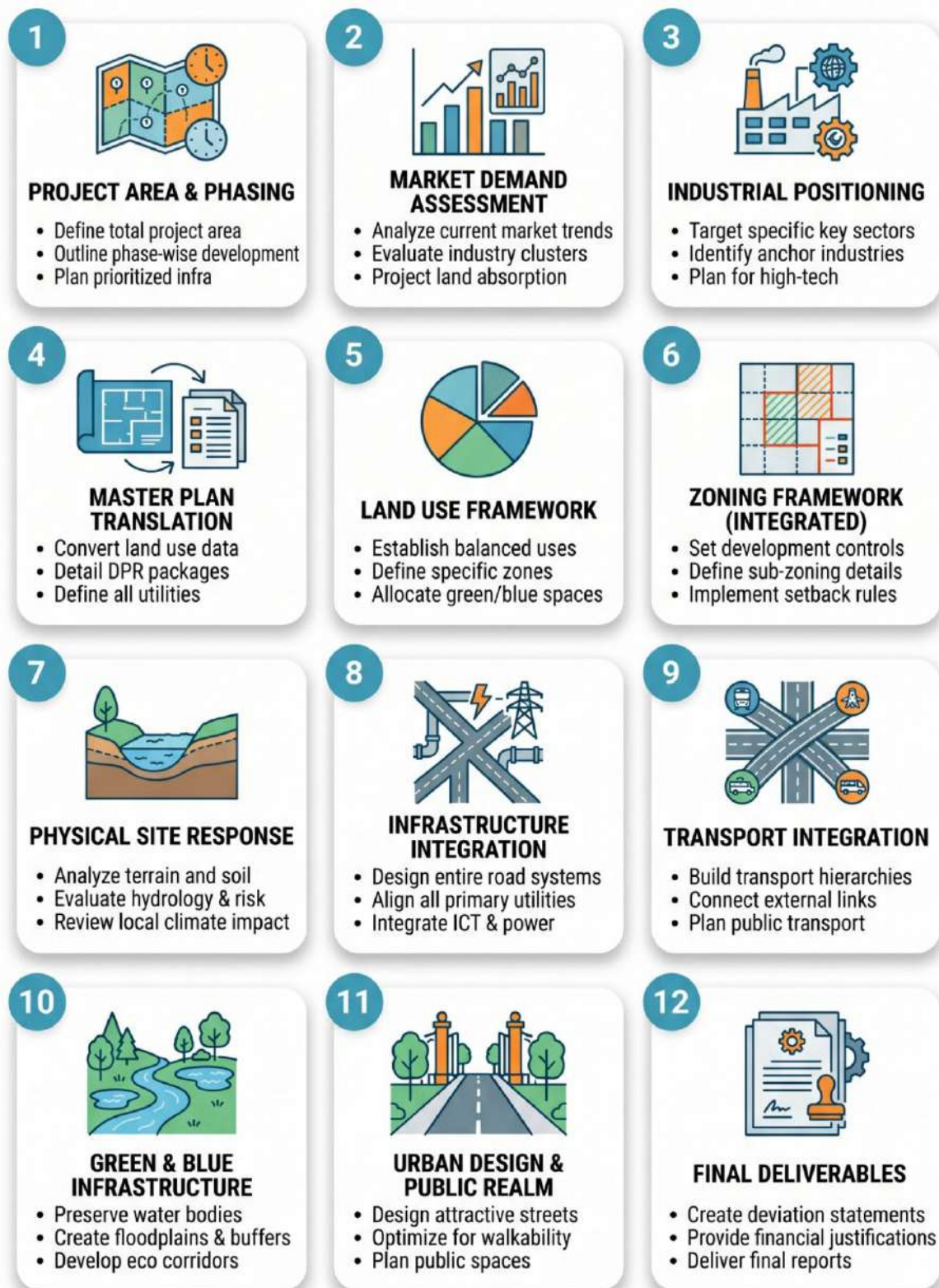


Figure 2.3: Planning Stages for the Master Planning

**Step 4:** Final Master Plan & Implementation Framework. The section presents:

- i) The finalized spatial and regulatory framework for the industrial park after incorporation of stakeholder consultations, statutory observations, environmental appraisal recommendations, and detailed engineering assessments.
- ii) The Final Master Plan establishes the approved land use structure by the authority, mobility framework, infrastructure systems, utility corridors, environmental buffers and development controls for implementation.
- iii) It forms the statutory basis for phased development, infrastructure execution, land allotment, investment promotion, and future development approvals.

**Step 5:** Submission of the Final Master Plan based on:

- i) Stakeholder consultations, public representations, environmental appraisal recommendations, and technical review observations. The planning process should integrate concerns related to environmental protection, mobility efficiency, social impact, infrastructure feasibility, and regulatory compliance.
- ii) The final planning structure should also incorporate modifications arising from detailed topographical studies, engineering assessments, environmental scoping, and statutory requirements to ensure technical viability and implementation readiness.

### **2.3 Market Demand and Industrial Positioning**

One needs to carry out market demand assessment to ensure that the industrial park is aligned with actual investor demand, regional competitiveness, and feasible industrial sectors. The assessment shall examine regional industrial trends, existing industrial clusters, land absorption patterns, investor enquiries, competing industrial parks, sectoral growth prospects, logistics advantages, labour availability, raw material linkages, supply-chain ecosystems and applicable policy incentives.

Based on this assessment, the target sectors and positioning strategy for the industrial park to be defined. Sector selection shall be guided by market demand, site suitability, infrastructure requirements, environmental compatibility, utility intensity, logistics needs, workforce availability and investor potential.

A demand-led industrial development framework shall be adopted, where each industrial zone is supported by clear sector rationale, infrastructure requirement, plot-size logic, market absorption potential, and implementation priority.

### 2.3.1. Methodology

The demand for industrial land within the proposed Industrial Park to be carried out through a blend of statistical projection of historic industrial investments and on-ground validation of demand. The demand framework has been depicted in Figure below:



*Figure 2.4: Demand Analysis Methodology*

#### **Task 1: Review of regional economic scenario and**

Review of industrial ecosystem in the region to understand the regional context and its importance in term of spatial, functional and economic linkages for future development and implementation of Industrial Park;

#### **Task 2: Market and Demand Assessment**

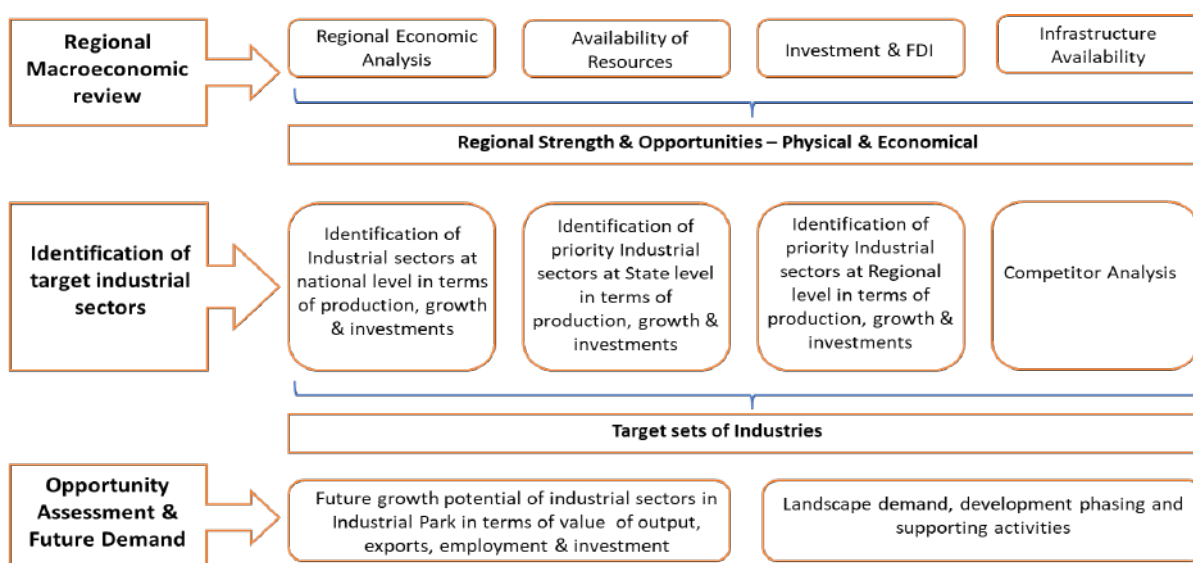
- Review the Macro-economic and manufacturing landscape of the region which provides snapshot of State's GDP and the development of the manufacturing sector. This helps to understand the information related to economic sectors, demand supply scenario of the proposed industrial product mix and its market perspective;
- Evaluate the locational suitability and inherent attractiveness of the proposed industries at the proposed site;
- Validate the findings of the demand assessment and the proposed product mix in terms of industries and supporting activities;

- Carry out a focused market survey and demand assessment specific to the proposed IA.
- Prioritization of industries for the proposed development;
- Derive the preferred development format based on prioritization, industry attractiveness and regulatory framework.
- Evaluate the industrial positioning to fit in the overall national framework of industrial development and supply-chain framework.

### Task 3: Benchmarking Studies

Identification of suitable and comparable case studies with regard to Industrial Parks with a view:

- To understand parallel and current practices on Industrial Parks of similar scale in India and Internationally,
- To understand product mix, master planning, land procurement, implementation mechanism, designing and engineering of similar manufacturing clusters, and
- To understand relevance of green development and Sustainable Industrial Park in context of proposed project.



#### 2.3.2. Framework for Market Assessment and Critical Gap Assessment

The suitable and optimal industry/product mix for the proposed Industrial Park to be derived keeping in perspective the State, District and local industrial strengths as well as Indian industrial sectorial growth and vision. Growth sectors under Make in India and State Industrial Policy are also explored to understand the suitability of some of the sunshine sectors that may possibly come up in region.

### a) Market Demand Assessment

Deriving an optimal industrial product mix for Industrial Park is done by identification of prominent industry groups at National and State level, which may be carried out by prioritizing the industries based on the parameters as shown in the figure below.

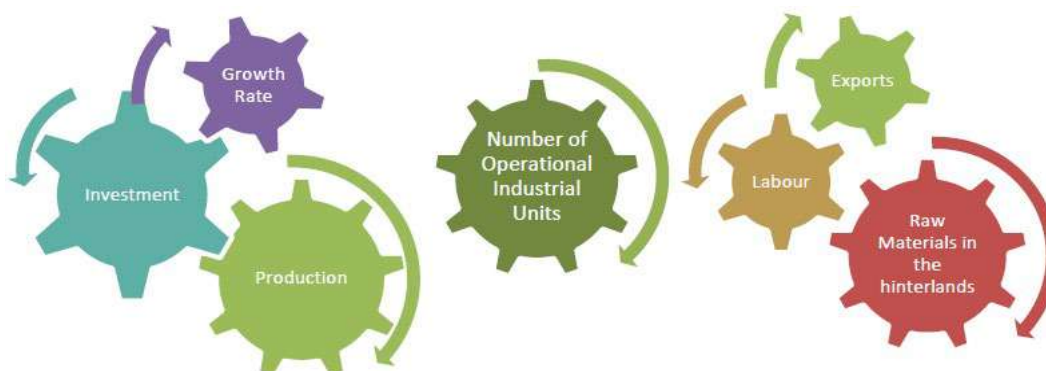


Figure 2.5 Parameters for Industrial prioritization

### b) Identification of Priority Industrial Sectors

The figure below depicts the methodology and the various parameters to be considered for identification of Priority Industrial Sectors at National, State and Regional level.

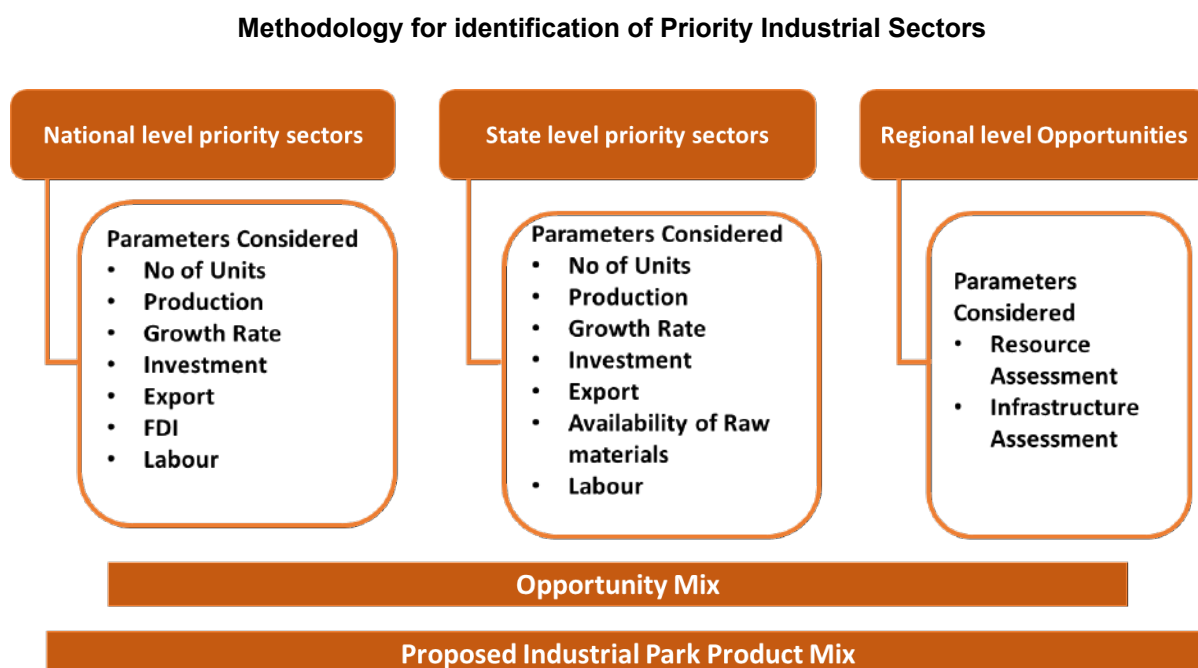


Figure 2.6 Methodology for identification of Priority Industrial Sectors

## 2.4 Technical Aspects of the Master Plan

### 2.4.1 Final Land Use & Zoning Plan

The Final Land Use Plan establishes the approved zoning structure and exact spatial demarcation of all development components within the project area. The framework defines finalized allocation of industrial, residential, commercial, institutional, utility, transportation, and recreational land uses based on planning standards and development objectives.

The zoning structure should ensure compatibility between land uses, operational efficiency, environmental compliance, and long-term development flexibility while preserving natural features, ecological corridors, drainage systems, and mandatory buffer zones.

*Table 2.1: Indicative Land Use Distribution*

| Land Use Category                       | Developable Area (%) | Primary Function                                      |
|-----------------------------------------|----------------------|-------------------------------------------------------|
| <b>Industrial</b>                       | 40% – 60%            | Manufacturing, and industrial activities              |
| <b>Residential</b>                      | 2% – 3%              | Workforce housing and residential development         |
| <b>Commercial</b>                       | 3% – 4%              | Retail, offices and business support services         |
| <b>Public / Semi-Public</b>             | 2% – 3%              | Institutional, healthcare and educational facilities  |
| <b>Transport &amp; Communication</b>    | 10% – 12%            | Road network and logistics infrastructure             |
| <b>Recreational / Open Space</b>        | 8% – 10%             | Parks, buffers and ecological greens                  |
| <b>Utilities &amp; Services</b>         | 2% – 3%              | WTP, STP, CETP and utility systems                    |
| <b>Logistics</b>                        | 3% - 5%              | Warehouse, Cold storage, Loading and Unloading space. |
| <b>Water Bodies &amp; Special Areas</b> | As Applicable        | Natural drainage and environmentally sensitive areas  |

*Source: Master Plans of Orvakal, Palakkad, Hisar*

### Key Components

- Finalized land use zoning
- Industrial classification and segregation
- Residential and mixed-use allocation
- Open space and buffer integration
- Utility and infrastructure reservations
- Transportation and logistics corridors

## 2.4.2 Provisions of Infrastructure Planning

Some of the aspects are given below as examples that should be included as part of the spatial planning exercise:

### 1) Mobility - eco efficient transportation

- a) External road linkages to nearby settlements or housing areas where from the workers/ employees will travel to the Industrial Park and to the railway station, bus station, etc.
- b) For internal mobility, provisions for bicycle tracks, adequate parking facilities, extensive pedestrian network consisting of sidewalks along roads and pathways in the green belts (greenways) have to be incorporated.
- c) Maintaining a hierarchy of vehicular road networks within the site would help in easy traffic movement. A suggestive road hierarchy is mentioned in the table below:

*Table 2.2: Road Hierarchy Planning*

|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Arterial Roads<br/>ROW of 50-80 m</b>                    | <ul style="list-style-type: none"><li>• Primary roads are designed to ensure high mobility within the industrial park, carrying the highest traffic volumes and longest trips at speeds of 50–60 km/h, with no frontage access, no vehicle standing, minimal cross-traffic, and intersection spacing of at least 500 m.</li></ul>                                                                                                             |
| <b>Sub Arterial<br/>Roads ROW of<br/>30- 50 m</b>           | <ul style="list-style-type: none"><li>• Sub-arterial roads support intra-urban through traffic with restricted carriageway access and may function as arterial roads due to their overlapping role.</li><li>• They carry similar traffic volumes, allow frontage access but no vehicle standing, handle high cross-traffic, and are designed for speeds up to 50 km/h with high-capacity intersections spaced at least 300 m apart.</li></ul> |
| <b>Distributor/<br/>Collector Roads<br/>ROW of 20- 30 m</b> | <ul style="list-style-type: none"><li>• Collector roads distribute traffic from access streets to arterial and sub-arterial roads, supporting speeds of around 30 km/h with free frontage access, no vehicle parking, heavy cross-traffic, and minimum intersection spacing of 150 m.</li></ul>                                                                                                                                               |
| <b>Access Streets<br/>ROW of 15- 30 m</b>                   | <ul style="list-style-type: none"><li>• Access roads provide direct access to adjoining properties and areas, carrying lower traffic volumes at low speeds.</li></ul>                                                                                                                                                                                                                                                                         |
| <b>Local Street ROW<br/>of 10- 20 m</b>                     | <ul style="list-style-type: none"><li>• Access streets provide free access to residences, businesses or other adjoining properties, with provisions for parking and pedestrian movement.</li></ul>                                                                                                                                                                                                                                            |

## **2) Stormwater Management**

- a) Storm water drains all across the industrial park in accordance with terrain and drainage.
- b) Decentralized storm water management system for cost effectiveness.
- c) Collection and treatment of run-off of first rains at the rate of 1-hour peak rainfall and 80% run-off coefficient to avoid any contamination risks.
- d) Ponding and integration into green landscapes.
- e) Recycle/reuse provisions for industrial, horticulture/irrigation uses.

## **3) Wastewater Management**

- a) Provisions for wastewater conveyance system in accordance with slopes and zoning of industries.
- b) Provisions for common effluent treatment plants (CETP), sewage treatment plants.
- c) Provisions for storage of treated wastewater (guard pond) and provisions for recycle/reuse.

## **4) Solid Waste Management**

- a) Provisions for collection, transportation, storage and disposal of wastes.
- b) Recycling centre for e-waste, vermi-compost plant and handmade paper plant etc.

## **5) Green/Open Spaces/ Landscapes**

- a) Central green – lungs for the Industrial area
- b) Green belts at the periphery- to act as buffer
- c) Vertical and horizontal stretches of greens spreading in the form of avenue plantation and greenways
- d) Greens at the plot level

## **6) Resource Efficiency**

- a) Provisions for rainwater harvesting recycle/reuse of water.
- b) Provisions for recycle/reuse of treated wastewater.
- c) Provisions of renewable energy & use of environment friendly materials.

### **2.4.3 Scale of a Site Master Plan**

The Site Plan, detailed Master Plan and various thematic layers of the Plans should be in appropriate scales:

- A Site Plan should be drawn at a scale of not less than 1:1000 or as per the State Regulations showing all physical details of the land, boundaries of the

land, the surrounding existing layouts/lands, and existing approach road to the land where the layout is proposed.

- Detailed Master Plan (or sometimes called as Layout Plan) should be drawn to a scale of not less than 1:500 or as per the State Regulations showing boundaries of land, proposed number of building plots with dimensions and area of each plot and its uses, alignment and width of the proposed streets/roads, dimensions and areas of open space/green areas provided, infrastructure provided etc. and all the other uses of land.
- If the plan approving authority prescribes a scale more detailed than the above, then the same should be adopted. The plans should be in digital form so that optical reductions (and not enlargement) of size of maps can be done as per requirement.

#### 2.4.4 Block-Level Planning & Plot Configuration

The Final Master Plan translates broad zoning into detailed block-level planning and plot configurations. The planning framework should organize the project area into functional development blocks that support operational efficiency, infrastructure accessibility, and phased implementation.

The industrial zones should be earmarked based on homogeneity of function of the industrial activity and their inter-relationship to get the best use of land.

Each zone should be divided into blocks of appropriate size, which can be subdivided into plots. Depending on demand for size of the plot, smaller plots could be clubbed together. Also, in the future, without changing infrastructure, the plots could be combined or sub-divided as per demands persisting then.

The plotting structure should provide flexibility for future amalgamation or subdivision of plots without affecting the primary road hierarchy, utility systems, or drainage networks. The framework should accommodate multiple industrial typologies ranging from anchor industries and logistics hubs to MSMEs and ancillary units.

*Table 2.3: Indicative Plot Configuration Standards*

| Plot Category                  | Indicative Plot Size | Primary Function                                |
|--------------------------------|----------------------|-------------------------------------------------|
| <b>Mega / Anchor Plots</b>     | 25 - 50 Acres        | Large-scale manufacturing and anchor industries |
| <b>Medium Industrial Plots</b> | 5 – 25 Acres         | Processing, assembly and logistics facilities   |
| <b>Small Industrial Plots</b>  | 1 – 5 Acres          | Light industries and vendor units               |
| <b>MSME / Micro Plots</b>      | Up to 1 Acre         | Ancillary industries and flatted factories      |

|                     |                |             |                                                 |
|---------------------|----------------|-------------|-------------------------------------------------|
| <b>Common Plots</b> | <b>Amenity</b> | As Required | Administrative and workforce support facilities |
|---------------------|----------------|-------------|-------------------------------------------------|

Source: Industrial Policies of Tamil Nadu, Gujarat, Maharashtra, Odisha and Assam

*\*The ranging on the size of given plot category should adopted based on the respective state's policy.*

## Key Components

- Block-level development structure
- Flexible and modular plotting framework
- Sector-specific industrial allocation
- Shared logistics and common amenities
- Utility accessibility and service integration
- Provision for future expansion and reconfiguration

### 2.4.5 Housing for Industrial Workers

Social infrastructure is not optional for industrial worker housing, it is an essential complement that determines whether workers stay long-term or migrate seasonally.

Housing is essential for the industrial workers in the proposed industrial parks and should be planned such that a minimum requirement is met within the industrial park though there may be Urban Agglomeration and Local Bodies in close vicinity of the proposed industrial park. The DPR shall plan and estimate the housing requirements, locate and segregate housing area for different types of housing based on the requirements of project/ worker groups. The industrial worker housing is recommended to be developed at a high density, with minimum 100 dwelling units per hectare for non-hilly states category and minimum 25 dwelling units per hectare for hilly states category using Fast Track Construction technology. The sizes for the same can be referred from the Secure, Affordable, Flexible and Efficient (S.A.F.E.) housing document.

Site planning shall strictly adhere to 'walk-to-work' and 'plug-and-play' principles to facilitate a safe ecosystem where workers can commute within a reasonable distance independently of private transport. The planned built form of the housing should be such that it reflects the local characteristics and aspirations of the people.

Depending upon the industrial park's overall area, social infrastructure facilities such as primary health care centres (PHC), community health care centres (CHC), day-care etc. may be planned. The elements of Secure, Affordable, Flexible and Efficient (S.A.F.E.) housing can be referred from the following link :-

[https://www.niti.gov.in/sites/default/files/2024-12/SAFE\\_Accommodation\\_Worker\\_Housing\\_for\\_Manufacturing\\_Growth.pdf](https://www.niti.gov.in/sites/default/files/2024-12/SAFE_Accommodation_Worker_Housing_for_Manufacturing_Growth.pdf)

## 2.5 Built to Suit (BTS) & Ready-Built Sheds (RBS)

Build-to-Suit (BTS) is a commercial real estate development model in which a property is custom-designed and constructed specifically for a single, pre-identified tenant. Unlike traditional leasing — where a business searches for available space and adapts its operations to what exists — the BTS model starts with the tenant's operational requirements and builds the facility around them.

In a BTS arrangement, a developer or investor funds and manages construction of a new facility to meet the exact specifications of a prospective or existing tenant. Upon completion, the tenant enters into a long-term lease — typically spanning 10 to 20 years — and occupies the purpose-built space without having committed upfront capital to property ownership.

The model has been used for decades as companies of all sizes seek to expand into new locations or upgrade facilities, while preserving the capital they would otherwise tie up in real estate. Today, BTS is recognized as a cornerstone of the modern industrial, logistics, retail, and healthcare real estate markets.

*Table 2.4: BTS Area Industry-wise bifurcation*

| Industry                                          | Built Up Area of Modules    |
|---------------------------------------------------|-----------------------------|
| Electrical & Electronics                          | 500 to 2,000 m <sup>2</sup> |
| Automotive Components                             |                             |
| Agricultural & Food Related Machinery & Equipment |                             |
| Textile/Apparel                                   |                             |
| Construction Material                             |                             |

Table 2.5: Pre-built BTS Factory Specifications

| Pre-Built BTS Factory Specifications |                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product Characteristics</b>       | <ul style="list-style-type: none"> <li>• Standard design pre built unit equipped with office and storage space</li> <li>• Typical Height ranging from 5 – 7 meters</li> <li>• High preference exhibited primarily by the medium scale manufacturing units</li> <li>• For higher area vertical development-Modular floor plates with provision for partitioning to accommodate 2-3 units per floor</li> </ul> |
| <b>Permitted Usage</b>               | Very Light Manufacturing, Trading & Distribution, Assembling, Packaging, Storing                                                                                                                                                                                                                                                                                                                             |
| <b>Features</b>                      | Dedicated entry & exit points, ramp for vehicles, loading docks for containers & trucks                                                                                                                                                                                                                                                                                                                      |
| <b>Utilities</b>                     | Electricity, Water and Gas connections                                                                                                                                                                                                                                                                                                                                                                       |

## 2.6 Development Control Regulations & Urban Design Framework

This chapter establishes the statutory planning controls, development regulations, and urban design guidelines governing the industrial park. It defines the framework for land use management, building permissions, environmental safeguards, mobility integration, and public realm quality to ensure orderly, safe, and sustainable urban development. The regulations are derived from applicable State Building Rules, URDPFI Guidelines, environmental norms and infrastructure standards.

The landscape strategy shall be developed in response to the site's existing landscape features and shall harmonize them with the requirements of a smart industrial development. It shall improve the natural character of the site, enhance ecological value, provide safe and inclusive green movement corridors for worker well-being and create a distinct identity through site-specific landscape features.

### 2.6.1 Planning Norms & Regulatory Framework

This section establishes the statutory and regulatory basis governing the development of the industrial park. The Development Control Regulations (DCRs) shall align with applicable State Building Rules, Industrial Area Development Regulations, URDPFI

Guidelines, IRC, and environmental regulations issued by MoEFCC and State Pollution Control Boards.

The framework ensures that all proposed developments comply with land use compatibility, fire and life safety standards, environmental safeguards, infrastructure capacities, and accessibility norms. Special provisions may also apply for hazardous industries, logistics facilities, warehousing, utilities, and high-impact industrial operations.

### Key Components

- State Building Rules/Industrial Area Development Board building rules and GDCR provisions
- URDPFI planning norms
- IRC road and mobility standards
- MoEFCC and SPCB environmental regulations
- PESO and industrial safety guidelines

## 2.6.2 Land Use Regulations & Buffer Controls

Land use regulations define the permissible and restricted activities within each planning zone to ensure compatible development patterns and environmental safety. Industrial zones shall be classified based on pollution categories such as Red, Orange, Green, and White industries, with appropriate separation from residential and public-use areas.

The regulations shall also establish mandatory buffer zones around environmentally sensitive areas, utility corridors, drainage channels, water bodies, forests, and hazardous installations. These safeguards help reduce environmental risks, maintain ecological continuity, and ensure long-term operational safety of the park.

### Key Components

- Permissible and non-permissible land uses
- Industrial zoning by pollution category
- Mixed-use and transition zone regulations
- Green belt and buffer requirements
- Utility corridor protection zones
- No Development Zones (NDZ)

*Table 2.6: Indicative Buffer & Environmental Control Norms*

| Feature Corridor | / | Utility | Minimum Requirement | Buffer | Planning Purpose |
|------------------|---|---------|---------------------|--------|------------------|
|------------------|---|---------|---------------------|--------|------------------|

|                                         |                                 |                            |
|-----------------------------------------|---------------------------------|----------------------------|
| <b>Major Water Bodies / Lakes</b>       | 30 m from FTL (Full Tank Level) | Flood protection & ecology |
| <b>Natural Drains / Streams</b>         | 5 m – 15 m                      | Drainage preservation      |
| <b>Forest / Eco-sensitive Areas</b>     | 1 Km – 10 Km                    | Ecological protection      |
| <b>Industrial–Residential Interface</b> | 15 m – 50 m Green Buffer        | Pollution mitigation       |
| <b>HT Power Corridors</b>               | 15 m - 50 m                     | Safety clearance           |
| <b>Gas / Petroleum Pipelines</b>        | 15 m – 30 m                     | Risk mitigation            |

Source: National Green tribunal, MoEFCC, CEA safety regulation, Building Byelaws of Maharashtra, Tamil Nadu, Gujarat, Odisha and Assam

*\*The Buffers of given Features should be adopted based on the National and respective state's specified guidelines.*

### 2.6.3 Urban Design Guidelines

Urban design guidelines establish the visual, spatial, and functional character of the industrial park. The objective is to create a well-structured, inclusive, and aesthetically cohesive environment that supports productivity, safety, and quality of life.

The guidelines address streetscape design, signage systems, lighting standards, landscape integration, public realm design, and universal accessibility. Emphasis is placed on walkability, climate responsiveness, shaded pedestrian environments, and consistent urban character across the park.

#### Key Components

- Streetscape and public realm design
- Universal accessibility standards
- Pedestrian-friendly infrastructure
- Landscape and green edge treatments
- Street furniture and smart poles
- Wayfinding and signage systems
- Energy-efficient lighting standards

Table 2.7: Indicative Signage & Streetscape Standards

| Signage Type                      | Location       | Maximum Height                                         | Minimum Clearance | Statutory code |
|-----------------------------------|----------------|--------------------------------------------------------|-------------------|----------------|
| <b>Gantry Directional Signage</b> | Arterial Roads | As per structural truss engineering (typically 7.5m to | 5.5 m             | IRC:67         |

|                              |                  |                               |       |                                                 |
|------------------------------|------------------|-------------------------------|-------|-------------------------------------------------|
|                              |                  | 8.5m total structure height). |       |                                                 |
| <b>Regulatory Signage</b>    | Footpath / MUZ   | 2.5 m                         | 2.1 m | IRC: 67                                         |
| <b>Advertisement Signage</b> | Designated Zones | 3.0 m                         | 2.5 m | IRC: 46 and State Municipal Corporation Byelaws |
| <b>Informational Signage</b> | Public Areas     | 2.5 m                         | 2.0 m | IRC: 67 and IRC: 99                             |

Source: IRC:67-2022 Code of Practice for Road Signs

## 2.6.4 Compliance & Approval Mechanism

All developments within the industrial park shall require approval from the competent planning and industrial development authority. Building proposals shall be reviewed for compliance with land use regulations, environmental conditions, infrastructure capacities, fire safety norms, and development controls prior to issuance of approvals.

Periodic monitoring and enforcement mechanisms shall be established to ensure continued compliance during construction and operational stages. Special approvals may be required for hazardous industries, high-rise structures, bulk utilities, and environmentally sensitive developments.

### Key Components

- Development permission process
- Building plan scrutiny mechanism
- Environmental compliance review
- Fire and safety clearances
- Utility and infrastructure approvals
- Construction monitoring and enforcement

## 2.7 Implementation Strategy & Execution Framework

The implementation and phasing of a master plan involve a strategic approach to execute its objectives and projects over a designated timeline. For an industrial park, this process includes integrating governance mechanisms such as Special Purpose Vehicles (SPVs) or Industrial Area Development Authorities (IADA) with the overall master plan and ensuring compliance with state and national legal frameworks.

### 2.7.1 Implementation Mechanisms & Phasing

Implementation of various proposals and identified projects requires a thorough assessment and step-by-step approach. Phasing breaks down the park's implementation into manageable segments, prioritizing infrastructure projects based

on urgency, market demand, and investment attractions. The development is typically organized into short-term, medium-term, and long-term phases to align with the financial capacity and land absorption rates.

*Table 2.8: Implementation Mechanisms for Industrial Parks*

| Implementation Mechanism  | Industrial Planning Application                                                                                                                                                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Micro-level Block Plans / | Delineating development schemes for specific industrial blocks, allowing for flexible plot amalgamation or subdivision based on tenant requirements.                                                                                                |
| Development Regulations   | Utilizing customized Building Byelaws and Zoning Regulations (e.g., separating Red/Orange industries from green zones) to regulate safe development.                                                                                                |
| Governance & Policy       | Establishing an Industrial Area Development Authority (IADA) or SPV and integrating approvals via online single-window clearance systems. Indicative compliance/clearances generally required for Industrial Parks is placed at <b>Annexure-1</b> . |
| Development Projects      | Executing anchor infrastructure projects first, such as trunk roads, Common Effluent Treatment Plants (CETPs), and multi-modal logistics hubs.                                                                                                      |

*Table 2.9: Base Factors for Development Phasing*

| Base Factor                     | Strategic Focus for Industrial Phasing                                                                                                                                   |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Economic Potential & Investment | Prioritize areas with high economic potential, immediate availability of developable land, and maximum investment attraction (e.g., plots closest to National Highways). |
| Infrastructure Deficiencies     | Focus initial phases on establishing critical utilities (water, power, sewerage) that are essential for the operation of early anchor tenants.                           |
| Workforce & Social Factors      | Phase in worker housing, healthcare, and skill development centres in tandem with industrial cluster operationalization to support the "walk-to-work" concept.           |

## 2.7.2 Monitoring Mechanism

It is recommended to establish a dedicated Monitoring and Evaluation Cell within the SPV or Development Authority to facilitate the continuous assessment of progress related to the master plan's implementation. The authority must identify the sequence for executing various projects and communicate this to the monitoring cell.

Furthermore, a Geographic Information System (GIS)-based platform, integrated with an Integrated Command and Control Centre (ICCC) and monitoring dashboards, should be developed to oversee activities.

*Table 2.10: GIS-Based Monitoring Criteria*

| Evaluation Criteria           |    | Monitoring Objective                                                                                                                             |
|-------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Land Conversions & Allotment  |    | Tracking Non-Agriculture (NA) conversions and the real-time status of industrial plot allotments.                                                |
| Development Permissions       |    | Monitoring the issuance of Consent to Establish (CTE), Consent to Operate (CTO), and building plan approvals to ensure "Ease of Doing Business". |
| Infrastructure Development    |    | Tracking the physical progress of roads, underground utilities, green buffers, and critical facilities like substations.                         |
| Stages of Development Schemes | of | Overseeing the step-by-step progress of block-level town planning or land pooling schemes.                                                       |

To support these monitoring activities, the authority should compile an annual report detailing the progress of the industrial park. Should any development activities deviate from the proposals outlined in the master plan, appropriate corrective measures and grievance redress mechanisms must be implemented.

---

## Chapter 3: Roads & Transportation System

---

### **3.1. About this Chapter:**

This chapter outlines the requirements and technical expectations for preparation of the Roads & Transportation component of the Detailed Project Report (DPR) to be submitted by the State/SPV/Implementing Agency under BHAVYA Scheme.

The chapter serves as the reference framework for planning, design, engineering, implementation, operation, maintenance, and future expansion of integrated transportation infrastructure for Industrial Cities and Manufacturing Clusters.

The DPR shall establish a safe, efficient, sustainable, resilient, multimodal, and future-ready transportation system capable of supporting industrial logistics movement, passenger mobility, public transport integration, emergency access, and long-term economic growth.

The proposed Roads & Transportation framework may include:

- External connectivity infrastructure
- Internal hierarchical road network
- Junctions and interchanges
- Freight and logistics infrastructure
- Footpaths and cycle tracks
- Public transport infrastructure
- Utility corridors
- Smart traffic systems
- Road safety infrastructure
- Storm water drainage systems
- Street-lighting systems
- ITS and SCADA systems

The DPR shall establish the overall transportation philosophy, traffic-demand assessment, road hierarchy, mobility strategy, safety framework, sustainability measures, operational philosophy, and lifecycle maintenance strategy.

### **3.2 Concept Note:**

BHAVYA Scheme envisages development of world-class industrial infrastructure with efficient logistics connectivity, multimodal transportation integration, resilient mobility systems, and future-ready road infrastructure.

The Roads & Transportation System for the proposed Industrial Park shall be planned as an integrated transportation framework ensuring efficient movement of industrial freight, passenger traffic, public transport, emergency vehicles, and non-motorized transport.

The planning philosophy shall emphasize:

- Efficient industrial logistics movement
- Seamless regional connectivity
- Hierarchical road network planning
- Complete streets concept
- Public transport integration
- Universal accessibility
- Safety and resilience
- Sustainable and green mobility
- Smart traffic-management systems
- Future scalability and phased expansion

The DPR shall establish transportation systems aligned with applicable IRC codes, MoRTH guidelines, National Building Code, urban street-design guidelines, and industrial-park infrastructure requirements.

### **3.3 Design Basis**

This section shall establish the overall planning philosophy, traffic-design criteria, operational objectives, and service-level requirements for the proposed Roads & Transportation System.

#### **3.3.1 Planning Horizon & Development Phasing**

The DPR shall define the adopted planning horizon, intermediate development phases, activation strategy, and phase-wise transportation infrastructure development linked with industrial occupancy and traffic growth.

#### **3.3.2 Basis of Traffic Demand Assessment**

The DPR shall establish the methodology and assumptions adopted for traffic-demand estimation based on industrial typology, employee projections, logistics movement, freight generation, land use, and regional connectivity.

#### **3.3.3 Road Hierarchy Philosophy**

The DPR shall establish a hierarchical road network comprising arterial roads, sub-arterial roads, collector streets, industrial roads, local streets, and service roads. Indicative Road Hierarchy:

Table 3.1: Road Hierarchy

| Road Type          | Typical ROW |
|--------------------|-------------|
| Arterial Roads     | 50-80 m     |
| Sub-Arterial Roads | 30- 50 m    |
| Collector Streets  | 20 - 30 m   |
| Access Streets     | 15- 30 m    |
| Local Streets      | 10 - 20 m   |

The DPR shall establish carriageway widths, medians, utility corridors, footpaths, cycle tracks, plantation zones, drainage systems, and future-widening provisions

### 3.3.4 Complete Streets & Multimodal Mobility Philosophy

The DPR shall adopt complete-street principles integrating pedestrians, cyclists, public transport users, industrial freight movement, and private vehicles within a safe and accessible transportation framework.

### 3.3.5 External Connectivity Strategy

The DPR shall explore to establish seamless connectivity of road, rail, airport, freight terminals, ports, tapping point for power infrastructure, water allocation, gas, OFC (Optical fibre cable), logistics etc. An indicative template on external connectivity is enclosed in the table below:

Table 3.2: External Connectivity template

| Sl. No | External Infra | Demand Qty as per DPR | Details of source (capacity) | Executing Agency | Sanctioned Cost (₹) Cr | Status |
|--------|----------------|-----------------------|------------------------------|------------------|------------------------|--------|
| (1)    | (2)            | (3)                   | (4)                          | (5)              | (6)                    | (7)    |
| 1      | Water Supply   | -                     | -                            | -                | -                      | -      |
| 2      | Power          | -                     | -                            | -                | -                      | -      |
| 3      | Road           | -                     | -                            | -                | -                      | -      |
| 4      | Rail           | -                     | -                            | -                | -                      | -      |
| 5      | Gas            | -                     | -                            | -                | -                      | -      |
| 6      | Telecom        | -                     | -                            | -                | -                      | -      |

### 3.3.6 Internal Road Network Strategy

The DPR shall establish the internal transportation network, connectivity hierarchy, block-level accessibility, emergency access systems, utility integration, and traffic-dispersal mechanisms.

### **3.3.7 Reliability, Redundancy & Resilience Criteria**

The DPR shall establish redundancy provisions, alternate access systems, emergency routes, disaster resilience measures, and operational continuity requirements.

### **3.3.8 Intelligent Transport Systems (ITS) & Smart Monitoring**

The DPR shall establish the smart mobility framework including adaptive traffic systems, GPS monitoring, CCTV systems, SCADA integration, smart signals, and integrated command-and-control systems.

### **3.3.9 Sustainability & Green Mobility Measures**

The DPR shall establish sustainability measures including EV infrastructure, non-motorized transport systems, energy-efficient street lighting, green corridors, and low-carbon mobility strategies.

### **3.3.10 Applicable Codes, Standards & Technical References**

The DPR shall identify the applicable codes, standards, manuals, guidelines, benchmarks, and statutory provisions adopted for planning, design, construction, operation, and maintenance of the proposed Power Supply System.

### **3.4 Indicative References:**

- IRC Codes
- MoRTH Specifications
- IRC: SP:41 – At Grade Intersections
- IRC:86 – Geometric standards for urban roads
- IRC:92 – Interchanges in urban areas
- IRC-SP:99 – Expressway Standards
- IRC:11 – Cycle Track Design
- IRC:35 – Road Markings
- IRC:37 – Design of Flexible pavements
- IRC:58 – Design of Plain Joined Rigid Pavements
- IRC:65 – Traffic Rotaries/Roundabouts and related geometric design
- IRC:73 – Geometric design standards for Rural highways
- IRC:67 – Road Signs
- IRC:88 – Road Safety Audit

- IRC:103 – For pedestrian facilities
- MoHUA Urban Street Design Guidelines
- BIS / IS Standards
- Service Level Benchmarks

This section outlines the applicable Service Level Benchmarks (SLBs) for the proposed Road Network, primarily based on the benchmarks prescribed by the MoRTH specifications/ IRC Codes and other relevant standards.

The DPR shall specify the adopted service levels against each benchmark parameter in a comparative tabular format, along with the proposed compliance approach. The adopted values shall generally meet or exceed the prescribed benchmark levels. Any deviation from the applicable benchmarks shall be supported with adequate project-specific technical justification.

*Table 3.3: Service Level benchmarks*

| Sl. No | Service Level Benchmarks (SLBs)    | Benchmark Value                        |
|--------|------------------------------------|----------------------------------------|
| 1      | Road Network Coverage              | 100% Planned Development Area          |
| 2      | Pavement Design Life               | 20 Years (Flexible) & 30 Years (Rigid) |
| 3      | Footpath Provision                 | Both Sides of Major Roads              |
| 4      | Cycle Track Provision              | Arterial & Sub-Arterial Roads          |
| 5      | Street Lighting Coverage           | 100% of planned area                   |
| 6      | Level of Service (LOS)             | LOS C or Better                        |
| 7      | Universal Accessibility Compliance | Mandatory                              |
| 8      | Smart Traffic Monitoring Coverage  | Critical Junctions                     |
| 9      | Emergency Access Coverage          | 100% Industrial Areas                  |
| 10     | Road Safety Audit Compliance       | Mandatory                              |

### 3.5 Adopted Design Standards & Norms

The DPR shall summarize the design standards, planning norms, technical references, and manuals adopted for preparation of the Roads & Transportation DPR.

The following codes, standards, manuals, guidelines, and references may be considered during preparation of the DPR, including but not limited to:

### 3.5.1 Design Parameter

Table 3.4: Design Parameters Roads & Transportation system

| Sl. No. | Design Parameter / Component | Reference Code / Manual             |
|---------|------------------------------|-------------------------------------|
| 1       | Design Speed                 | IRC Codes                           |
| 2       | Pavement Design              | IRC:37 (Flexible) & IRC :58 (Rigid) |
| 3       | Junction Design              | IRC: SP:41                          |
| 4       | Footpath Design              | IRC:86                              |
| 5       | Cycle Track Design           | IRC:11                              |
| 6       | Road Signs & Markings        | IRC:67 / IRC:35                     |
| 7       | Street Lighting              | IE Standards                        |
| 8       | Drainage Design              | MoRTH / IRC Codes                   |
| 9       | Geometric Design             | IRC Guidelines                      |
| 10      | Road Safety Audit            | IRC: SP 88                          |
| 11      | Utility Corridors            | Project Specific                    |
| 12      | ITS & SCADA Systems          | Smart Mobility Standards            |

### 3.6 Traffic Demand Assessment

This section shall establish phase-wise and ultimate-year traffic assessment for the proposed Industrial Park. The assessment shall include:

- Passenger traffic assessment
- Freight and logistics traffic
- Employee movement assessment
- Public transport demand
- Parking demand assessment
- Pedestrian & NMT demand
- Traffic forecasting
- Peak-hour traffic analysis
- Junction capacity analysis

#### 3.6.1 Industrial Traffic Assessment

The DPR shall assess industrial traffic generated from manufacturing units, warehouses, logistics hubs, and freight movement.

### **3.6.2 Passenger Traffic Assessment**

The DPR shall assess employee traffic, visitor traffic, residential traffic, and commercial traffic.

### **3.6.3 Freight & Logistics Traffic Assessment**

The DPR shall assess truck traffic, freight corridors, logistics movement, container traffic, and industrial cargo flows.

### **3.6.4 Public Transport Assessment**

The DPR shall establish bus routes, public transport terminals, employee shuttle systems, and future mass-transit integration.

### **3.6.5 Pedestrian & Non-Motorized Transport Assessment**

The DPR shall establish pedestrian demand, cycling demand, universal accessibility requirements, and last-mile connectivity.

### **3.6.6 Junction Capacity & LOS Analysis**

The DPR shall establish capacity analysis for critical intersections, roundabouts, grade separators, and signalized junctions.

### **3.6.7 Parking Assessment**

The DPR shall establish parking requirements for industrial, commercial, logistics, and public infrastructure.

### **3.6.8 Future Traffic Growth & Forecasting**

The DPR shall establish long-term traffic growth projections and future infrastructure augmentation requirements.

## **3.7 Major Project Components**

This section shall establish the technical configuration, sizing philosophy, operational framework, implementation strategy, traffic-management framework, environmental safeguards, safety provisions, resilience criteria, and utility-integration requirements for all major components of the proposed Roads & Transportation System.

### **3.7.1 External Connectivity Infrastructure**

The DPR shall establish the framework for external road connectivity with NHs, SHs, freight corridors, railway terminals, airports, and logistics infrastructure.

### **3.7.2 Internal Road Network**

The DPR shall establish the complete internal road network including road hierarchy, carriageways, medians, utility corridors, service roads, and access-control systems.

### **3.7.3 Road Hierarchy & Typical Cross Sections**

The DPR shall include typical cross sections for all categories of roads.

Indicative Cross-Section Components:

- Carriageway
- Median
- Utility Corridor
- Footpath
- Cycle Track
- Plantation Strip
- Drainage System
- Street Lighting

Indicative Typical Road Sections:

#### Arterial Road – 60 m ROW

- Dual carriageway with central median
- Service roads
- Cycle track & footpath
- Utility corridor
- Storm-water drain

#### Sub-Arterial Road – 45 m ROW

- Divided carriageway
- Median for future widening
- Footpath and cycle track
- Utility corridor

#### Collector Street – 30 m ROW

- Divided carriageway
- Utility corridor
- Footpath and NMT infrastructure

#### Industrial Street – 24 m ROW

- Two-way carriageway
- Footpath and utilities

#### Residential Street – 18 m / 12 m ROW

- Local access roads
- Traffic calming measures
- Universal accessibility provisions.

Indicative Pavement Design Formulae

### **Indicative Traffic Design**

$$N = 365 \times [(1+r)^n - 1]/r \times A \times D \times F$$

Where:

N = Cumulative standard axles

A = Initial commercial vehicles per day

r = Annual growth rate

n = Design life

D = Lane distribution factor

F = Vehicle damage factor

### **Stopping Sight Distance (SSD)**

$$SSD = vt + v^2/2gf$$

Where:

v = Speed of vehicle

t = Reaction time

g = Acceleration due to gravity

f = Coefficient of friction

### **Super Elevation Formula**

$$e = v^2/225R$$

Where:

e = Super elevation

v = Speed in kmph

R = Radius of curve

## **3.7.4 Junction & Interchange Infrastructure**

The DPR shall establish the planning and design framework for:

- Roundabouts
- At-grade intersections
- Signalized intersections
- Grade separators
- Flyovers
- Cloverleaf interchanges
- Left-in left-out junctions

The DPR shall establish junction-capacity calculations, channelization plans, turning-radius requirements, signalization philosophy, and safety provisions

### **3.7.5 Footpaths & Universal Accessibility**

The DPR shall establish continuous pedestrian infrastructure in compliance with IRC:86 and universal-accessibility requirements.

### **3.7.6 Cycle Track & NMT Infrastructure**

The DPR shall establish dedicated cycle-track infrastructure, green mobility corridors, bicycle parking, and NMT connectivity.

### **3.7.7 Public Transport Infrastructure**

The DPR shall establish bus bays, terminals, employee transit systems, public transport integration, and future transit corridors.

### **3.7.8 Truck Terminals & Logistics Infrastructure**

The DPR shall establish truck terminals, logistics hubs, freight parking, container yards, and industrial logistics infrastructure.

### **3.7.9 Road Safety & Traffic Management Systems**

The DPR shall establish:

- Crash barriers
- Road signage
- Pavement markings
- Traffic-calming systems
- Speed-control measures
- Safety audits
- Emergency response systems

### **3.7.10 Street Lighting & Utility Corridors**

**The DPR shall establish street-lighting systems, electrical utility corridors, telecom corridors, water pipelines, and integrated utility planning.**

### **3.7.11 ITS, ICT & Smart Mobility Systems**

The DPR shall establish:

- Adaptive traffic signals
- CCTV systems
- Smart parking systems
- GPS-enabled fleet systems
- Variable message signs
- SCADA systems

- Integrated command-and-control systems

### 3.7.12 Storm Water & Roadside Drainage

The DPR shall establish roadside drainage systems, culverts, cross-drainage structures, rainwater management, and flood resilience measures.

### 3.7.13 Entry / Exit Gate

The DPR shall establish a mandate of at least one Park Entry/Exit Plaza with: ANPR, FASTag-compatible gate, dynamic VMS, EV charging (4–6 chargers initial), visitor management system.

## 3.8 O&M framework

The DPR shall establish a comprehensive operation and maintenance framework covering manpower deployment, preventive maintenance, pavement-condition monitoring, road-marking maintenance, street-lighting systems, traffic-signal operations, drainage maintenance, complaint management, ITS systems, and emergency-response arrangements.

| O&M Framework Component            | Key Considerations                                                                                       |
|------------------------------------|----------------------------------------------------------------------------------------------------------|
| Preventive Maintenance Program     | Scheduled maintenance for pavements, junctions, drainage, and transportation infrastructure.             |
| Pavement & Road Maintenance        | Overlay works, pothole repairs, and shoulder maintenance.                                                |
| Traffic Signal & ITS Maintenance   | Maintenance of traffic signals, CCTV systems, SCADA systems, sensors, and smart-mobility infrastructure. |
| Street Lighting Maintenance        | Maintenance of poles, luminaires, cabling, and electrical systems.                                       |
| Drainage Maintenance               | Cleaning and desilting of roadside drains and storm-water systems.                                       |
| Road Safety Management             | Maintenance of signage, markings, crash barriers, and safety infrastructure.                             |
| Emergency Response Plan            | Accident response systems, traffic diversion plans, and disaster management arrangements.                |
| Traffic Monitoring & MIS Reporting | Traffic analytics, GPS systems, command-and-control systems, and operational dashboards.                 |

## 3.9 CAPEX & OPEX Assessment

This section shall establish the phase-wise Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) assessment for the proposed Roads & Transportation System covering all transportation, mobility, utility, safety, smart-

infrastructure, and operational components required for implementation and long-term sustainability.

The assessment shall include all civil, pavement, junction, drainage, utility, street-lighting, ITS, SCADA, safety, logistics, and allied infrastructure required for development and operation of the integrated transportation framework.

The cost estimation shall be based on applicable Schedule of Rates (SoR), MoRTH specifications, approved market rates, recent comparable projects, OEM budgetary quotations, and accepted estimation methodologies.

The DPR shall establish phase-wise investment linked with development phasing, traffic growth, industrial occupancy, and future expansion strategy.

| Category                              | Key Considerations                                                                                                                 |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Civil Infrastructure                  | Roads, bridges, culverts, junctions, footpaths, cycle tracks, and utility corridors, Retaining wall/Toe wall (wherever applicable) |
| Pavement Infrastructure               | Flexible pavements, rigid pavements, shoulders, medians, and road furnishings.                                                     |
| Junction & Interchange Infrastructure | Roundabouts, signalized junctions, flyovers, interchanges, and grade separators.                                                   |
| Utility & Drainage Infrastructure     | Storm-water drains, utility ducts, pipelines, cable trenches, and roadside utilities.                                              |
| Street Lighting Systems               | Poles, luminaires, cabling, smart-lighting systems, and control panels.                                                            |
| ITS & Smart Mobility Systems          | CCTV, SCADA, adaptive traffic systems, GPS systems, smart parking, and command centers.                                            |
| Road Safety Infrastructure            | Signage, road markings, crash barriers, bollards, and safety systems.                                                              |
| O&M Cost                              | Pavement maintenance, energy consumption, manpower, cleaning, monitoring, and repairs.                                             |
| Lifecycle Replacement                 | Replacement of lighting systems, ITS infrastructure, road furniture, and pavement rehabilitation.                                  |

### 3.10 Checklist for Mandatory Deliverables.

The DPR shall include all technical deliverables, studies, calculations, drawings, approvals, and reports necessary for technical appraisal and implementation.

| Sl. No | Deliverables               | Checks                   |
|--------|----------------------------|--------------------------|
| 1      | Traffic Demand Assessment  | <input type="checkbox"/> |
| 2      | Road Hierarchy Plan        | <input type="checkbox"/> |
| 3      | External Connectivity Plan | <input type="checkbox"/> |
| 4      | Internal Road Network Plan | <input type="checkbox"/> |
| 5      | Typical Cross Sections     | <input type="checkbox"/> |
| 6      | Junction Design Drawings   | <input type="checkbox"/> |

|    |                                  |                          |
|----|----------------------------------|--------------------------|
| 7  | Traffic Forecasting Report       | <input type="checkbox"/> |
| 8  | Pavement Design Calculations     | <input type="checkbox"/> |
| 9  | Road Safety Audit                | <input type="checkbox"/> |
| 10 | Drainage Design                  | <input type="checkbox"/> |
| 11 | Utility Corridor Plan            | <input type="checkbox"/> |
| 12 | Street Lighting Design           | <input type="checkbox"/> |
| 13 | ITS & SCADA Framework            | <input type="checkbox"/> |
| 14 | Parking Assessment               | <input type="checkbox"/> |
| 15 | Public Transport Plan            | <input type="checkbox"/> |
| 16 | CAPEX & OPEX Assessment          | <input type="checkbox"/> |
| 17 | O&M Framework                    | <input type="checkbox"/> |
| 18 | Implementation Phasing Plan      | <input type="checkbox"/> |
| 19 | Statutory Approvals & Clearances | <input type="checkbox"/> |

---

## Chapter 4: Water Supply

---

#### **4.1 About this Chapter:**

This chapter outlines the requirements and technical expectations for the Water Supply component of the Detailed Project Report (DPR) to be submitted by the State/SPV/implementing agency. It serves as the reference framework for preparation and technical evaluation of the proposed water supply scheme by the appraisal authority.

The chapter aims to ensure that the proposed Industrial Park under this scheme is supported by a reliable, resilient, scalable, and future-ready water supply system covering source development, treatment, storage, transmission, distribution, reuse, and monitoring infrastructure.

The DPR shall demonstrate that the proposed scheme is capable of meeting the projected domestic, industrial, process, utility, firefighting, landscaping, and other water demands within the project area across all development phases and up to the adopted design horizon. The proposed system shall also incorporate provisions for water conservation, treated wastewater reuse, operational reliability, and long-term sustainability.

The proposed water supply system shall be planned as a resilient, digitally enabled and resource – efficient utility infrastructure capable of supporting long-term industrial growth, investment readiness, sustainability objectives and operational reliability under varying demand and climate conditions.

#### **4.2 Concept Note:**

BHAVYA Scheme envisages the development of future-ready, sustainable, and efficient Industrial Parks with high-quality infrastructure aimed at enhancing industrial productivity, operational reliability, and long-term resource efficiency. The infrastructure framework shall include integrated core utilities such as internal roads, underground utility networks, drainage systems, common treatment facilities, ICT infrastructure, and administrative systems. Considering water and power infrastructure as major lifecycle cost components, the planning approach shall prioritize efficiency, resilience, sustainability, and ease of operations.

The Water Supply system for the proposed Industrial Park shall be planned as an integrated utility network comprising water sourcing, transmission, treatment, storage, distribution, reuse, monitoring, and control systems. The overall planning philosophy shall aim to ensure reliable and continuous water supply for domestic, industrial, process, utility, landscaping, and firefighting requirements across all phases of development.

The proposed system architecture shall broadly include source infrastructure, Water Treatment Plants (WTPs), zonal storage reservoirs, transmission mains, distribution networks, pumping systems, recycled water infrastructure, and smart monitoring systems. The planning approach shall emphasize water conservation, reuse of treated

wastewater, reduction of non-revenue water, operational efficiency, and adoption of digital utility management systems.

Water demand assessment shall be derived from the proposed land use pattern, industrial typologies, development phasing, and applicable planning benchmarks. Separate assessment and planning shall be undertaken for freshwater and recycled water systems to promote sustainable water management and minimize dependency on freshwater resources.

The water supply network shall be planned using appropriate hydraulic modelling and engineering analysis tools in accordance with applicable standards, codes, and service level benchmarks. Subsequent sections of this document elaborate the technical requirements, planning principles, design considerations, and infrastructure components to be addressed in the DPR.

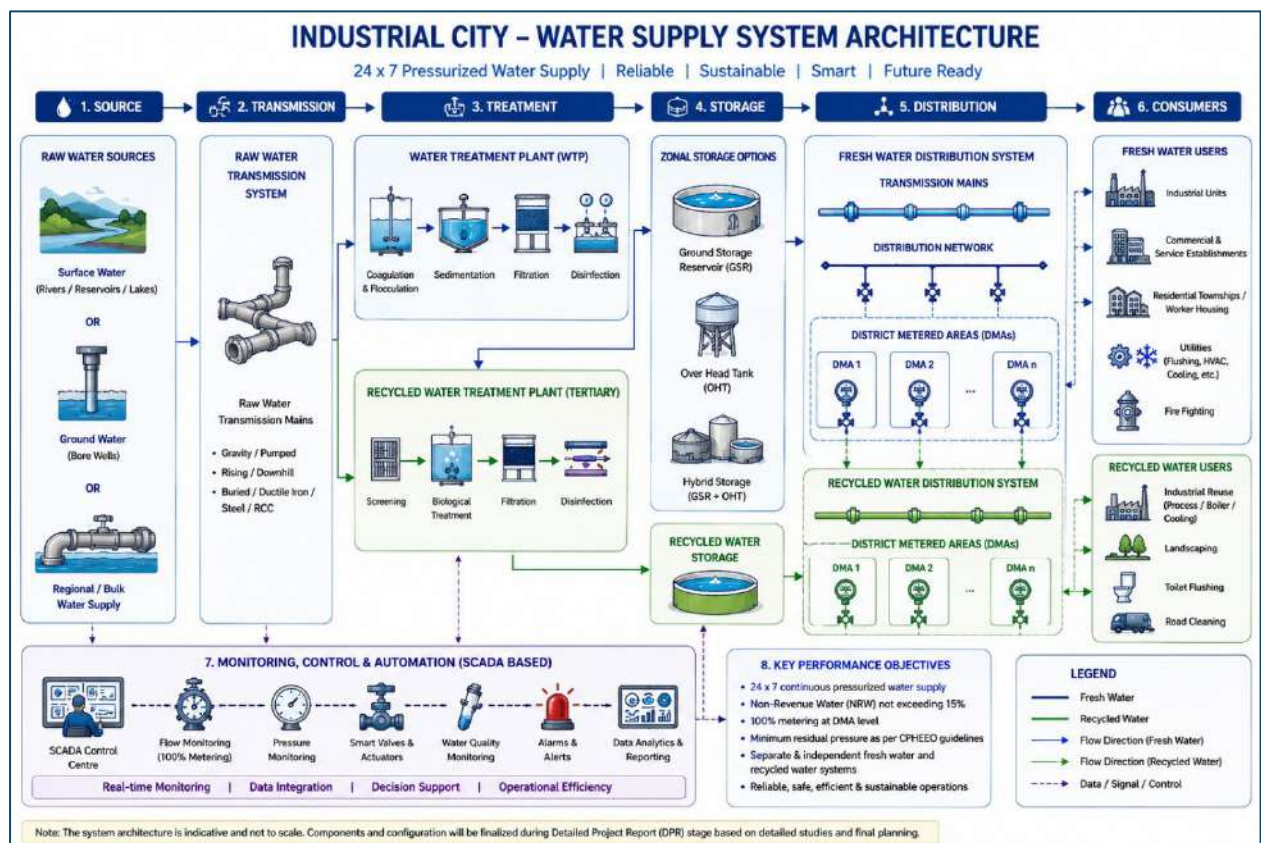


Figure 4.1: Indicative Water Supply System Architecture

### 4.3 Design Basis

This section shall establish the overall planning philosophy, design criteria, operational objectives, and minimum service level requirements for the proposed Water Supply system. The DPR shall clearly define the technical basis adopted for infrastructure planning, demand assessment, hydraulic performance, operational reliability, sustainability measures, and future scalability of the system. The design basis and service level benchmarks established under this section shall govern the planning,

sizing, phasing, and performance evaluation of all subsequent water supply infrastructure components proposed in the DPR.

#### **4.3.1 Planning Horizon & Development Phasing**

The DPR shall define the adopted planning horizon, intermediate development stages, and phase-wise infrastructure augmentation strategy considering projected industrial growth, land development pattern, and future expansion requirements of the Industrial City.

#### **4.3.2 Basis of Population & Industrial Growth Projection**

The DPR shall establish the methodology and assumptions adopted for estimating resident population, floating population, worker population, industrial occupancy, and future industrial growth based on the approved master plan and proposed industrial typologies.

#### **4.3.3 Service Level Objectives**

The DPR shall define the proposed service level targets for continuity of supply, system reliability, pressure management, water quality, metering coverage, operational efficiency, monitoring, and customer-level service delivery in accordance with applicable standards and project requirements.

#### **4.3.4 Water Supply Philosophy**

The DPR shall describe the overall water supply approach including freshwater sourcing, treatment, storage, transmission, distribution, reuse, and system integration strategy proposed for ensuring reliable and sustainable water supply across all phases of development. The philosophy shall define the approach for meeting domestic and industrial water demands across all phases of development, including provisions for process water requirements, integration of recycled water for suitable non-potable and industrial applications, and optimization of freshwater use. The DPR shall also demonstrate the proposed system reliability measures, redundancy provisions, phased infrastructure augmentation strategy, and compliance with applicable standards and regulatory requirements to ensure uninterrupted and efficient service delivery.

#### **4.3.5 Freshwater & Recycled Water Framework**

The DPR shall define the planning philosophy for freshwater and recycled water systems including intended reuse applications, separation of networks, reuse targets, and measures proposed for minimizing freshwater dependency and preventing cross-contamination.

The framework shall establish a clear water reuse hierarchy, prioritizing the use of treated wastewater for industrial processes, utility services, cooling systems, landscaping, flushing, construction activities, and other suitable non-potable

applications, with freshwater reserved primarily for potable and other quality-sensitive uses. The DPR shall identify phase-wise recycled water utilization targets, assess the reuse potential across various sectors, and demonstrate the strategy for maximizing treated wastewater reuse and promoting circular water management.

#### **4.3.6 Reliability, Redundancy & Resilience Criteria**

The DPR shall establish the reliability and redundancy provisions proposed for critical infrastructure components including source systems, pumping stations, treatment facilities, transmission mains, storage reservoirs, and power backup arrangements to ensure uninterrupted system operations under peak and emergency conditions.

#### **4.3.7 Pressure Zoning & Distribution Philosophy**

The DPR shall define the proposed distribution strategy including pressure zoning approach, hydraulic considerations, storage integration, balancing arrangements, and network configuration proposed for achieving equitable and continuous pressurized water supply.

#### **4.3.8 NRW Reduction & Metering Strategy**

The DPR shall define the proposed approach for reduction and monitoring of Non-Revenue Water (NRW) through bulk metering, consumer metering, District Metered Areas (DMAs), pressure management, leak detection, and network monitoring systems.

#### **4.3.9 Automation & Smart Water Management Systems**

The DPR shall describe the proposed automation and digital monitoring framework including SCADA systems, instrumentation, telemetry, smart metering, centralized monitoring systems, and data-driven operational controls for efficient utility management.

#### **4.3.10 Sustainability & Resource Efficiency Measures**

The DPR shall establish the sustainability measures proposed for water conservation, energy-efficient operations, reuse optimization, resource recovery, climate resilience, and long-term environmental performance of the Water Supply system.

#### **4.3.11 Applicable Codes, Standards & Technical References**

The DPR shall identify the applicable codes, standards, manuals, guidelines, benchmarks, and statutory provisions adopted for planning, design, construction, operation, and maintenance of the proposed Water Supply system and its individual infrastructure components.

### 4.3.12 Water Security & Source Sustainability

The DPR shall establish the Source sustainability for the Water demand. Preference shall be given to projects minimizing freshwater dependency through treated wastewater reuse and integrated water-resource optimization.

### 4.4 Service Level Benchmarks

This section outlines the applicable Service Level Benchmarks (SLBs) for the proposed Water Supply system, primarily based on the benchmarks prescribed by the Ministry of Housing and Urban Affairs (MoHUA) and other relevant standards.

The DPR shall specify the adopted service levels against each benchmark parameter in a comparative tabular format, along with the proposed compliance approach. The adopted values shall generally meet or exceed the prescribed benchmark levels. Any deviation from the applicable benchmarks shall be supported with adequate project-specific technical justification.

*Table 4.1: Service level Benchmarks for water supply system*

| Sl. No | Service Level Benchmarks (SLBs)                | MoHUA Value           |
|--------|------------------------------------------------|-----------------------|
| 1      | Coverage of Water Supply Connections           | 100%                  |
| 2      | Per-Capita Supply of water (Domestic)          | 135 LPCD*             |
| 3      | Extent of Non-revenue Water                    | ≤ 15%                 |
| 4      | Extent of metering                             | 100%                  |
| 5      | Continuity of water supplied                   | 24 x 7 Supply         |
| 6      | Efficiency in redressal of customer complaints | ≥ 80%                 |
| 7      | Quality of Water Supplied                      | 100% (IS 10500 :2012) |
| 8      | Cost Recovery                                  | 100%                  |
| 9      | Efficiency in collection of Water charges      | 100%                  |

\* Domestic water supply norms shall be appropriately assessed for the project considering the proposed land use, occupancy pattern, industrial character, and applicable planning standards for phase wise development. Industrial and process water demand shall be assessed separately based on the proposed industrial typologies and utility requirements.

### 4.5 Adopted Design Standards & Norms

This section shall summarize the design standards, codes, guidelines, reference manuals, and planning norms adopted for preparation of the Water Supply DPR. The objective of this section is to establish a consolidated technical reference framework for all design parameters and infrastructure components, thereby avoiding repetitive citation of standards in subsequent sections of the DPR.

The DPR shall clearly identify the adopted design criteria, corresponding reference standards, and applicable codal provisions for individual system components. In cases where project-specific requirements necessitate deviation from standard codal provisions or commonly adopted engineering practices, the DPR shall provide adequate technical justification and supporting rationale for such deviations.

The following codes, standards, manuals, guidelines, and references may be considered during preparation of the DPR, including but not limited to:

#### 4.5.1 Design Period

| Component                                        | Reference Code / Manual                 | Commonly adopted Design Period |
|--------------------------------------------------|-----------------------------------------|--------------------------------|
| Source Infrastructure                            | CPHEEO Manual                           | 30-50 Years                    |
| Water Treatment Plant (Civil)                    | CPHEEO Manual                           | 30 Years                       |
| Water Treatment Plant (Process & E&M components) | CPHEEO Manual                           | 30 Years                       |
| Transmission Mains                               | CPHEEO Manual                           | 30 years                       |
| Distribution Network                             | CPHEEO Manual                           | 30 years                       |
| Service Reservoirs (ESR/GLSR/CWR)                | CPHEEO Manual                           | 15-30 years                    |
| Pump House Structures                            | CPHEEO Manual                           | 30 years                       |
| Pumping Machinery & Equipment (E&M)              | CPHEEO Manual                           | 15 years                       |
| SCADA, Instrumentation & Automation Systems      | Industry Practice / OEM Recommendations | 10-15 years                    |

#### 4.5.2 Water Demand Assessment Criteria

| Component                               | Reference Code / Manual           | Commonly adopted criteria                                                 |
|-----------------------------------------|-----------------------------------|---------------------------------------------------------------------------|
| Per Capita Supply (Domestic)            | CPHEEO Manual;                    | 135 lpcd                                                                  |
| Per Capita Supply (Offices/Commercial)  | CPHEEO Manual; (Fresh & Recycled) | 45 lpcd<br>(Varies based on occupancy, usage pattern & development style) |
| Non-Revenue Water Allowance             | MoHUA SLB                         | ≤ 15%                                                                     |
| Sewerage Generation Factor (Domestic)   | CPHEEO Manual                     | 80% of Fresh water demand                                                 |
| Sewerage Generation Factor (Industrial) | CPHEEO Manual                     | 60 - 80% of Fresh water demand (depending on proposed industry mix)       |
| Peak Factor (Domestic)                  | CPHEEO Manual                     | 2.5<br>(Varies as per the population band)                                |

|                                |                                 |                                                              |
|--------------------------------|---------------------------------|--------------------------------------------------------------|
| Peak Factor<br>(Industrial)    | CPHEEO Manual                   | 1.2-2.0<br>(Varies as per Industry mix)                      |
| Horticulture/Irrigation demand | CPHEEO Manual/State Regulations | To be assessed based on the green area & irrigation strategy |
| Firefighting demand            | CPHEEO Manual                   | 1% of the Total Water Demand (Varies)                        |
| Treatment plant Efficiency     | Industry Practices              | ≥ 95%                                                        |

The above values are indicative planning criteria generally adopted for preparation of DPRs. The final adopted values shall be based on applicable standards, project-specific requirements, industrial typologies, development characteristics, sustainability objectives, and engineering assessment.

#### 4.5.3 Network Design Parameters

| Component                                               | Reference Code / Manual                     | Commonly adopted criteria                                                                          |
|---------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------|
| Hydraulic Design Formula (Distribution network)         | CPHEEO Manual                               | Hazen–Williams Equation (commonly adopted)                                                         |
| Hydraulic Design Formula (Transmission/Pumping network) | CPHEEO Manual;                              | Hazen–Williams and/or Darcy–Weisbach / Colebrook-White Equation                                    |
| Hazen- Williams Coefficient (C- Value)                  | CPHEEO Manual; Manufacturer Recommendations | As per adopted Pipe Materials                                                                      |
| Flow Velocity                                           | CPHEEO Manual                               | Generally, 0.6-2.0 m/s                                                                             |
| Minimum Pipe Diameter                                   | CPHEEO Manual                               | Generally, 100-110mm                                                                               |
| Depth of Cover                                          | CPHEEO Manual                               | Generally, ≥1.0 m from pipe crown, subject to road classification and utility corridor requirement |
| Residual Pressure at Consumer Connection                | CPHEEO Manual                               | Minimum 12m.                                                                                       |
| Network Configuration                                   | Industry Practice                           | Close-loop Network for reliability & redundancy                                                    |
| Pipe Materials – Transmission Mains                     | CPHEEO Manual; Relevant BIS Standards       | MS, DI or equivalent, based on hydraulic, structural, and operational requirement                  |
| Pipe Materials – Distribution network                   | CPHEEO Manual; Relevant BIS Standards       | DI, HDPE or equivalent, based on pressure class and network requirements                           |
| Pumping Operation Hours                                 | CPHEEO Manual                               | 24 Hours (with Standby arrangements)                                                               |
| Type of Pumps                                           | Project Specific                            | Preferably VFD                                                                                     |
| Balancing Storage                                       | CPHEEO Manual                               | Generally, 33% to 50% of Average daily demand                                                      |
| Emergency Storage                                       | CPHEEO Manual                               | 4-8 Hours of Average Demand                                                                        |
| Standby Pumping provisions                              | CPHEEO Manual                               | Minimum 1 Standby unit for All pumping systems                                                     |

|                     |                  |                                     |
|---------------------|------------------|-------------------------------------|
| Power Backup        | Project Specific | 100% backup for critical facilities |
| <b>Network Type</b> | Project Specific | Closed-loop network system          |

#### 4.5.4 Materials, Valves & appurtenances

| Component           | Reference Code / Manual | Commonly adopted criteria                                            |
|---------------------|-------------------------|----------------------------------------------------------------------|
| DI Pipes            | IS 8329                 | May be adopted for Transmission Mains & Major Distribution Lines     |
| HDPE Pipes          | IS 4984                 | May be adopted for distribution Lines.                               |
| MS Pipes            | IS 3589                 | May be adopted for Transmission Mains & Major Distribution Lines     |
| Butterfly Valves    | IS 13095                | As per requirements                                                  |
| Sluice/ Gate Valves | IS 14846                | As per requirements                                                  |
| Air Valves          | IS 14845                | As per requirements                                                  |
| Di Fittings         | IS 9523                 | For DI Pipes                                                         |
| Valve Chambers      | CPHEEO Manual           | Preferable RCC Chambers with Maintenance & accessibility provisions. |

#### 4.6 Water Demand Assessment

This section of the DPR shall establish the phase-wise and ultimate water demand for the proposed industrial/manufacturing cluster based on approved land use, industrial typology, occupancy projections, utility requirements, and service-level benchmarks. The assessment shall clearly segregate potable, industrial/process, firefighting, horticulture, and recycled-water demands and shall form the basis for sizing of all downstream infrastructure components. The adopted methodology, assumptions, peak factors, losses, and design horizon shall be explicitly declared and supported through calculations and benchmark references.

##### 4.6.1 Domestic Water Demand

Domestic demand shall be assessed based on projected residential population, worker accommodation, dormitories, staff housing, and associated institutional facilities proposed within the industrial area. The adopted per-capita norms shall be in accordance with CPHEEO guidelines and applicable state regulations. Occupancy assumptions and phase-wise population projections shall be clearly stated in the DPR.

| Category | Indicative Norms |
|----------|------------------|
|----------|------------------|

|                               |                             |
|-------------------------------|-----------------------------|
| Residential Housing           | 135 LPCD                    |
| Workers Housing/Accommodation | 70-100 LPCD                 |
| Institutional Facilities      | 70 LPCD                     |
| Transit Accommodation         | Project specific assessment |

#### 4.6.2 Commercial Water Demand

Commercial water demand shall be estimated based on the proposed commercial floor area, office occupancy, logistics infrastructure, utility establishments, and common amenity facilities within the project area. Separate consideration shall be given to administrative buildings, food courts, commercial complexes, and support infrastructure generating non-industrial demand.

| Category            | Indicative Norms          |
|---------------------|---------------------------|
| Office Buildings    | Occupancy Based           |
| Commercial Area     | Floor-Area basis          |
| Logistic Facilities | Utility Benchmark         |
| Common Amenities    | Occupancy & usage pattern |

#### 4.6.3 Industrial & Process Water Demand

Industrial and process water demand shall be assessed category-wise based on the proposed industrial mix, process-water intensity, plot-allocation pattern, expected industrial occupancy model, and benchmark consumption data from comparable industrial park developments. Generic per-capita norms shall not be adopted for industrial demand estimation.

The assessment shall distinctly consider potable, process, cooling, utility, and recycled-water requirements. Industrial water demand shall preferably be derived from case studies, benchmarking of comparable industrial estates/clusters, and demand assessments of similar industrial sectors. The adopted industrial water-demand norms shall be furnished separately in terms of KL/Ha/day along with supporting basis and references as part of the DPR annexures.

#### 4.6.4 Firefighting & horticulture Demand

Firefighting demand shall be assessed in accordance with CPHEEO recommendations and applicable fire-safety regulations considering the industrial risk profile and redundancy philosophy. Although firefighting systems are generally preferred to be supplied through potable water, the DPR may explore the avenue for the use of treated wastewater/recycled water for firefighting applications, subject to compliance with applicable quality requirements, operational suitability, and approval of the competent authority.

Horticulture demand shall be estimated based on greenbelt area, avenue plantation, and landscape-development requirements, and shall be met exclusively through treated wastewater/recycled water for non-potable applications.

Even in the closed-loop water distribution systems, dedicated firefighting reserve storage shall be maintained to ensure reliable emergency response under peak-demand, power-failure, or system-disruption conditions. The firefighting reserve may be integrated within common storage infrastructure; however, the reserved capacity shall remain protected from routine operational drawdown.

| Category                                | Design Considerations                                                                                                             |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Fire Reserve                            | Dedicated Storage Provision                                                                                                       |
| Fire Hydrant Network                    | As per Fire Strategy                                                                                                              |
| Greenbelt Irrigation & landscape Demand | Area Based & seasonal requirement                                                                                                 |
| Recycled water Reuse                    | Compulsory for Horticulture.<br>Options may be explored for Firefighting & HVAC use subject to approval from competent authority. |

#### 4.6.5 Summary of Total Water Demand

The DPR shall provide a consolidated phase-wise and ultimate-year water demand assessment covering domestic, commercial, industrial/process, utility, firefighting, horticulture, and recycled-water requirements. The demand assessment shall clearly identify freshwater demand, recycled-water demand, peak demand factors, wastewater generation, and infrastructure design demand adopted for sizing of intake systems, WTP, reservoirs, pumping systems, and distribution networks. Detailed calculations, assumptions, industrial benchmarking, occupancy projections, and adopted demand norms shall be enclosed as annexures to the DPR.

| Demand Component        | Unit Demand Criteria | Phase wise demand | Ultimate Design Horizon | Remarks |
|-------------------------|----------------------|-------------------|-------------------------|---------|
| Domestic Demand         | LPCD basis           |                   |                         |         |
| Commercial Demand       | Occupancy/Floor Area |                   |                         |         |
| Industrial Demand       | KL/Ha/day            |                   |                         |         |
| Utility Demand          | Project specific     |                   |                         |         |
| Firefighting Demand     | CPHEEO               |                   |                         |         |
| Horticulture Demand     | Area basis           |                   |                         |         |
| Total Freshwater Demand | Computed             |                   |                         |         |
| Recycled Water Demand   | Computed             |                   |                         |         |

|                            |                           |  |  |  |
|----------------------------|---------------------------|--|--|--|
| Net Freshwater Requirement | Computed                  |  |  |  |
| Wastewater Generation      | % of water demand         |  |  |  |
| Peak Factor Adopted        | CPHEEO / Project specific |  |  |  |
| Design Demand Adopted      | Computed                  |  |  |  |

#### 4.6.6 Water Quality

This section shall establish the raw-water quality characteristics, treatment requirements, and treated-water quality objectives for the proposed system. The DPR shall identify critical parameters influencing treatment-process selection and mandatorily demonstrate compliance with the latest version of BIS:10500 standards for potable water.

Raw-water sampling and testing shall be mandatorily carried out in accordance with applicable codal provisions and CPHEEO guidelines, and the corresponding test reports shall be enclosed as annexures to the DPR. The sampling programme shall preferably cover multiple water sources, seasonal variations, and representative sampling events to adequately capture temporal variation in source-water quality. All laboratory analysis shall be carried out through a NABL-accredited laboratory.

#### 4.6.7 Water Balance Diagram

The DPR shall include a comprehensive water balance diagram illustrating raw-water abstraction, treatment, potable-water distribution, industrial consumption, wastewater generation, treatment, recycled-water production, reuse applications, losses, and final disposal/surplus arrangements. The water balance shall establish the overall sustainability and resource-efficiency framework of the proposed development.

| Water Balance Component           | Description / Requirement                                                                                        |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------|
| Raw Water abstraction             | Source wise water intake                                                                                         |
| WTP Output                        | Treated Potable water Generation                                                                                 |
| Industrial & Domestic Consumption | Category wise water Utilisation                                                                                  |
| Distribution Losses/NRW           | System losses & UAF water                                                                                        |
| Wastewater generation             | Domestic sewage & industrial effluent generation                                                                 |
| STP/CETP treatment                | Treatment & Recovery of Wastewater                                                                               |
| Recycled water generation         | Quantity Available for Reuse                                                                                     |
| Recycled water Utilization        | Horticulture, utilities, process reuse, flushing, etc. Additional Firefighting/HVAC utilization may be explored. |

|                            |                                                                                                                                                           |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Process losses             | Non-Recoverable Losses                                                                                                                                    |
| Surplus/Deficit Assessment | Net Water Balance Status                                                                                                                                  |
| Disposal Arrangements      | Disposal of surplus treated wastewater if any (preferable to be avoided and options to be explored for reuse applications in process water/industry etc.) |

## 4.7 Major Project Components

This section shall establish the technical configuration, sizing philosophy, hydraulic integration, redundancy provisions, operational framework, and implementation strategy for all major components of the proposed water-supply system. The DPR shall demonstrate that the proposed infrastructure is adequately sized for phase-wise as well as ultimate demand conditions and is capable of ensuring reliable, energy-efficient, and scalable system performance.

The DPR shall include component-wise design basis, engineering calculations, hydraulic-model outputs, layout drawings, equipment sizing, operational philosophy, and utility integration requirements for all major infrastructure components forming part of the proposed system

### 4.7.1 Raw Water source, Intake & Transmission System

The DPR shall establish the proposed raw-water source, allocated quantity, intake arrangement, pumping requirements, and raw-water conveyance system required for transmission of water to the treatment facility or balancing reservoir. The design shall consider source sustainability, seasonal variation, transmission losses, right-of-way constraints, hydraulic requirements, energy optimization, and future expansion provisions. Source-allocation approvals and relevant statutory clearances shall be enclosed as part of the DPR.

| Component             | Design Considerations         |
|-----------------------|-------------------------------|
| Source Reliability    | Long-term Sustainability      |
| Intake Arrangements   | Seasonal Operability          |
| Transmission System   | Hydraulic Adequacy            |
| Pumping System        | Energy Efficient & redundancy |
| Crossings & Utilities | Corridor Coordination         |

### 4.7.2 Water treatment Plant

The Water Treatment Plant (WTP) shall be designed based on ultimate water demand, raw-water quality characteristics, treatment objectives, operational flexibility, and modular expansion philosophy.. The DPR shall establish the basis for selection of the

treatment process through an appropriate treatment-process selection matrix and shall define the design criteria for all treatment units, hydraulic profile, unit sizing, sludge handling and disposal arrangements, automation and control systems, standby provisions, energy efficiency measures, and operational flexibility requirements. The proposed treatment scheme shall be supported by raw water quality assessment and treatability studies, wherever applicable, to demonstrate the adequacy and effectiveness of the selected process. Provision for advanced and tertiary treatment systems shall be incorporated, where required, to consistently achieve the desired treated water quality. The treated water shall mandatorily comply with the latest version of IS 10500 standards for potable-water supply.

| Component           | Design Considerations                            |
|---------------------|--------------------------------------------------|
| Design Horizon      | Ultimate demand basis                            |
| Treatment Objective | IS:10500 compliances                             |
| Plant Configuration | Modular & Expandable                             |
| Automation          | SCADA enabled                                    |
| Standby provisions  | Mandatory for Critical Units                     |
| <b>Redundancy</b>   | N+1 Redundancy mandatory for all critical units. |

#### 4.7.3 Clear Water Reservoirs & Master Balancing Reservoirs

Balancing reservoirs and storage infrastructure shall be designed considering peak demand variation, pumping schedules, firefighting reserve, emergency water storage requirements, and operational reliability of the overall system. The DPR shall provide storage-capacity calculations, redundancy philosophy, mass-curve analysis, and justification for proposed reservoir locations and staging arrangements.

| Component             | Design Considerations         |
|-----------------------|-------------------------------|
| Source Reliability    | Long-term Sustainability      |
| Intake Arrangements   | Seasonal Operability          |
| Transmission System   | Hydraulic Adequacy            |
| Pumping System        | Energy Efficient & redundancy |
| Crossings & Utilities | Corridor Coordination         |

#### 4.7.4 Pumping System & Pumping Stations

The DPR shall establish the design basis, sizing philosophy, operational requirements, and redundancy provisions for all pumping systems proposed under the water-supply infrastructure. The assessment shall include raw-water pumping, clear-water

pumping, intermediate boosting arrangements, distribution pumping, recycled-water pumping, and firefighting pumping systems, wherever applicable.

Pump sizing shall be based on design discharge, total dynamic head, operating hours, peak demand conditions, storage balancing philosophy, and future expansion requirements. The DPR shall include pump-capacity calculations, pump-head calculations, system curves, energy assessment, standby philosophy, surge analysis (where required), and power-supply arrangements.

The pumping system shall be designed to ensure operational reliability, energy efficiency, ease of maintenance, and uninterrupted service during emergency conditions. Adequate standby pumping capacity and backup power arrangements shall be provided for critical infrastructure components. Variable Frequency Drives (VFDs), automation systems, and energy-efficient pumping solutions shall preferably be considered for optimized operation. A comprehensive list of all electro-mechanical components including the suggested brand/make etc. may be annexed with this DPR for their suitable references.

| Component         | Design Considerations                               |
|-------------------|-----------------------------------------------------|
| Pump Capacity     | Ultimate Design Flow                                |
| Pump head         | Static + Friction + Surge Conditions                |
| Redundancy        | Minimum N+1 philosophy                              |
| Surge protection  | Mandatory                                           |
| Energy Efficiency | IE3/IE4 motors, VFDs                                |
| Automation        | SCADA controlled                                    |
| Power reliability | Mandatory Power Back up & Dual feeder as applicable |

#### 4.7.5 Service Reservoirs (GSLR/ESR)

Ground-Level Service Reservoirs (GLSRs) and Elevated Service Reservoirs (ESRs) shall be planned based on pressure zoning, distribution-network hydraulics, topography, service coverage, and operational flexibility requirements. The DPR shall include reservoir-capacity calculations, locations, staging-height assessment, hydraulic integration, and service-zone delineation.

#### 4.7.6 Distribution Network

The distribution network shall be designed as a hydraulically efficient and operationally reliable system capable of supplying potable and non-potable water to all consumers within the industrial area. The DPR shall establish the network philosophy, zoning approach, pipe-sizing criteria, pressure-management strategy, material selection, and redundancy provisions. Hydraulic modelling using recognized software platforms such

as Water GEMS/EPANET/or equivalent shall be undertaken to validate system performance under peak-demand and firefighting conditions.

The potable Water network & Recycle water network shall be planned independently to avoid cross contamination. Both networks shall be developed as closed-loop distribution systems to ensure hydraulic reliability, operational flexibility, and continuity of supply. Appropriate provisions for emergency interconnections, isolation arrangements, and monitoring mechanisms shall be incorporated to facilitate system resilience and maintenance.

#### **4.7.7 Plot/Property Connections & metering**

The DPR shall establish the design philosophy and standard arrangements for plot/property connections including service connections, bulk metering, consumer metering, isolation valves, and utility-interface infrastructure. The connection system shall support accurate metering, operational isolation, ease of maintenance, and integration with smart utility-management systems. Separate provisions shall be mandatorily considered for potable and recycled-water supply systems as applicable.

#### **4.7.8 Valves & Chambers**

The DPR shall establish the requirement and placement philosophy for isolation valves, air valves, scour valves, pressure-reducing valves, flow-control valves, and associated chambers within the transmission and distribution network in accordance with CPHEEO guidelines and applicable codal provisions. Valve placement shall ensure operational flexibility, sectional isolation, pressure management, maintenance accessibility, and protection of the pipeline system.

Precast RCC valve chambers with suitable access arrangements shall preferably be adopted, wherever feasible, to facilitate faster construction, ease of maintenance, durability, and operational efficiency. Separate chamber covers with appropriate identification markings/colour coding for different valve types shall be considered for ease of operation, maintenance, and asset identification.

#### **4.7.9 Instrumentation, Automation & SCADA**

The DPR shall include the proposed automation and SCADA framework for real-time monitoring and control of the water-supply system. The automation architecture shall cover flow monitoring, pressure monitoring, reservoir-level monitoring, pump operation, energy monitoring, water-quality monitoring, and centralized data acquisition systems. The system shall support operational optimization, leak detection analytics, pressure optimization, remote operation, IoT enabled metering and predictive maintenance strategies.

The proposed utility system shall preferably support future integration with integrated Command & Control Centres (ICCC) and digital utility management platforms.

#### 4.7.10 Recycled Water System

The DPR shall establish the planning, design basis, operational philosophy, and integration framework for the recycled-water system proposed within the industrial/manufacturing cluster. The recycled-water system shall be planned to maximize reuse of treated wastewater and minimize dependence on freshwater sources, in line with sustainable water-management principles and applicable regulatory guidelines.

The DPR shall identify the proposed sources of recycled water, treatment standards, storage requirements, transmission arrangements, pumping requirements, distribution network, end-use applications, and quality-monitoring framework. Separate assessment shall be carried out for recycled-water demand for horticulture, utilities, flushing, cooling, process reuse, firefighting (where applicable), and other non-potable applications.

The recycled-water infrastructure shall preferably operate through a dedicated distribution network adequately segregated from the potable-water system to avoid cross-contamination. The DPR shall establish the reuse philosophy, storage balancing requirements, pressure-management strategy, redundancy provisions, and operational safeguards for the recycled-water system. The Storage & distribution of the Recycled water shall be separately considered.

The quality of recycled water shall conform to applicable standards and end-use requirements. Adequate monitoring, metering, automation, backflow-prevention measures, and identification protocols shall be incorporated within the system design. The DPR shall also establish the overall recycled-water utilization efficiency and reduction in freshwater dependency proposed under the project.

#### 4.8 O&M framework

The DPR shall establish a comprehensive operation and maintenance framework covering manpower deployment, preventive & predictive maintenance, asset management systems, reservoir cleaning, NRW reduction, emergency response, water-quality surveillance, Spare philosophy and SCADA operation.

| Category                            | Key Considerations                       |
|-------------------------------------|------------------------------------------|
| Preventive & Predictive Maintenance | Scheduled Program (Mandatory)            |
| Water Quality Testing               | Routine testing as per CPHEEO Guidelines |
| SCADA operation                     | Continuous Monitoring                    |
| Emergency Response                  | Contingency Plan                         |
| Energy Management                   | Efficient Tracking                       |
| <b>Spare Philosophy</b>             | Tentative schedule                       |

## 4.9 CAPEX & OPEX Assessment

This section shall establish the phase-wise Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) for the proposed water-supply infrastructure system. The assessment shall include all civil, electromechanical, transmission, storage, distribution, automation, utility, and allied infrastructure components required for development and operation of the complete system.

The cost estimation shall be based on applicable Schedule of Rates (SoR), approved market rates, recent comparable projects, or other accepted estimation methodologies adopted by the implementing agency. The DPR shall clearly specify the basis of estimation, year of pricing, contingencies, escalation provisions, and applicable taxes/duties considered in the cost assessment.

The CAPEX assessment shall cover intake systems, transmission mains, WTP, pumping systems, reservoirs, distribution network, valves and appurtenances, utility crossings, SCADA systems, electrical infrastructure, and associated site-development works. The OPEX assessment shall include power consumption, chemical consumption, manpower, preventive maintenance, laboratory testing, SCADA operation, and asset-maintenance requirements.

The DPR shall also establish phase-wise investment planning and assess long-term operational sustainability considering energy efficiency, NRW reduction, automation, recycled-water integration, lifecycle asset-management requirements & costing.

| Category                  | Key Considerations                                                                  |
|---------------------------|-------------------------------------------------------------------------------------|
| Civil Infrastructure      | WTP, reservoirs, chambers, buildings                                                |
| Pipeline Infrastructure   | Transmission & distribution network, Manholes, Chambers etc.                        |
| Electromechanical Systems | Pumps, motors, Valves, electrical systems etc,                                      |
| Automation & SCADA        | Monitoring and control systems                                                      |
| Metering Systems          | Bulk & Plot level Metering                                                          |
| Utility Infrastructure    | Power supply and utility works                                                      |
| O&M Cost                  | Power, chemicals, manpower, maintenance                                             |
| Lifecycle Replacement     | Long-term asset replacement provision, Asset depreciation, Inflation & escalations. |

## 4.10 Checklist for Mandatory Deliverables.

The DPR shall include all technical deliverables, design documents, calculations, drawings, investigations, approvals, and supporting studies necessary for technical appraisal, implementation, operation, and future reference of the proposed water-supply system. All submissions shall be consistent with the adopted design criteria,

phase-wise demand assessment, hydraulic analysis, recycled-water integration framework, and applicable CPHEEO/BIS standards adopted under the DPR.

| Sl. No | Deliverables                                                                              | Checks                   |
|--------|-------------------------------------------------------------------------------------------|--------------------------|
| 1      | Water Demand Assessment (Phase-wise & Ultimate)                                           | <input type="checkbox"/> |
| 2      | Industrial Water Benchmarking & KL/Ha/day Basis (Annexure)                                | <input type="checkbox"/> |
| 3      | Adopted Design Criteria & Engineering Standards                                           | <input type="checkbox"/> |
| 4      | Water Balance Diagram (Freshwater + Recycled Water System)                                | <input type="checkbox"/> |
| 5      | Raw Water Quality Investigation Report (NABL Accredited)                                  | <input type="checkbox"/> |
| 6      | Source Allocation / Water Abstraction NOC & Statutory Clearances                          | <input type="checkbox"/> |
| 7      | Hydraulic Design Calculations                                                             | <input type="checkbox"/> |
| 8      | Hydraulic Model Files/Outputs (Peak & Fire Demand Conditions)                             | <input type="checkbox"/> |
| 9      | Pumping System Design Calculations (Head, Discharge, Redundancy) & Surge Analysis report. | <input type="checkbox"/> |
| 10     | Water Treatment Plant Design Report (Process + Unit Sizing)                               | <input type="checkbox"/> |
| 11     | Reservoir & Storage Sizing Calculations (Including Fire Reserve)                          | <input type="checkbox"/> |
| 12     | Distribution Network Design (Zoning, DMA, Pressure Management) & surge analysis report    | <input type="checkbox"/> |
| 13     | Valve & Appurtenance Schedule with Chamber Details                                        | <input type="checkbox"/> |
| 14     | Recycled Water System Design (Separate Network & Reuse Plan)                              | <input type="checkbox"/> |
| 15     | SCADA & Automation Architecture (Monitoring & Control Framework & Functional Philosophy)  | <input type="checkbox"/> |
| 16     | Utility Corridor Layouts & Crossing Details (Road/Rail/Utilities)                         | <input type="checkbox"/> |
| 17     | Engineering Drawings (GA, Plan, Profile, Sections, Schematics)                            | <input type="checkbox"/> |
| 18     | BOQ & Detailed Cost Estimates (CAPEX & OPEX)                                              | <input type="checkbox"/> |
| 19     | Implementation Phasing Plan Linked to Demand Growth                                       | <input type="checkbox"/> |
| 20     | Operation & Maintenance Framework (Asset & System Management)                             | <input type="checkbox"/> |
| 21     | Any other which shall be deemed applicable.                                               | <input type="checkbox"/> |
|        |                                                                                           | <input type="checkbox"/> |

### 1. DESIGN BASIS



- 30-year planning horizon
- Phase-wise expansion
- Future-ready approach

### 2. SOURCE & QUALITY



- Source reliability
- Water quality compliance
- Approval status

### 3. TREATMENT (WTP)



- Capacity & process
- Disinfection system
- Expansion provision

### 4. STORAGE & PUMPING



- Raw & treated storage
- Pump capacity
- Redundancy

### 5. PEAK FACTOR



- Demand variation
- Peak load analysis
- Design consideration

### 6. DISTRIBUTION NETWORK



- Pipe sizing & layout
- Pressure zones
- Valves & metering

### 7. RECYCLED WATER



- Non-potable reuse
- Separate network
- Application areas

### 8. O&M + MONITORING



- SCADA integration
- Leakage control
- Maintenance plan

---

## Chapter 5: Sewerage & Industrial Effluent System

---

## **5.1 About this Chapter:**

This chapter outlines the technical requirements, planning philosophy, engineering expectations, design governance framework, and minimum deliverables for preparation of the Sewerage Network, Sewage Treatment Plant (STP), and Common Effluent Treatment Plant (CETP) components of the Detailed Project Report (DPR) for integrated industrial/manufacturing clusters under the Scheme.

The chapter is intended to function as a technical guidance document and DPR preparation framework for planning, design, appraisal, implementation, operation, maintenance, and evaluation of sewerage and wastewater-management infrastructure systems within Industrial Cities, Industrial Manufacturing Clusters, Integrated Industrial Townships, Industrial Parks, and associated economic-development zones.

The DPR shall demonstrate that the proposed scheme is capable of adequately collecting, conveying, treating, reusing, and safely disposing the projected domestic sewage and industrial effluent generated within the Industrial Park across all phases of development and up to the adopted design horizon.

The DPR shall further establish that the proposed sewerage and wastewater-management infrastructure has been planned to maximize treated-water reuse potential, reduce dependency on freshwater sources, improve overall water-use efficiency, and promote sustainable industrial-water management practices.

The proposed planning approach shall, wherever technically and economically feasible, incorporate principles of Zero Liquid Discharge (ZLD) wherever applicable, circular water economy, wastewater recycling, and resource recovery in accordance with applicable environmental regulations, CPCB/SPCB requirements, and long-term sustainability objectives of the Industrial City.

## **5.2 Concept Note:**

The Sewerage Network, Sewage Treatment Plant (STP), and Common Effluent Treatment Plant (CETP) infrastructure for the proposed Industrial Park shall be planned as an integrated wastewater-management utility system designed to ensure safe collection, conveyance, treatment, reuse, and disposal of domestic sewage, industrial effluent, commercial wastewater, and utility wastewater generated within the planning area.

The proposed infrastructure shall be planned to support the projected development of the Industrial Park across all phases and up to the adopted design horizon while ensuring compliance with applicable environmental regulations, service-level benchmarks, and operational-performance requirements.

The proposed system architecture shall broadly comprise underground sewerage collection networks, trunk and interceptor sewer systems, industrial effluent conveyance systems, sewage and effluent pumping stations, rising mains, Sewage

Treatment Plants (STPs), Common Effluent Treatment Plants (CETPs), sludge-management systems, treated-water storage systems, recycled-water distribution systems, odour-control systems, instrumentation systems, and SCADA-based monitoring and control systems.

The planning philosophy shall prioritize:

- Environmentally compliant wastewater management
- Maximization of gravity-based conveyance systems
- Segregation of domestic sewage and industrial effluent streams
- Reliable and energy-efficient operation
- Minimization of untreated discharge and overflow conditions
- Maximization of treated-water reuse potential
- Reduction in freshwater dependency
- Lifecycle operational sustainability
- Ease of operation and maintenance
- Provision for future scalability and phased expansion

Wastewater generation assessment shall be derived from the approved land-use pattern, industrial typologies, process-water requirements, worker population, utility demand, commercial activities, development phasing, and applicable planning norms and benchmarks. Separate assessment and infrastructure planning shall be undertaken for domestic sewage systems, industrial effluent systems, and recycled-water systems.

The proposed sewerage and wastewater-treatment infrastructure shall be planned using appropriate hydraulic analysis, process-design methodology, and engineering assessment tools in accordance with CPHEEO guidelines, CPCB/SPCB requirements, BIS standards, environmental regulations, and applicable service-level benchmarks.

The DPR shall establish the technical basis, planning framework, design methodology, infrastructure configuration, operational philosophy, treatment strategy, reuse framework, implementation approach, and long-term sustainability measures proposed for the sewerage, STP, and CETP systems.

### **5.3 Design Basis**

This section shall establish the overall planning philosophy, hydraulic criteria, treatment framework, operational requirements, environmental objectives, and infrastructure-planning principles adopted for the proposed Sewerage Network, Industrial Effluent Conveyance Network, Sewage Treatment Plant (STP), and Common Effluent Treatment Plant (CETP) systems under the DPR.

The DPR shall clearly establish the engineering rationale and technical basis adopted for assessment of domestic sewage generation, industrial effluent generation, hydraulic conveyance planning, industrial wastewater segregation, treatment-process

selection, treated-water reuse, sludge management, operational reliability, and future scalability of the proposed wastewater-management infrastructure for the Industrial City.

The proposed infrastructure shall be planned considering the approved land-use pattern, industrial typologies, worker population, process-water requirements, utility demand, development phasing, environmental obligations, and ultimate development potential of the Industrial City. The planning approach shall aim to ensure environmentally compliant, operationally reliable, hydraulically efficient, and sustainable wastewater management across all phases of development and up to the adopted design horizon.

The proposed wastewater-management framework shall broadly comprise underground sewerage networks, industrial effluent conveyance systems, trunk and interceptor sewer systems, effluent conveyance mains, sewage and effluent pumping stations, rising mains, STP infrastructure, CETP infrastructure, sludge-management systems, treated-water reuse systems, monitoring infrastructure, and SCADA-based operational-control systems.

### **5.3.1 Planning Horizon & Development Phasing**

The DPR shall define the adopted planning horizon, intermediate stages of infrastructure augmentation, and phase-wise development strategy for the proposed sewerage and industrial effluent-management infrastructure. The adopted planning framework shall be aligned with the approved master plan, industrial-development strategy, projected wastewater generation, and long-term infrastructure requirements of the Industrial City.

The proposed infrastructure systems shall be planned with adequate provision for phased implementation and future expansion without major disruption to the operational network. The DPR shall clearly identify the base year, intermediate development phases, ultimate design year, and corresponding infrastructure-capacity requirements proposed under each development stage.

### **5.3.2 Wastewater Generation & Hydraulic Design Basis**

The DPR shall establish the methodology, assumptions, norms, and design criteria adopted for assessment of domestic sewage generation, industrial effluent generation, commercial wastewater generation, utility wastewater generation, infiltration allowance, recycle streams, and peak-flow conditions.

Wastewater generation assessment shall be based on the approved land-use distribution, industrial typologies, process-water intensity, worker population, utility demand, applicable planning benchmarks, and projected development pattern of the Industrial City. Separate assessment shall be undertaken for domestic sewage systems, industrial effluent systems, and treated-water reuse systems wherever applicable.

The DPR shall clearly establish the adopted Average Daily Flow (AF), Maximum Daily Flow (MF), Peak Hourly Flow (PF), ultimate design flow, sewage-return factors, infiltration allowances, and peak-flow factors considered for hydraulic design of the sewerage and industrial effluent conveyance systems.

The hydraulic design philosophy shall prioritize gravity-based conveyance systems to the maximum extent feasible while ensuring adequate carrying capacity, self-cleansing velocity, prevention of surcharge conditions, operational reliability, and provision for future expansion.

### **5.3.3 Sewerage & Industrial Effluent Network Planning Philosophy**

The DPR shall establish the overall planning philosophy for the underground sewerage network and industrial effluent conveyance network, including catchment delineation, sewerage zoning, industrial drainage zoning, hierarchy of branch, sub-trunk, trunk, and interceptor systems, pumping requirements, utility-corridor integration, and future connectivity provisions.

The planning approach shall prioritize segregation of domestic sewage and industrial effluent streams wherever technically and operationally required, considering industrial typologies, effluent characteristics, environmental requirements, treatment compatibility, and long-term operational sustainability.

The DPR shall establish the adopted pipe-material selection philosophy considering hydraulic performance, structural requirements, corrosion resistance, industrial effluent characteristics, soil conditions, installation methodology, lifecycle performance, and maintenance requirements.

The proposed network planning shall also consider accessibility for inspection and maintenance, reduction of pumping dependency, minimization of operational risk, and compatibility with phased urban and industrial development.

### **5.3.4 Industrial Effluent Management policy**

Industrial effluent generated from manufacturing, process, utility, and associated industrial activities within the Industrial Park shall be collected and conveyed through a dedicated industrial effluent conveyance system separate from the domestic sewerage network.

The DPR shall establish the industrial typologies proposed within the planning area, anticipated effluent characteristics, source-level pretreatment requirements, industrial discharge standards, equalization requirements, and the overall framework adopted for collection, conveyance, monitoring, treatment, reuse, and disposal of industrial effluent.

The proposed industrial effluent management framework shall be planned considering treatment compatibility, environmental-compliance requirements, operational safety, lifecycle sustainability, and integration with the proposed CETP infrastructure.

The DPR shall also establish the provisions proposed for industrial discharge monitoring, pretreatment compliance, emergency isolation, and online monitoring systems in accordance with applicable CPCB/SPCB regulations and environmental standards.

### **5.3.5 Treatment Philosophy & Technology Selection**

The DPR shall establish the treatment philosophy and technical basis adopted for selection of the proposed STP and CETP systems. The proposed treatment framework shall be developed considering influent wastewater characteristics, hydraulic loading, organic loading, variability in industrial effluent, treated-water reuse requirements, land availability, environmental-compliance requirements, energy consumption, operational reliability, and lifecycle sustainability.

The DPR shall include comparative assessment of suitable treatment technologies and establish the engineering basis adopted for selection of the proposed treatment process. The selected treatment system shall be technically justified with respect to treatment efficiency, operational flexibility, automation requirements, sludge generation characteristics, energy efficiency, ease of operation and maintenance, treated-water quality objectives, and long-term scalability.

The DPR shall also establish the proposed treatment-train configuration including preliminary treatment, primary treatment, biological treatment, tertiary treatment, disinfection systems, sludge-handling systems, odour-control systems, chemical-dosing systems, and treated-water reuse infrastructure.

### **5.3.6 Treated Water Reuse Policy**

The DPR shall establish the treated-water reuse strategy proposed for the Industrial Park with the objective of maximizing wastewater recycling, reducing freshwater dependency, improving water-use efficiency, and promoting sustainable industrial-water management practices.

The proposed reuse framework shall identify the potential applications of recycled water including industrial process requirements, utility-water demand, cooling-water systems, landscaping, horticulture, firefighting storage, and other non-potable applications wherever feasible.

The DPR shall establish the adopted treated-water quality requirements, reuse-demand assessment, recycled-water storage systems, pumping requirements, distribution-network arrangements, quality-monitoring systems, metering systems, and cross-connection prevention measures proposed under the scheme.

The planning approach shall prioritize development of a dedicated recycled-water distribution network segregated from the potable-water network to prevent contamination and ensure operational reliability.

The DPR shall also establish a water reuse hierarchy and assess the feasibility of utilizing treated wastewater across various applications in accordance with the following planning principles:

| <b>Application</b>                                           | <b>Reuse requirement</b>                                                  |
|--------------------------------------------------------------|---------------------------------------------------------------------------|
| <b>Landscaping, Green belts &amp; horticulture</b>           | Mandatory                                                                 |
| <b>Toilet Flushing &amp; other non-potable sanitary uses</b> | Mandatory                                                                 |
| <b>HVAC/Air-conditioning system</b>                          | Mandatory (Subject to water quality requirements)                         |
| <b>Cooling Tower make up water</b>                           | Mandatory (Subject to water quality requirements)                         |
| <b>Construction, road washing etc.</b>                       | Mandatory (wherever applicable)                                           |
| <b>Process Cooling water</b>                                 | Preferred                                                                 |
| <b>Boiler feed water</b>                                     | Preferred (after tertiary treatment/advance treatment as applicable)      |
| <b>Industrial Process water</b>                              | To be assessed based on specific process based water quality requirements |

### **5.3.7 Sludge Management Philosophy**

The DPR shall establish the sludge-management framework proposed for handling sludge generated from STP and CETP systems. The proposed sludge-management strategy shall consider sludge generation quantity, sludge characteristics, stabilization requirements, dewatering requirements, storage arrangements, transportation methodology, treatment requirements, disposal mechanisms, and opportunities for resource recovery wherever feasible.

The DPR shall establish the proposed sludge-thickening systems, sludge-drying arrangements, mechanical dewatering systems, sludge-handling infrastructure, temporary storage facilities, and final disposal arrangements proposed under the scheme.

The adopted sludge-management framework shall comply with applicable environmental regulations, CPCB/SPCB guidelines, hazardous-waste-management provisions wherever applicable, and other statutory requirements governing sludge handling and disposal.

### **5.3.8 Redundancy & Emergency Management**

The DPR shall establish the reliability and redundancy philosophy adopted for critical sewerage, pumping, treatment, monitoring, and utility systems proposed under the scheme.

The DPR shall clearly identify redundancy provisions proposed for pumping systems, treatment units, standby power systems, instrumentation systems, SCADA systems, chemical-dosing systems, critical pipelines, and other critical infrastructure

components to ensure uninterrupted operation during equipment failure, maintenance shutdowns, or emergency conditions.

The proposed framework shall also establish emergency bypass philosophy, overflow-management measures, emergency-storage provisions, flood-protection measures, backup power arrangements, alarm systems, emergency-response procedures, and contingency-management mechanisms proposed for the wastewater-management infrastructure.

### **5.3.9 Digital Utility, Automation & Smart Infrastructure Framework**

The DPR shall establish the proposed automation and smart utility-management framework for the sewerage network, industrial effluent systems, pumping stations, STP, CETP, and recycled-water infrastructure proposed under the Industrial City. The proposed framework shall aim to improve operational efficiency, infrastructure reliability, environmental compliance, energy management, preventive maintenance, utility monitoring, and lifecycle sustainability of the wastewater-management systems.

The proposed framework shall establish the SCADA architecture, instrumentation systems, online monitoring systems, centralized operational-control systems, smart metering systems, GIS-based utility mapping systems, and digital asset-management philosophy proposed for monitoring and management of the wastewater-management infrastructure.

The DPR shall also establish the proposed framework for integration of automation systems, online flow and water-quality monitoring systems, alarm-management systems, data-acquisition systems, communication systems, and centralized utility-management systems for efficient operation and regulatory compliance of the proposed infrastructure.

The proposed automation and smart utility-management framework shall be planned considering operational reliability, interoperability, scalability, redundancy requirements, ease of maintenance, cybersecurity considerations, future expansion requirements, and compatibility with long-term smart industrial-city infrastructure objectives.

### **5.3.10 Sustainability & Resource Efficiency Measures**

The DPR shall establish the sustainability measures proposed for water conservation, energy-efficient operations, reuse optimization, resource recovery, climate resilience, and long-term environmental performance of the Water Supply system.

### **5.3.11 Industrial Water Pretreatment Policy**

The DPR shall establish the industrial wastewater pretreatment philosophy, identifying industries requiring source-level pretreatment prior to discharge into the common conveyance or treatment system. The framework shall define influent quality requirements, discharge standards, and pretreatment measures including equalization

at plot level, pH neutralization, oil and grease removal, heavy metal removal, toxic stream segregation, shock-load attenuation, and other industry-specific treatment requirements, as applicable. The DPR shall also define provisions for flow measurement, online monitoring, compliance verification, and admission control to protect downstream conveyance, treatment, recycling, and disposal infrastructure.

#### **5.3.12 Applicable Codes, Standards & Technical References**

The DPR shall clearly identify all applicable codes, standards, technical manuals, environmental regulations, statutory provisions, and engineering references adopted for planning, design, construction, operation, and maintenance of the proposed sewerage and wastewater-management infrastructure.

The adopted references shall generally include CPHEEO guidelines, BIS standards, CPCB/SPCB regulations, MoEFCC requirements, electrical safety regulations, environmental standards, industrial wastewater-management guidelines, and other applicable statutory and technical provisions relevant to the proposed infrastructure systems.

All hydraulic analysis, treatment-process design, equipment selection, utility planning, structural design, electrical systems, automation systems, environmental-compliance systems, and operational frameworks proposed under the DPR shall conform to the adopted standards and applicable regulatory requirements.

#### **5.4 Service Level Benchmarks**

The DPR shall establish the proposed service-level benchmarks for the Sewerage Network, Industrial Effluent Conveyance Network, STP, CETP, treated-water reuse systems, and associated wastewater-management infrastructure proposed under the scheme. The adopted benchmarks shall be aligned with applicable CPHEEO guidelines, CPCB/SPCB requirements, environmental regulations, MoEFCC provisions, and other applicable standards and statutory requirements relevant to sewerage and industrial wastewater-management infrastructure.

The proposed service-level benchmarks shall form the basis for planning, design, sizing, performance assessment, operational monitoring, infrastructure evaluation, environmental compliance, and long-term asset management of the proposed wastewater-management systems for the Industrial City.

The adopted benchmarks shall aim to ensure safe collection, conveyance, treatment, reuse, and disposal of domestic sewage and industrial effluent while minimizing environmental impact, reducing freshwater dependency, improving operational efficiency, and promoting sustainable and circular water-management practices. The planning framework shall incorporate Zero Liquid Discharge (ZLD) principles as a

mandatory consideration for industrial wastewater management and treated-water reuse planning under the proposed development.

Indicative service-level benchmarks to be adopted under the DPR are provided below. The DPR may suitably refine the benchmarks based on project-specific requirements, industrial typologies, statutory obligations, environmental-clearance conditions, and applicable regulatory provisions.

| Sl. No | Service Level Benchmarks (SLBs)                                             | Indicative Benchmarks                          |
|--------|-----------------------------------------------------------------------------|------------------------------------------------|
| 1      | Sewerage & Industrial Effluent Collection Coverage                          | 100%                                           |
| 2      | Collection efficiency of Sewerage Network                                   | 100%                                           |
| 3      | Adequacy of Sewerage treatment Capacity                                     | 100%                                           |
| 4      | Quality of Sewerage Treatment – Treatment Compliance as per CPCB/SPCB norms | 100%                                           |
| 5      | Extent of Treated water Reuse                                               | ≥50%                                           |
| 6      | Extent of Cost Recovery in Waste water Management                           | 100%                                           |
| 7      | Efficiency in redressal of customer complaints                              | ≥ 90%                                          |
| 8      | Efficiency in collection of Sewage Water charges                            | 90%                                            |
| 9      | Segregation of Domestic Sewerage & industrial effluent                      | Mandatory                                      |
| 10     | Untreated Waste water Discharge/Bypass                                      | Nil                                            |
| 11     | Overflow incidence                                                          | Nil<br>(in all design conditions)              |
| 12     | SCADA & Online Monitoring Coverage                                          | Mandatory                                      |
| 13     | Standby Power Availability                                                  | Mandatory<br>(for all critical facilities)     |
| 14     | Redundancy for all Critical equipment                                       | Mandatory<br>(N+1 Philosophy)                  |
| 15     | Odor Control Provisions                                                     | Mandatory<br>(for all critical facilities)     |
| 16     | Sludge-Disposal Compliance                                                  | 100%                                           |
| 17     | Online Flow & quality Monitoring                                            | 100% at defined locations                      |
| 18     | Emergency Storage/Bypass provisions                                         | Mandatory                                      |
| 19     | Asset Accessibility for O&M                                                 | 100%                                           |
| 20     | Environmental Compliance                                                    | Mandatory as per<br>CPCB/SPCB/Other guidelines |
| 21     | Zero liquid Discharge Framework                                             | Industry specific                              |
| 22     | CETP uptime                                                                 | ≥95%                                           |

|    |                         |                                            |
|----|-------------------------|--------------------------------------------|
| 23 | Industrial Pretreatment | Mandatory (Industry specific requirements) |
|----|-------------------------|--------------------------------------------|

The DPR shall provide a comparative statement indicating the adopted service-level benchmarks, proposed design provisions, compliance methodology, monitoring mechanisms, operational framework, and performance-monitoring arrangements proposed for achieving the identified service standards under the project. Any deviation from the indicative service-level benchmarks shall be explicitly identified and technically justified within the DPR, along with the corresponding mitigation measures, operational implications, and project-specific constraints considered while adopting such deviations.

## 5.5 Adopted Design Standards & Norms

This section shall summarize the design standards, codes, guidelines, reference manuals, and planning norms adopted for preparation of the Water Supply DPR. The objective of this section is to establish a consolidated technical reference framework for all design parameters and infrastructure components, thereby avoiding repetitive citation of standards in subsequent sections of the DPR.

The DPR shall clearly identify the adopted design criteria, corresponding reference standards, and applicable codal provisions for individual system components. In cases where project-specific requirements necessitate deviation from standard codal provisions or commonly adopted engineering practices, the DPR shall provide adequate technical justification and supporting rationale for such deviations.

The following codes, standards, manuals, guidelines, and references may be considered during preparation of the DPR, including but not limited to:

### 5.5.1 Design Period

| Component                                            | Reference Code / Manual                 | Commonly adopted Design Period |
|------------------------------------------------------|-----------------------------------------|--------------------------------|
| Sewerage & Industrial Effluent Conveyance Network    | CPHEEO Manual                           | 30 Years                       |
| STP/CETP/Pumping Stations (Civil)                    | CPHEEO Manual                           | 30 Years                       |
| STP/CETP/Pumping Stations (Process & E&M components) | CPHEEO Manual                           | 15 Years                       |
| Rising Mains                                         | CPHEEO Manual                           | 30 years                       |
| Sludge Handling System                               | Industry Practices                      | 15 years                       |
| SCADA, Instrumentation & Automation Systems          | Industry Practice / OEM Recommendations | 10-15 years                    |

### 5.5.2 Wastewater generation & treatment criteria

| Component                         | Reference Code / Manual                        | Commonly adopted criteria                                                       |
|-----------------------------------|------------------------------------------------|---------------------------------------------------------------------------------|
| Domestic Sewage generation factor | CPHEEO Manual;                                 | Generally, 80% of Fresh water demand                                            |
| Industrial effluent generation    | CPHEEO Manual/Industry assessment              | Generally, 75% of Fresh water Demand                                            |
| Peak Factor- Sewerage             | CPHEEO Manual                                  | 2.5<br>(varies with population)                                                 |
| Peak Factor- Industrial           | CPHEEO Manual                                  | 3.0<br>(Varies as per Industry types)                                           |
| STP/CETP treatment Efficiency     | CPHEEO Manual/ Industry Practices              | 100%                                                                            |
| ZLD adherence                     | CPCB/SPCB guidelines                           | As per Industry Specific requirements                                           |
| Treated Water Reuse               | CPCB/SPCB Guidelines                           | To be Maximized. Options to be explored for industrial process application also |
| Sludge Handling & Disposal        | CPHEEO Manual/CPCB/SPCB/ Hazardous Waste Rules | Mandatory & 100% compliance                                                     |

The above values are indicative planning criteria generally adopted for preparation of DPRs. The final adopted values shall be based on applicable standards, project-specific requirements, industrial typologies, development characteristics, sustainability objectives, and engineering assessment.

### 5.5.3 Network Design Parameters

| Component                                              | Reference Code / Manual | Commonly adopted criteria                                                                          |
|--------------------------------------------------------|-------------------------|----------------------------------------------------------------------------------------------------|
| Hydraulic Design Formula (Gravity Sewer network)       | CPHEEO Manual           | Manning's Formula (commonly adopted)                                                               |
| Hydraulic Design Formula (Rising Main/Pumping network) | CPHEEO Manual;          | Hazen–Williams and/or Darcy–Weisbach equation.                                                     |
| Minimum Self cleansing Velocity                        | CPHEEO Manual           | ≥ 0.6 m/s                                                                                          |
| Maximum Velocity                                       | CPHEEO Manual           | 3.0 m/s<br>As per adopted pipe materials & hydraulic Designs                                       |
| Minimum Pipe Diameter – Sewerage                       | CPHEEO Manual           | Generally, 200mm                                                                                   |
| Minimum Pipe Diameter – Industrial Effluent            | CPHEEO Manual           | Generally, 160mm                                                                                   |
| Capacity of Sewer                                      | CPHEEO Manual           | Max. 0.80 times diameter at Ultimate peak flow                                                     |
| Depth of Cover                                         | CPHEEO Manual           | Generally, ≥1.0 m from pipe crown, subject to road classification and utility corridor requirement |
| Infiltration & Inflow                                  | CPHEEO Manual           | Minimum – 5000 L/Ha/day                                                                            |

|                                    |                                          |                                                                               |
|------------------------------------|------------------------------------------|-------------------------------------------------------------------------------|
|                                    |                                          | Minimum- 500 L/Km of Sewer /day<br>Minimum 250/L/day/manhole                  |
| Network Configuration              | Industry Practice                        | Close-loop Network, Gravity Based System at maximum feasible extent           |
| Pipe Materials – Rising Mains      | CPHEEO Manual;<br>Relevant BIS Standards | DI or equivalent, based on hydraulic, structural, and operational requirement |
| Pipe Materials – Conveyance System | CPHEEO Manual;<br>Relevant BIS Standards | DI, HDPE or equivalent, based on pressure class and network requirements      |
| Manhole Spacing                    | CPHEEO Manual                            | Within 30m for Sewerage/effluent carrying Pipes.                              |
| Pumping Operation Hours            | CPHEEO Manual                            | 24 Hours (with Standby arrangements)                                          |
| Type of Pumps                      | Project Specific                         | Preferably VFD                                                                |
| Standby Pumping provisions         | CPHEEO Manual                            | Minimum 1 Standby unit for All pumping systems                                |
| Power Backup                       | Project Specific                         | 100% backup for critical facilities                                           |

#### 5.5.4 STP, CETP Process Design parameters

| Component                      | Reference Code / Manual               | Commonly adopted criteria                                     |
|--------------------------------|---------------------------------------|---------------------------------------------------------------|
| Treatment Technology Selection | Best Industry Practice/ CPHEEO Manual | Suitable based on influent & treated water Characteristics    |
| Equalization Provision         | Best Industry Practices               | Mandatory for CETP system                                     |
| Preliminary treatment Units    | CPHEEO Manual                         | Mandatory                                                     |
| Biological Treatment system    | CPHEEO Manual                         | As per the influent characteristics/adopted treatment process |
| Tertiary Treatment System      | CPCB/ Reuse Requirements              | As per treated water reuse applications                       |
| Sludge Management system       | Best Industry Practices               | Mandatory as per requirements                                 |
| Odour control units            | Best Industry Practices               | Mandatory for critical units                                  |
| Automation & monitoring        | CPHEEO Manual                         | Mandatory                                                     |

#### 5.5.5 Materials, Valves & appurtenances

| Component | Reference Code / Manual | Commonly adopted criteria |
|-----------|-------------------------|---------------------------|
|-----------|-------------------------|---------------------------|

|                     |               |                                                                      |
|---------------------|---------------|----------------------------------------------------------------------|
| DI Pipes            | IS 8329       | May be adopted for Rising Mains / pumping Lines                      |
| HDPE Pipes          | IS 14333      | May be adopted for conveyance system.                                |
| Butterfly Valves    | IS 13095      | As per requirements                                                  |
| Sluice/ Gate Valves | IS 14846      | As per requirements                                                  |
| Air Valves          | IS 14845      | As per requirements                                                  |
| Di Fittings         | IS 9523       | For DI Pipes                                                         |
| Valve Chambers      | CPHEEO Manual | Preferable RCC Chambers with Maintenance & accessibility provisions. |

The above values are indicative planning and design criteria generally adopted for preparation of DPRs for industrial wastewater-management infrastructure. The final adopted values shall be based on applicable standards, project-specific requirements, industrial typologies, environmental obligations, sustainability objectives, operational philosophy, treatment requirements, and detailed engineering assessment carried out.

## 5.6 Design of Major Project Components

This section shall establish the technical configuration, sizing philosophy, hydraulic integration, treatment framework, redundancy provisions, operational philosophy, and implementation strategy for all major components of the proposed Sewerage Network, Industrial Effluent Conveyance Network, STP, CETP, treated-water reuse systems, and associated wastewater-management infrastructure under the DPR.

The DPR shall demonstrate that the proposed infrastructure is adequately sized for phase-wise and ultimate design-flow conditions and is capable of ensuring reliable, environmentally compliant, energy-efficient, operationally sustainable, and scalable wastewater-management performance across the Industrial City.

The DPR shall include component-wise design basis, engineering calculations, hydraulic assessments, treatment-process design, equipment sizing, layout drawings, operational philosophy, redundancy provisions, utility integration requirements, and performance criteria for all major infrastructure systems proposed under the project.

The proposed infrastructure planning shall establish the technical basis and design framework for sewerage collection systems, industrial effluent conveyance systems, trunk and interceptor systems, pumping stations, rising mains, STP infrastructure, CETP infrastructure, equalization systems, sludge-management systems, treated-water reuse systems, SCADA systems, electrical systems, odour-control systems, and associated utility infrastructure proposed under the scheme.

### **5.6.1 Design of Wastewater Collection System**

The DPR shall establish the planning criteria, hydraulic design basis, alignment philosophy, construction methodology, and operational framework adopted for the proposed sewerage collection system and industrial effluent conveyance system with due reference to the adopted standards, codes, manuals, and norms specified in the previous sections of the DPR. The DPR shall generally address the following design aspects for the wastewater collection system:

#### **5.6.1.1 Design Period:**

The adopted design period for sewerage and industrial effluent conveyance systems shall be established in accordance with CPHEEO guidelines and the overall project development horizon.

#### **5.6.1.2 Peak Factor:**

The DPR shall establish the adopted peak factors for domestic sewage and industrial effluent systems considering population characteristics, industrial variability, and operational conditions.

#### **5.6.1.3 Minimum & Maximum Velocity of Flow:**

The adopted hydraulic velocity criteria shall ensure self-cleansing conditions while preventing scouring, erosion, sediment deposition, and excessive head loss within the network.

#### **5.6.1.4 Minimum Size of Sewer / Effluent Line:**

The DPR shall establish the minimum permissible pipe diameter considering hydraulic performance, maintenance accessibility, blockage prevention, and future scalability.

#### **5.6.1.5 Hydraulic Design Formula:**

The DPR shall establish the adopted hydraulic design methodology and equations for gravity-flow and pressure systems with reference to applicable CPHEEO guidelines and engineering standards.

#### **5.6.1.6 Horizontal Alignment Criteria:**

The DPR shall establish the alignment philosophy considering ROW availability, utility corridors, accessibility, road hierarchy, future maintenance requirements, and constructability considerations.

#### **5.6.1.7 Vertical Alignment Criteria:**

The adopted vertical alignment shall consider gravity-flow optimization, utility crossings, minimum cover requirements, outfall integration, and pumping minimization philosophy.

#### **5.6.1.8 Sewer Gradient:**

The DPR shall establish the adopted gradient criteria required for maintaining design velocity and hydraulic performance within the network.

**5.6.1.9 Flooding & Ponding Areas:**

The proposed alignment shall consider flood-prone areas, waterlogging zones, drainage constraints, and operational-risk conditions.

**5.6.1.10 Bedding & Backfilling:**

The DPR shall establish the adopted bedding, pipe-support, and backfilling methodology considering soil conditions, loading conditions, groundwater conditions, and pipe-material requirements.

**5.6.1.11 Minimum Clearance & Pipe Position within ROW:**

The DPR shall establish the minimum horizontal and vertical clearances from other utilities and the adopted utility-corridor positioning philosophy.

**5.6.1.12 Property / Plot Connections:**

The DPR shall establish the criteria adopted for plot connections, industrial connections, inspection chambers, and interface arrangements with the trunk system.

**5.6.1.13 Pipes & Appurtenances:**

The DPR shall establish the criteria adopted for selection of pipes, specials, valves, fittings, and associated network appurtenances.

**5.6.1.14 Pipe Materials:**

The DPR shall undertake a comparative technical assessment of alternative pipe materials proposed for sewerage and industrial effluent conveyance systems considering hydraulic performance, corrosion resistance, structural strength, lifecycle cost, constructability, maintenance requirements, soil conditions, effluent characteristics, pressure conditions, and long-term operational suitability. The final selection of pipe materials shall be technically justified based on the adopted design criteria and project-specific requirements.

**5.6.1.15 Pipe Laying & Jointing:**

The DPR shall establish the construction methodology, jointing system, leakage-control measures, and installation requirements proposed for the network.

**5.6.1.16 Manholes:**

The DPR shall establish the planning criteria, spacing philosophy, accessibility requirements, and structural considerations adopted for manhole systems.

**5.6.1.17 Types of Manholes:**

The DPR shall establish the applicability and use of standard, drop, junction, inspection, and special manhole arrangements proposed under the project.

**5.6.1.18 Size of Manholes:**

The adopted manhole sizing criteria shall be established considering pipe diameter, depth, maintenance accessibility, and operational requirements.

**5.6.1.19 Drop Manholes:**

The DPR shall establish the criteria adopted for provision of drop arrangements under steep-gradient or level-difference conditions.

**5.6.1.20 Junction Manholes:**

The DPR shall establish the planning criteria adopted for junctions between branch, sub-trunk, and trunk systems.

**5.6.1.21 Side Entry Manholes:**

The DPR shall establish the applicability and planning criteria for side-entry arrangements wherever required.

**5.6.1.22 Manhole Covers & Frames:**

The DPR shall establish the adopted loading standards, material specifications, and accessibility requirements for manhole covers and frames.

**5.6.1.23 Rungs / Access Systems:**

The DPR shall establish the access provisions and safety arrangements proposed for deep manholes and maintenance access.

**5.6.1.24 Road & Utility Crossings:**

The DPR shall establish the methodology adopted for crossings of roads, drains, railways, utility corridors, and other infrastructure interfaces.

**5.6.1.25 Layout & Network Plan:**

The DPR shall include layout drawings, network plans, hydraulic profiles, utility integration details, and longitudinal sections required for establishing the technical adequacy of the proposed system.

**5.6.1.26 Smart Monitoring & GIS Integration Systems:**

The DPR shall establish the proposed framework for integration of sewerage & industrial effluent conveyance system with SCADA system, online flow monitoring system, smart metering system, GIS-based utility mapping system, digital asset management and centralized utility monitoring platforms under this project.

The DPR shall establish the monitoring philosophy, instrumentation locations, communication systems, alarm systems, and operational integration framework

proposed for efficient monitoring, preventive maintenance, hydraulic assessment, and lifecycle management of the wastewater collection system

### **5.6.2 Pumping System & pumping Stations**

The DPR shall establish the planning philosophy, sizing basis, redundancy framework, operational strategy, and infrastructure requirements adopted for sewage pumping stations, industrial effluent pumping stations, and associated pumping systems proposed under the project. The DPR shall generally address the following design aspects for pumping infrastructure:

#### **5.6.2.1 Civil Structures:**

The DPR shall establish the structural configuration, layout requirements, accessibility provisions, durability considerations, and operational requirements adopted for pumping-station structures.

#### **5.6.2.2 Screen Chambers:**

The DPR shall establish the screening philosophy, screen sizing, screening arrangements, and debris-management provisions proposed for protection of downstream systems.

#### **5.6.2.3 Selection of Pumps, Head & Discharge:**

The DPR shall undertake comparative assessment of alternative pumping arrangements, pump configurations, operating philosophies, and equipment options considering hydraulic efficiency, energy consumption, redundancy requirements, surge conditions, operational flexibility, maintenance requirements, lifecycle cost, and long-term operational reliability. The selected pumping system shall be technically justified through detailed hydraulic and techno-economic evaluation.

#### **5.6.2.4 Number of Pumps & Redundancy:**

The DPR shall establish the redundancy philosophy and standby provisions adopted for critical pumping systems.

#### **5.6.2.5 Surging & Water Hammer:**

The DPR shall establish the surge-analysis criteria and protection measures proposed for pressure systems and rising mains.

#### **5.6.2.6 Wet Well Design:**

The DPR shall establish the sizing philosophy, detention requirements, operational levels, and maintenance considerations adopted for wet wells.

#### **5.6.2.7 Internal Lining & Waterproofing:**

The DPR shall establish the corrosion-protection systems, lining requirements, and waterproofing measures adopted for pumping structures.

#### **5.6.2.8 Floor Slope:**

The DPR shall establish the drainage philosophy and floor-slope criteria adopted for pumping stations.

#### **5.6.2.9 Odour-Control Units:**

The DPR shall establish the odour-management strategy and odour-control systems proposed for pumping facilities.

#### **5.6.2.10 Lighting & Ventilation:**

The DPR shall establish the lighting standards, ventilation requirements, and occupational-safety provisions adopted for pumping infrastructure.

#### **5.6.2.11 Power Backup:**

The DPR shall establish the backup-power philosophy and emergency power arrangements proposed for uninterrupted operation.

#### **5.6.2.12 Flow Measurement Devices:**

The DPR shall establish the flow-monitoring systems, instrumentation requirements, and SCADA integration proposed for pumping systems.

#### **5.6.2.13 Automation, Remote operation & preventive Maintenance:**

The DPR shall establish the proposed automation framework for pumping systems including SCADA integration, remote monitoring systems, automated control systems, pump-health monitoring systems, alarm-management systems, energy-monitoring systems, and predictive-maintenance systems proposed for pumping infrastructure.

The DPR shall establish the operational philosophy, redundancy provisions, communication systems, and centralized monitoring framework proposed for efficient and reliable operation of the pumping systems

### **5.6.3 Sewerage Treatment Plant (STP)**

The DPR shall establish the treatment philosophy, process-design framework, technology-selection basis, operational strategy, and infrastructure requirements adopted for the proposed STP systems.

The DPR shall generally address the following design aspects for STP infrastructure:

#### **5.6.3.1 Influent & Treated Effluent Quality:**

The DPR shall establish the adopted influent characteristics, treated-water quality standards, discharge norms, and reuse requirements.

#### **5.6.3.2 Technology Selection & Comparison:**

The DPR shall undertake a comparative assessment of feasible treatment technologies considering influent characteristics, treatment efficiency, land

requirement, energy consumption, sludge generation, automation requirements, operational complexity, lifecycle cost, treated-water reuse objectives, scalability, environmental compliance, and long-term operational sustainability. The selected treatment technology shall be technically justified through an appropriate techno-economic comparison framework.

#### **5.6.3.3 Design Computations for Individual Units:**

The DPR shall include design calculations and sizing criteria adopted for all treatment units and process systems.

#### **5.6.3.4 Redundancy Provisions:**

The DPR shall establish the standby philosophy and redundancy provisions proposed for critical treatment systems and equipment.

#### **5.6.3.5 Power Backup:**

The DPR shall establish the emergency power arrangements and backup systems proposed for uninterrupted treatment operations.

#### **5.6.3.6 Land Requirement:**

The DPR shall establish the land-area assessment and space-planning considerations adopted for the STP infrastructure.

#### **5.6.3.7 Process Flow Diagram:**

The DPR shall include process-flow diagrams and hydraulic profiles establishing the treatment sequence and process integration.

#### **5.6.3.8 Essential Facilities within STP:**

The DPR shall establish the utility systems, laboratory facilities, administrative areas, chemical storage, access roads, drainage systems, and support infrastructure proposed within the STP campus.

#### **5.6.3.9 O&M Protocols:**

The DPR shall establish the operation, maintenance, safety, monitoring, and asset-management framework proposed for the STP systems.

#### **5.6.3.10 Electrical, Mechanical & Instrumentation Systems:**

The DPR shall establish the design basis and operational philosophy adopted for E&M systems and instrumentation infrastructure.

#### **5.6.3.11 Flow Management & SCADA Controls:**

The DPR shall establish the automation philosophy, monitoring framework, and SCADA integration proposed for the STP systems.

#### **5.6.3.12 Online Monitoring & Smart Utility Integration:**

The DPR shall establish the proposed framework for integration of STP systems with online water-quality monitoring systems, instrumentation systems, energy-monitoring systems, digital process-control systems, centralized utility-management systems, and predictive-maintenance systems proposed for the project.

The DPR shall establish the proposed monitoring locations, automation philosophy, reporting systems, operational analytics framework, and integration requirements proposed for regulatory compliance, operational optimization, and lifecycle management of the STP infrastructure

#### **5.6.3.13 Storage Reservoirs for Treated Water:**

The DPR shall establish the sizing criteria, balancing requirements, and operational philosophy adopted for treated-water storage systems.

### **5.6.4 Common effluent treatment Plants**

The DPR shall establish the planning framework, treatment philosophy, process-design basis, operational strategy, and environmental-compliance framework adopted for the CETP systems proposed under the project.

The DPR shall generally address the following design aspects for CETP infrastructure, but not limited to:

#### **5.6.4.1 Influent Effluent Characteristics:**

The DPR shall establish the adopted industrial wastewater characteristics, variability considerations, shock-load conditions, and design influent assumptions.

#### **5.6.4.2 Pre-treatment Requirements:**

The DPR shall establish the source-level pre-treatment philosophy and industrial discharge requirements proposed under the project.

#### **5.6.4.3 Technology Selection & Process Compatibility:**

The DPR shall undertake a comparative assessment of feasible CETP treatment technologies and process configurations considering industrial typologies, influent variability, shock-load handling capability, chemical-treatment requirements, sludge generation, ZLD compatibility, operational reliability, environmental compliance, lifecycle cost, treated-water recovery objectives, and long-term sustainability. The selected process configuration shall be supported through detailed technical justification and comparative evaluation.

#### **5.6.4.4 Equalization Systems:**

The DPR shall establish the equalization philosophy and balancing requirements adopted for handling hydraulic and organic fluctuations.

#### **5.6.4.5 Treatment Units & Process Systems:**

The DPR shall establish the design basis and sizing criteria adopted for individual treatment units and process systems.

#### **5.6.4.6 Chemical Dosing Systems:**

The DPR shall establish the chemical-treatment philosophy and dosing systems proposed for CETP operations.

#### **5.6.4.7 Sludge Management Systems:**

The DPR shall establish the sludge-handling, dewatering, storage, transportation, and disposal framework proposed for CETP systems.

#### **5.6.4.8 Online Monitoring, Automation & Smart Utility Systems:**

The DPR shall establish the proposed framework for integration of CETP infrastructure with online water-quality monitoring systems, industrial discharge monitoring systems, SCADA systems, automated process-control systems, chemical-dosing automation systems, centralized monitoring systems, and predictive-maintenance systems proposed for the project.

The DPR shall establish the monitoring philosophy, instrumentation systems, reporting framework, communication systems, compliance-monitoring systems, and operational-control systems proposed for efficient operation, environmental compliance, emergency management, and lifecycle sustainability of the CETP infrastructure. The framework shall also define the integration requirements with applicable CPCB/SPCB online monitoring platforms and other regulatory reporting systems, as applicable.

#### **5.6.4.9 ZLD Framework:**

The DPR shall assess the applicability of Zero Liquid Discharge (ZLD) based on the proposed industrial profile, wastewater characteristics, regulatory requirements, and water management objectives. Where applicable, the DPR shall define the ZLD framework, including wastewater segregation, recycle and recovery systems, reject management, and final residue disposal arrangements, along with an assessment of technical and operational feasibility.

### **5.7 O&M framework**

The DPR shall establish a comprehensive operation and maintenance framework covering manpower deployment, preventive maintenance strategy, asset management, reservoir cleaning, NRW reduction, emergency response, water-quality surveillance, and SCADA operation.

| Category               | Design Considerations                    |
|------------------------|------------------------------------------|
| Preventive Maintenance | Scheduled Program                        |
| Water Quality Testing  | Routine testing as per CPHEEO Guidelines |

|                                                |                       |
|------------------------------------------------|-----------------------|
| SCADA operation                                | Continuous Monitoring |
| Emergency Response                             | Contingency Plan      |
| Energy Management                              | Efficient Tracking    |
| <b>Digital Environmental compliance system</b> | Mandatory             |

## 5.8 CAPEX & OPEX Assessment

This section shall establish the phase-wise Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) for the proposed Wastewater network system. The assessment shall include all civil, electromechanical, transmission, storage, distribution, automation, utility, and allied infrastructure components required for development and operation of the complete system.

The cost estimation shall be based on applicable Schedule of Rates (SoR), approved market rates, recent comparable projects, or other accepted estimation methodologies adopted by the implementing agency. The DPR shall clearly specify the basis of estimation, year of pricing, contingencies, escalation provisions, and applicable taxes/duties considered in the cost assessment.

The CAPEX assessment shall cover intake systems, transmission mains, STP/CETP, pumping systems, reservoirs, distribution network, valves and appurtenances, utility crossings, SCADA systems, electrical infrastructure, and associated site-development works. The OPEX assessment shall include power consumption, chemical consumption, manpower, preventive maintenance, laboratory testing, SCADA operation, and asset-maintenance requirements.

The DPR shall also establish phase-wise investment planning and assess long-term operational sustainability considering energy efficiency, leakage detection, automation, recycled-water integration, and lifecycle asset-management requirements.

| Category                  | Design Considerations                                      |
|---------------------------|------------------------------------------------------------|
| Civil Infrastructure      | STP/CETP, reservoirs, Pumping stations chambers, buildings |
| Pipeline Infrastructure   | Rising Mains & conveyance network, Manholes, Chambers etc. |
| Electromechanical Systems | Pumps, motors, Valves, electrical systems etc,             |
| Automation & SCADA        | Monitoring and control systems                             |
| Metering Systems          | Bulk & Plot level Metering                                 |
| Utility Infrastructure    | Power supply and utility works                             |

|                       |                                         |
|-----------------------|-----------------------------------------|
| O&M Cost              | Power, chemicals, manpower, maintenance |
| Lifecycle Replacement | Long-term asset replacement provision   |

## 5.9 Checklist for Mandatory Deliverables.

The DPR shall include all technical deliverables, design documents, calculations, drawings, investigations, approvals, and supporting studies necessary for technical appraisal, implementation, operation, and future reference of the proposed wastewater & treatment system. All submissions shall be consistent with the adopted design criteria, phase-wise demand assessment, hydraulic analysis, recycled-water integration framework, and applicable CPHEEO/BIS standards adopted under the DPR.

| Sl. No.                                                      | Mandatory Deliverable                                                            | Compliance               |
|--------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------|
| <b>A. Planning, Design Basis &amp; Investigations</b>        |                                                                                  |                          |
| 1                                                            | Approved Master Plan / Land-use Plan                                             | <input type="checkbox"/> |
| 2                                                            | Planning Horizon & Development Phasing Assessment                                | <input type="checkbox"/> |
| 3                                                            | Industrial Typology ,Wastewater Characterization Assessment & Treatability study | <input type="checkbox"/> |
| 4                                                            | Wastewater Generation & Hydraulic Design Basis Report                            | <input type="checkbox"/> |
| 5                                                            | Recycled Water Demand & Reuse Market Assessment                                  | <input type="checkbox"/> |
| 6                                                            | Water Balance Diagram & Flow Assessment                                          | <input type="checkbox"/> |
| 7                                                            | Design Criteria, Codes & Standards Statement                                     | <input type="checkbox"/> |
| 8                                                            | Service Level Benchmark Compliance Statement                                     | <input type="checkbox"/> |
| <b>B. Sewerage &amp; Industrial Effluent Network Systems</b> |                                                                                  |                          |
| 9                                                            | Sewerage & Industrial Effluent Network Design Report                             | <input type="checkbox"/> |
| 10                                                           | Sewerage Catchment & Industrial Effluent Zoning Plan                             | <input type="checkbox"/> |
| 11                                                           | Sewerage & Industrial Effluent Network Layout Drawings                           | <input type="checkbox"/> |
| 12                                                           | Hydraulic Profiles & Longitudinal Sections                                       | <input type="checkbox"/> |
| 13                                                           | Utility Corridor Coordination & Crossing Details                                 | <input type="checkbox"/> |
| 14                                                           | Pipe Material Evaluation & Selection Justification                               | <input type="checkbox"/> |
| 15                                                           | Pumping System Design & Hydraulic Assessment                                     | <input type="checkbox"/> |
| 16                                                           | Pumping Station Layouts, Electrical & Mechanical Drawings                        | <input type="checkbox"/> |
| <b>C. STP, CETP &amp; Recycled Water Systems</b>             |                                                                                  |                          |
| 17                                                           | STP Design Basis, Process Selection & Design Report                              | <input type="checkbox"/> |
| 18                                                           | STP Process Flow Diagram, Hydraulic Profile & Layout Drawings                    | <input type="checkbox"/> |
| 19                                                           | CETP Design Basis, Influent Assessment & Design Report                           | <input type="checkbox"/> |
| 20                                                           | CETP Process Flow Diagram, Hydraulic Profile & Layout Drawings                   | <input type="checkbox"/> |
| 21                                                           | Industrial Pretreatment & ZLD feasibility/Compliance Framework                   | <input type="checkbox"/> |
| 22                                                           | Sludge Management & Disposal Framework                                           | <input type="checkbox"/> |
| 23                                                           | Treated Water Reuse & Recycled Water Distribution Framework                      | <input type="checkbox"/> |
| 24                                                           | Odour Control & Environmental Compliance Framework                               | <input type="checkbox"/> |
| <b>D. Electrical, Automation &amp; Smart Utility Systems</b> |                                                                                  |                          |
| 25                                                           | Electrical Load Assessment & Power Backup Framework                              | <input type="checkbox"/> |
| 26                                                           | Single Line Diagrams (SLD) & Electrical System Drawings                          | <input type="checkbox"/> |
| 27                                                           | SCADA, Automation & Instrumentation Framework                                    | <input type="checkbox"/> |
| 28                                                           | Online Monitoring, Smart Metering & Utility Monitoring Framework                 | <input type="checkbox"/> |
| 29                                                           | GIS Based Utility Mapping & Digital Asset Management Framework                   | <input type="checkbox"/> |
| 30                                                           | Emergency Response Framework                                                     | <input type="checkbox"/> |

| <b>E. Costing, Implementation &amp; Project Governance</b> |                                                                       |                          |
|------------------------------------------------------------|-----------------------------------------------------------------------|--------------------------|
| 31                                                         | CAPEX, OPEX & life Cycle Cost Assessment                              | <input type="checkbox"/> |
| 32                                                         | Testing, commissioning, Performance validation Framework              | <input type="checkbox"/> |
| 33                                                         | O&M Philosophy, Staffing & Preventive Maintenance Framework           | <input type="checkbox"/> |
| 34                                                         | Environmental, CPCB/SPCB & Statutory Compliance Assessment            | <input type="checkbox"/> |
| 35                                                         | Statutory Approval Matrix, Risk Assessment & DPR Compliance Statement | <input type="checkbox"/> |

---

## Chapter 6: Drainage & Storm Water Management

---

## **6.1 About this Chapter:**

This chapter presents the planning approach, design basis, hydrological assessment, hydraulic design criteria and infrastructure requirements for the proposed Storm Water Drainage (SWD) system for the industrial / manufacturing city. The chapter covers:

- Assessment of existing drainage characteristics and natural drainage systems;
- Hydrological investigations and runoff assessment;
- Storm water drainage planning and outfall strategy;
- Design of roadside drains, trunk drains and cross-drainage structures;
- Rainwater harvesting and runoff mitigation measures;
- Flood management and climate resilience considerations;
- Operation and maintenance framework.

The chapter shall establish that the proposed storm water drainage system is hydraulically adequate, technically sound, maintainable and capable of safely managing runoff under ultimate development conditions.

## **6.2 Concept Note:**

The storm water drainage system for the proposed industrial / manufacturing park has been planned as an integrated surface runoff management system intended to safely collect, convey and dispose storm runoff generated from industrial, commercial, transportation, utility and open areas under ultimate development conditions.

The proposed system has been conceptualized considering the existing terrain characteristics, natural drainage pattern, watershed behaviour, outfall availability, proposed land use and future urbanization impacts. The planning approach aims to preserve natural drainage paths to the extent feasible while minimizing flood risks, water logging and downstream hydraulic impacts.

The proposed drainage network shall comprise roadside drains, secondary carrier drains, trunk drains, culverts, cross-drainage structures, detention / recharge systems and outfall arrangements integrated with the proposed road hierarchy and grading strategy.

The drainage planning philosophy further incorporates runoff attenuation, rainwater harvesting, groundwater recharge and climate resilience measures to mitigate the impact of increasing imperviousness and extreme rainfall events associated with urban and industrial development.

The chapter establishes the hydrological basis, hydraulic design criteria, drainage zoning, outfall planning methodology and infrastructure requirements for development of a technically sound, hydraulically adequate and maintainable storm water drainage system for the project area.

### **6.3 Design Basis**

This section shall establish the overall planning philosophy, hydrological framework, hydraulic design basis, flood-management approach, operational requirements, runoff-management strategy, and infrastructure-planning principles adopted for the proposed Storm Water Drainage (SWD) system under the DPR.

The DPR shall clearly establish the engineering rationale and technical basis adopted for assessment of catchment characteristics, runoff generation, rainfall analysis, hydraulic conveyance planning, outfall strategy, flood routing, runoff attenuation, rainwater harvesting, and long-term storm water management for the Industrial City.

The proposed storm water drainage infrastructure shall be planned considering the approved land-use pattern, industrial typologies, road hierarchy, grading strategy, terrain characteristics, utility corridors, environmental obligations, external catchment contribution, development phasing, and ultimate development potential of the Industrial City. The planning approach shall aim to ensure hydraulically adequate, environmentally sustainable, operationally reliable, climate-resilient and maintainable storm water management infrastructure across all phases of development and up to the adopted design horizon.

The proposed storm water management framework shall broadly comprise roadside drainage systems, underground storm drainage systems wherever applicable, secondary and trunk storm drains, interceptor drains, culverts and cross-drainage structures, outfall systems, flood-routing corridors, detention and retention systems, recharge structures, rainwater-harvesting infrastructure, pumping systems wherever required, monitoring infrastructure, and SCADA-based operational-control systems.

#### **6.3.1 Planning Horizon & Development Phasing**

The DPR shall define the adopted planning horizon, intermediate infrastructure augmentation stages, and phase-wise development strategy for the proposed storm water drainage infrastructure. The adopted planning framework shall be aligned with the approved master plan, projected urbanization pattern, industrial-development strategy, proposed grading plan, and long-term drainage requirements of the Industrial City.

The proposed drainage infrastructure shall be planned with adequate provision for phased implementation and future augmentation without major disruption to the operational system. The DPR shall clearly identify the base year, intermediate development phases, ultimate design year, and corresponding drainage-capacity requirements proposed under each stage of development.

### **6.3.2 Hydrological & Hydraulic Design Basis**

The DPR shall establish the methodology, assumptions, hydrological criteria, rainfall analysis framework, runoff assessment methodology, hydraulic design criteria, and flood-management approach adopted for planning and design of the proposed storm water drainage infrastructure.

The hydrological assessment shall be based on terrain characteristics, watershed delineation, approved land-use distribution, surface characteristics, industrial development pattern, proposed grading strategy, runoff characteristics, and external catchment contribution within and adjoining the Industrial City. The DPR shall clearly establish the adopted:

- Rainfall data sources;
- Intensity-duration-frequency relationships;
- Design storm criteria;
- Design return periods;
- Runoff coefficients;
- Time of concentration;
- Peak runoff estimation methodology;
- Climate resilience considerations;
- Flood routing philosophy.

Hydraulic design of the storm water drainage system shall prioritize gravity-based conveyance systems to the maximum extent feasible while ensuring adequate carrying capacity, permissible flow velocities, prevention of surcharge and prolonged water-logging conditions, operational reliability, maintainability, and provision for future expansion.

### **6.3.3 Storm Water Drainage Planning Philosophy**

The DPR shall establish the overall planning philosophy for the proposed storm water drainage network including drainage zoning, watershed integration, hierarchy of roadside drains, branch drains, secondary drains, trunk drains, interceptor drains, outfall systems, detention systems, and flood-routing corridors.

The planning approach shall prioritize preservation and integration of natural drainage systems to the extent feasible while minimizing obstruction to existing drainage paths and reducing downstream hydraulic impacts resulting from urbanization and industrial development. The DPR shall establish the adopted drainage-network planning philosophy considering:

- Terrain characteristics;
- Natural drainage paths;
- Grading strategy;

- Road hierarchy;
- Utility-corridor integration;
- Flood vulnerability;
- Maintainability;
- Future connectivity and expansion requirements.

The proposed planning framework shall also prioritize gravity-based drainage systems, minimum dependency on pumping, minimization of operational risk, optimization of hydraulic flow conditions, and integration of runoff attenuation and recharge measures within the drainage network.

#### **6.3.4 Existing Drainage Integration & Regional Drainage connectivity**

The DPR shall establish the framework adopted for integration of the proposed storm water drainage system with the existing natural drainage systems, regional drainage networks, existing culverts, natural outfalls, downstream waterways, and adjoining drainage infrastructure within and surrounding the Industrial City. The planning approach shall identify and evaluate:

- Existing natural drainage paths and nallah systems;
- Existing roadside drains and regional storm drainage systems;
- Existing culverts, cross-drainage structures and hydraulic crossings;
- External catchments contributing runoff into the project area;
- Downstream drainage constraints and tailwater conditions;
- Existing flood-prone and water-logging locations;
- Existing ponds, lakes, canals and receiving water bodies;
- Encroachments or obstructions affecting natural drainage behaviour.

The DPR shall establish that the proposed drainage planning preserves natural drainage characteristics to the extent feasible and avoids adverse impacts on upstream and downstream hydrology due to proposed development activities. The proposed drainage framework shall establish the methodology adopted for:

- Interception and diversion of external runoff;
- Integration of existing drains within the proposed network;
- Augmentation of downstream drainage infrastructure wherever required;
- Flood routing through natural and engineered drainage corridors;
- Mitigation of hydraulic bottlenecks and backflow conditions.

The DPR shall further establish that the carrying capacity of downstream drainage systems and receiving outfalls has been assessed for the proposed ultimate development runoff under the adopted design conditions.

### **6.3.5 Outfall planning & Flood Routing Philosophy**

The DPR shall establish the overall outfall planning and flood-routing philosophy adopted for the proposed storm water drainage system. The planning framework shall identify:

- Natural outfall systems;
- Receiving water bodies;
- Downstream drainage constraints;
- Tailwater conditions;
- Flood-prone zones;
- External catchment inflows;
- Major flood-routing corridors.

The DPR shall establish the proposed framework for safe routing and disposal of runoff generated under both normal and extreme rainfall events without causing adverse hydraulic impacts within or downstream of the project area. The proposed outfall planning shall also establish provisions for:

- detention systems;
- emergency overflow routing;
- flood bypass arrangements;
- outfall protection measures;
- erosion-control measures;
- downstream flood-impact mitigation.

### **6.3.6 Rainwater harvesting & Runoff Mitigation Strategy**

The DPR shall establish the runoff mitigation and rainwater-harvesting framework proposed for the Industrial Park with the objective of reducing incremental runoff generated due to urbanization and industrialization, improving groundwater recharge, and enhancing long-term water sustainability.

The proposed framework shall identify suitable provisions for detention, retention, recharge, infiltration and reuse of storm water through integration of recharge pits, recharge trenches, detention ponds, retention ponds, landscaped recharge systems, permeable surfaces, and plot-level rainwater-harvesting systems wherever feasible.

The DPR shall establish the adopted framework for integration of runoff attenuation and recharge systems with the proposed storm water drainage network, grading strategy, open-space planning, and environmental-management systems.

### **6.3.7 Climate Resilience & Urban Flood Management Framework**

The DPR shall establish the climate resilience and urban flood-management philosophy adopted for the proposed storm water drainage infrastructure.

The proposed framework shall consider increasing short-duration extreme rainfall events, future urbanization impacts, flood vulnerability of critical infrastructure, operational reliability during extreme events, and long-term resilience of the drainage infrastructure. The DPR shall establish the proposed framework for:

- Flood-risk assessment;
- Major-minor drainage hierarchy;
- Surcharge management;
- Flood-routing corridors;
- Emergency overflow management;
- Critical infrastructure protection;
- Redundancy provisions wherever required.

The proposed framework shall also evaluate incorporation of runoff attenuation measures, decentralized recharge systems, detention facilities, rainwater-harvesting systems, and Sustainable Urban Drainage Systems (SUDS) to improve flood resilience, reduce peak runoff, enhance groundwater recharge, and minimize downstream hydraulic impacts resulting from urbanization and industrial development.

### **6.3.8 Digital utility monitoring & Smart Infrastructure**

The DPR shall establish the proposed framework for monitoring, operational management, and digital utility integration for critical storm water drainage infrastructure within the Industrial City.

The proposed framework may include rainfall-monitoring systems, water-level monitoring arrangements at critical locations, flood-warning systems, GIS-based drainage mapping, and digital asset-management systems for improving operational monitoring, preventive maintenance, and emergency-response capability of the storm water drainage network.

SCADA integration and automated monitoring systems, wherever proposed, shall generally be limited to critical infrastructure components such as storm water pumping stations, detention systems, major outfall structures, and vulnerable flood-management corridors requiring active operational monitoring and emergency management.

The proposed framework shall prioritize gravity-based drainage systems with minimum dependence on pumping and complex automation systems.

### 6.3.9 Applicable Codes, Standards & Technical References

The DPR shall clearly identify all applicable codes, standards, technical manuals, hydrological references, statutory provisions, and engineering guidelines adopted for planning, design, construction, operation, and maintenance of the proposed storm water drainage infrastructure.

The adopted references shall generally include the latest revisions of CPHEEO Manual on Storm Water Drainage Systems (2019), IRC codes related to urban drainage and cross-drainage works, relevant BIS standards, CWC flood-estimation practices, MoHUA guidelines, environmental regulations, rainfall and hydrological data references, and other applicable statutory and technical provisions relevant to the proposed infrastructure systems.

All hydrological assessment, hydraulic analysis, drainage-network planning, culvert and cross-drainage design, outfall planning, flood-management measures, recharge systems, structural design, utility integration, monitoring systems, and operational frameworks proposed under the DPR shall conform to the adopted standards and applicable regulatory requirements.

### 6.4 Service Level Benchmarks

The DPR shall establish the proposed service-level benchmarks and performance requirements for the storm water drainage infrastructure proposed under the scheme. The adopted benchmarks shall be aligned with applicable CPHEEO guidelines, IRC codes and manuals, BIS standards, and other applicable statutory and technical provisions relevant to storm water drainage systems.

The adopted service-level framework shall form the basis for hydrological assessment, hydraulic design, flood management, infrastructure sizing, and operational planning of the proposed storm water drainage system for the Industrial City.

The proposed storm water drainage infrastructure shall be planned to meet or exceed the adopted service-level benchmarks under the prescribed design conditions while minimizing flooding, water logging, surcharge conditions, erosion, and downstream hydraulic impacts.

Indicative service-level benchmarks to be adopted under the DPR are provided below. The DPR may suitably refine the benchmarks based on project-specific requirements, terrain characteristics, land-use pattern, flood vulnerability, and applicable statutory provisions.

| Sl. No | Service Level Benchmarks (SLBs) | Indicative Benchmarks |
|--------|---------------------------------|-----------------------|
| 1      | Storm Water Drainage Coverage   | 100%                  |

|   |                                                                          |                                |
|---|--------------------------------------------------------------------------|--------------------------------|
| 2 | Incidence of Water logging                                               | Nil (In all Design conditions) |
| 3 | Preservation of Natural Drainage System & Paths                          | Mandatory                      |
| 4 | Adequacy of Drainage network & Cross drainage Structures                 | 100%                           |
| 5 | Accessibility for Maintenance, Inspection & desilting of Drainage system | 100%                           |
| 6 | Environmental & regulatory Compliances                                   | 100%                           |

The DPR shall provide a comparative statement indicating the adopted service-level benchmarks, corresponding design provisions, and compliance methodology proposed under the project. Any deviation from the adopted benchmarks shall be explicitly identified and technically justified within the DPR along with the corresponding mitigation measures and project-specific constraints considered while adopting such deviations.

## 6.5 Adopted Design Standards & Norms

This section shall summarize the design standards, codes, guidelines, reference manuals, hydrological references, and planning norms adopted for preparation of the Storm Water Drainage (SWD) DPR. The objective of this section is to establish a consolidated technical reference framework for hydrological assessment, hydraulic design, structural design, flood management, and operational planning of the proposed storm water drainage infrastructure, thereby avoiding repetitive citation of standards in subsequent sections of the DPR.

The DPR shall clearly identify the adopted design criteria, corresponding reference standards, and applicable codal provisions for individual system components. In cases where project-specific requirements necessitate deviation from standard codal provisions or best engineering practices, the DPR shall provide adequate technical justification and supporting rationale for such deviations.

The following codes, standards, manuals, guidelines, and references may be considered during preparation of the DPR, including but not limited to:

### 6.5.1 Design Period

| Component                            | Reference Code / Manual     | Commonly adopted Design Period |
|--------------------------------------|-----------------------------|--------------------------------|
| Storm Water Drainage Network         | CPHEEO Manual               | 30 Years                       |
| Primary/Trunk Drains                 | CPHEEO Manual/<br>IRC SP:50 | 30 Years                       |
| Culverts & Cross Drainage structures | Relevant IRC codes          | 30 Years                       |

|                                                  |                                         |             |
|--------------------------------------------------|-----------------------------------------|-------------|
| Storm water pumping Systems (Civil) if required. | CPHEEO Manual                           | 30 years    |
| Storm water pumping Systems (E&M) if required.   | Industry Practices                      | 15 years    |
| Instrumentation & Monitoring Systems             | Industry Practice / OEM Recommendations | 10-15 years |

### 6.5.2 Hydrological & hydraulic Design criteria

| Component                         | Reference Code / Manual | Commonly adopted criteria                                       |
|-----------------------------------|-------------------------|-----------------------------------------------------------------|
| Rainfall Analysis                 | IMD Data/ CPHEEO manual | Based on Historical rainfall data                               |
| Design Storm Methodology          | CPHEEO Manual/IRC SP:50 | Rational Method or other suitable hydrological method           |
| Design return Period              | CPHEEO Manual/IRC SP:50 | Based on hierarchy and criticality of Drainage infrastructure.  |
| Run-off coefficient               | CPHEEO Manual/IRC SP:50 | Based on land use & surface characteristics                     |
| Time of concentration             | CPHEEO Manual/IRC SP:50 | As per adopted hydrological method                              |
| Hydraulic Design formula          | CPHEEO Manual           | Manning's Formula                                               |
| Permissible velocity              | CPHEEO Manual/IRC SP:50 | As per drain type & hydraulic condition                         |
| Freeboard                         | CPHEEO Manual/IRC SP:50 | As per drain type & hydraulic condition                         |
| Drainage Gradient                 | CPHEEO/IRC guidelines   | To maintain adequate hydraulic performance and minimize silting |
| Flood Routing/Outfall design      | CPHEEO Manual/IRC SP:50 | Mandatory                                                       |
| External Catchment considerations | CPHEEO Manual/IRC SP:50 | Mandatory considerations                                        |

The above values are indicative planning and design criteria generally adopted for preparation of DPRs for storm water drainage infrastructure. The final adopted values shall be based on applicable standards, project-specific requirements, terrain characteristics, rainfall characteristics, flood vulnerability, downstream constraints, and detailed engineering assessment carried out under the DPR.

### 6.5.3 Drainage Network Planning Parameters

| Component              | Reference Code / Manual            | Commonly adopted criteria                                     |
|------------------------|------------------------------------|---------------------------------------------------------------|
| Drainage Network       | CPHEEO Manual                      | Separate Storm Water Drainage network.                        |
| Drainage Configuration | CPHEEO Manual /Industry Practices; | Gravity based drainage system to the maximum possible extent. |
| Roadside Drainage      | CPHEEO Manual/IRC SP:50            | According to Grading & drainage requirements.                 |

|                               |                               |                                                                                                      |
|-------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------|
| Open/ Covered Drains          | CPHEEO Manual/IRC SP:50       | Based on location, accessibility, safety, and maintenance consideration. (Preferable Covered Drains) |
| Inspection & desilting Access | CPHEEO Manual                 | Mandatory                                                                                            |
| Cross-drainage Structures     | Relevant IRC codes            | Mandatory for Natural drainage crossings                                                             |
| Erosion protection Measures   | IRC / Best industry practices | Mandatory at vulnerable locations.                                                                   |

#### 6.5.4 Flood Management & Recharge Measures

| Component                    | Reference Code / Manual      | Commonly adopted criteria                |
|------------------------------|------------------------------|------------------------------------------|
| Rainwater harvesting         | CGWB/State guidelines        | To be integrated wherever feasible       |
| Recharge Structures          | CGWB/Best Industry Practices | As per site suitability                  |
| Protection of Natural Drains | CPHEEO Manual                | Mandatory                                |
| Flood protection Measures    | Best Industry Practices      | For Critical & vulnerable infrastructure |

#### 6.5.5 Materials & appurtenances

| Component                  | Reference Code / Manual       | Commonly adopted criteria                                                                                          |
|----------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------|
| RCC Drains                 | Relevant BIS standards        | May be adopted for Primary/trunk/ Road drains                                                                      |
| RCC pipes                  | IS 458                        | May be adopted for conveyance system and/or for culverts and underground drainage applications wherever applicable |
| RCC precast Drain elements | Relevant BIS standards        | As per requirements                                                                                                |
| Cover/Gratings             | Relevant BIS standards        | As per requirements                                                                                                |
| Manholes & Chambers        | CPHEEO/Relevant BIS standards | RCC chambers with maintenance & access provisions                                                                  |

The above values/codes are indicative planning and design criteria generally adopted for preparation of DPRs for storm water drainage infrastructure. The final adopted values shall be based on applicable standards, project-specific requirements, terrain conditions, hydraulic requirements, operational philosophy, maintainability requirements, and detailed engineering assessment carried out under the DPR.

## **6.6 Design of Major Project Components**

This section shall establish the hydrological framework, hydraulic design philosophy, infrastructure configuration, flood-management approach, operational requirements, resilience framework, and implementation strategy adopted for all major components of the proposed Storm Water Drainage (SWD) infrastructure under the DPR.

The DPR shall demonstrate that the proposed storm water drainage infrastructure is technically adequate for the adopted design storm conditions, external catchment contribution, phase-wise development requirements, ultimate development scenario, and long-term urbanization impacts while ensuring safe, reliable, hydraulically efficient, maintainable, and climate-resilient storm water management across the Industrial City.

The DPR shall include component-wise hydrological assessment, hydraulic computations, runoff analysis, flood-routing assessment, drainage-network design, sizing calculations, structural considerations, utility integration requirements, layout drawings, operational philosophy, maintainability provisions, and implementation framework for all major storm water drainage infrastructure proposed under the project.

The proposed infrastructure planning shall establish the technical basis and design framework for roadside storm water drains, covered drainage systems, underground storm water conduits, secondary drains, trunk drains, interceptor drains, culverts, cross-drainage structures, outfall systems, flood-routing corridors, recharge systems, detention systems, erosion-protection systems, storm water pumping systems wherever required, storm water inlet systems, inspection chambers, monitoring systems, and associated drainage appurtenances proposed under the scheme. The proposed storm water drainage infrastructure shall prioritize:

- Gravity-based drainage systems;
- Target Zero instances of flooding and water logging;
- Preservation and integration of natural drainage systems;
- Hydraulic adequacy under ultimate development conditions;
- Reduction of operational and maintenance risks;
- Flood resilience and emergency drainage capability;
- Ease of inspection, desilting, and maintenance accessibility;
- Integration with grading strategy, road hierarchy, and utility corridors;
- Long-term operational sustainability and scalability.

The design of all storm water drainage components shall conform to the adopted standards, manuals, hydrological practices, environmental requirements, and statutory provisions specified under the DPR.

### **6.6.1 Hydrological Assessments & Design Storm Analysis**

The DPR shall establish the hydrological assessment framework, rainfall-analysis methodology, runoff-estimation philosophy, and design storm criteria adopted for

planning and design of the proposed storm water drainage infrastructure. The DPR shall generally address the following design aspects for hydrological assessment and runoff estimation:

#### 6.6.1.1 Rainfall Analysis

The DPR shall establish the adopted rainfall-analysis methodology considering IMD records, available historical rainfall data, storm characteristics, rainfall intensity-duration-frequency relationships, temporal rainfall distribution, spatial variability, and extreme rainfall conditions relevant to the project area.

#### 6.6.1.2 Catchment Delineation

The DPR shall establish the catchment delineation framework considering topography, grading pattern, natural drainage paths, development pattern, external catchment contribution, road network, utility corridors, and outfall locations.

#### 6.6.1.3 Design Return Period

The DPR shall establish the adopted design return periods for various storm water drainage components considering drainage hierarchy, infrastructure criticality, road classification, industrial sensitivity, flood risk, operational importance, and applicable CPHEEO and IRC codes.

#### 6.6.1.4 Runoff Estimation Procedure

The DPR shall establish the adopted methodology for estimation of runoff considering land-use characteristics, imperviousness, runoff travel path, catchment slope, infiltration characteristics, grading pattern, development density, and ultimate development conditions.

#### 6.6.1.5 Rational Method & Hydrological Formulae

The DPR shall establish the adopted hydrological methods and formulae used for runoff estimation including Rational Method and other suitable hydrological approaches adopted for various drainage catchments under the project

#### 6.6.1.6 Runoff Coefficient

The DPR shall establish the adopted runoff coefficients for industrial areas, paved surfaces, landscaped zones, utility areas, open spaces, and other land-use categories considering surface characteristics and future urbanization conditions.

#### 6.6.1.7 Time of Concentration

The DPR shall establish the adopted methodology and criteria for estimation of time of concentration considering catchment geometry, hydraulic flow path, slope conditions, surface roughness, and drainage-network configuration.

#### 6.6.1.8 Design Flow Estimation

The DPR shall establish the methodology adopted for estimation of peak runoff and design discharge for all storm water drainage components considering ultimate development scenario, external catchment contribution, surcharge conditions, tailwater effects, and flood-routing requirements.

#### 6.6.2 Hydraulic Design of SWD system

The DPR shall establish the hydraulic design philosophy, sizing criteria, hydraulic-performance requirements, and flow-management framework adopted for design of the proposed storm water drainage infrastructure. The DPR shall generally address the following hydraulic design aspects:

Hydraulic Design Methodology: The DPR shall establish the adopted hydraulic-design approach and criteria for design of storm water drainage systems considering hydraulic efficiency, flow stability, sediment transport, flood management, energy dissipation, operational reliability, and maintenance requirements.

Hydraulic Design Formula: The DPR shall establish the adopted hydraulic formulae and equations for storm water drainage design with reference to applicable CPHEEO guidelines and engineering standards.

Manning's equation & roughness Coefficient: The DPR shall establish the adopted Manning's roughness coefficients and hydraulic parameters considered for design of lined drains, covered drains, underground conduits, culverts, and open-channel systems.

Design Velocity & Self Cleansing Criteria: The DPR shall establish the adopted velocity criteria required for maintaining adequate hydraulic performance while preventing silting, stagnation, erosion, sediment deposition, turbulence, and structural deterioration within the drainage network.

Free Board: The DPR shall establish the adopted freeboard criteria considering drain hierarchy, hydraulic conditions, surcharge considerations, flood risk, and operational safety requirements.

Hydraulic Gradient & Drain Slope: The DPR shall establish the adopted hydraulic-gradient criteria, longitudinal slope requirements, and flow conditions required for efficient conveyance and prevention of adverse hydraulic conditions within the drainage network.

Transition Losses & Hydraulic junctions: The DPR shall establish the criteria adopted for hydraulic transitions, drain junctions, flow bifurcation, confluence locations, level differences, and associated head-loss considerations.

Tailwater effects & Backwater conditions: The DPR shall establish the methodology adopted for assessment of tailwater conditions, backflow risks, downstream surcharge conditions, and outfall-control effects influencing the hydraulic performance of the drainage system.

Hydraulic Computation sheets: The DPR shall include hydraulic calculations, conduit-sizing calculations, hydraulic profiles, flow-capacity assessment, and supporting computation sheets for all storm water drainage (SWD) components proposed under the project.

### **6.6.3 Design of Stormwater Drainage Network**

The DPR shall establish the planning philosophy, alignment framework, drainage hierarchy, network configuration, and infrastructure-integration approach adopted for the proposed storm water drainage network. The DPR shall generally address the following design aspects for the storm water drainage network.

Drainage Hierarchy & Network Configuration: The DPR shall establish the proposed hierarchy of tertiary drains, roadside drains, secondary drains, trunk drains, interceptor drains, and outfall systems along with the corresponding catchment allocation and drainage-network configuration.

Covered Drainage Philosophy: Covered storm water drainage systems shall generally be adopted within developed urban areas, industrial plots, logistics areas, commercial areas, utility corridors, and pedestrian-accessible zones of the Industrial City. Open drains shall generally be avoided except along natural drainage channels, existing drainage paths, peripheral drainage corridors, and locations where open-channel conveyance is necessitated due to hydraulic and flood-management considerations.

Selection of Drain Type: The DPR shall undertake comparative assessment of alternative drain configurations including circular conduits, rectangular drains, trapezoidal drains, covered drains, underground conduit systems, and open-channel systems considering hydraulic efficiency, maintenance accessibility, construction feasibility, utility integration, lifecycle cost, and operational requirements.

Alignment Criteria: The DPR shall establish the horizontal and vertical alignment philosophy considering grading pattern, road geometry, utility corridors, outfall integration, flood-routing requirements, hydraulic performance, accessibility requirements, and future maintenance considerations.

Road Side Drainage system: The DPR shall establish the design approach, sizing philosophy, collection efficiency, and drainage integration framework adopted for roadside storm water drainage systems along the proposed road network.

External Catchment Considerations: The DPR shall establish the framework adopted for interception, diversion, routing, and management of runoff contribution from external catchments entering the proposed development area.

Storm water Manholes & inspection Chambers: The DPR shall establish the planning criteria, spacing philosophy, sizing requirements, accessibility provisions, structural considerations, and maintenance requirements adopted for storm water manholes and inspection chambers.

Road & Utility Crossings: The DPR shall establish the methodology adopted for crossings of roads, drains, railways, utility corridors, pipelines, and other infrastructure interfaces.

Layout Drawings & Hydraulic Profile: The DPR shall include drainage-network layouts, catchment plans, hydraulic profiles, utility integration details, longitudinal sections, and key cross-sections required for establishing the technical adequacy of the proposed system.

#### **6.6.4 Stormwater Inlets & Collection System:**

The DPR shall establish the planning framework, hydraulic criteria, collection efficiency requirements, and spacing philosophy adopted for storm water inlet systems. The DPR shall generally address the following design aspects:

Types of Inlets: The DPR shall establish the applicability and use of curb inlets, grated inlets, gully pits, combination inlets, trench drains, and other inlet arrangements proposed under the project.

Design & location of inlets: The DPR shall establish the design criteria, interception capacity, spacing philosophy, hydraulic capacity requirements, and placement methodology adopted for storm water inlets considering road geometry, grading pattern, runoff accumulation, traffic movement, pedestrian safety, and maintenance accessibility.

Silt & debris Management: The DPR shall establish the provisions proposed for interception and management of silt, debris, floating material, and solid waste entering the storm water drainage network.

#### **6.6.5 Culverts, cross-Drainage Structures & Outfall system:**

The DPR shall establish the planning philosophy, hydraulic design framework, structural considerations, and integration requirements adopted for culverts, cross-drainage structures, and outfall systems proposed under the project. The DPR shall generally address the following design aspects.

Culverts & Cross Drainage Structures: The DPR shall establish the hydraulic design criteria, sizing methodology, waterway assessment, afflux considerations, and structural framework adopted for culverts and cross-drainage structures.

Outfall design: The DPR shall establish the hydraulic integration framework, outfall-capacity assessment, discharge conditions, tailwater considerations, erosion-control measures, and downstream integration philosophy adopted for storm water outfall systems.

Erosion Protection: The DPR shall establish the erosion-control measures, slope-protection systems, energy-dissipation arrangements, scour-protection measures, and bank-protection provisions proposed under the project.

#### **6.6.6 Design Considerations for special Area:**

The DPR shall establish the special design criteria and engineering considerations adopted for storm water drainage systems in areas having unique terrain conditions, flood vulnerability, or hydraulic constraints.

Hilly Areas & Steep Terrain: The DPR shall establish the design considerations adopted for hilly terrain, steep-gradient zones, and high-velocity flow conditions including slope stabilization, cascade arrangements, erosion protection, hydraulic transitions, and energy-dissipation measures.

Flood-prone & low-lying areas: The DPR shall establish the flood-management measures, emergency-routing philosophy, drainage augmentation provisions, flood-protection measures, and operational safeguards proposed for flood-prone and low-lying areas.

#### **6.6.7 Storm Water Pumping Systems:**

The DPR shall establish the planning philosophy, sizing basis, redundancy framework, operational strategy, and infrastructure requirements adopted for storm water pumping systems wherever gravity-based drainage is not feasible.

Pumping Philosophy: The DPR shall establish the basis for adoption of storm water pumping systems and demonstrate that gravity-based drainage has been prioritized to the maximum feasible extent.

Selection of Pumps: The DPR shall undertake comparative assessment of alternative pumping arrangements considering hydraulic efficiency, flood-management requirements, operational reliability, redundancy requirements, energy consumption, surge conditions, and lifecycle cost.

Pumping Main: The DPR shall establish the design basis, hydraulic criteria, material-selection philosophy, surge-protection requirements, and outfall integration framework adopted for storm water pumping mains.

Redundancy & Power back up: The DPR shall establish the standby philosophy, backup-power arrangements, emergency operation framework, and redundancy provisions proposed for critical pumping infrastructure.

Monitoring & Automation: The DPR shall establish the monitoring framework, instrumentation systems, alarm systems, flood-warning systems, and automation philosophy proposed for storm water pumping infrastructure.

#### **6.6.8 Rainwater Harvesting & Sustainable Drainage system:**

The DPR shall establish the framework adopted for integration of rainwater harvesting, recharge systems, runoff attenuation measures, and sustainable storm water management practices within the proposed development. The DPR shall generally highlight following aspects:

Rainwater Harvesting Integration: The DPR shall establish the proposed framework for integration of rainwater harvesting systems with the storm water drainage network or within the project area through different best industry practices wherever feasible.

Groundwater recharge: The DPR shall establish the planning criteria and applicability of recharge pits, recharge trenches, recharge wells, infiltration systems, and associated groundwater-recharge measures proposed under the project.

Detention & retention System: The DPR shall establish the applicability and sizing philosophy adopted for detention systems, retention systems, balancing systems, and runoff-attenuation measures for critical drainage catchments.

Sustainable Storm water Management: The DPR shall evaluate the applicability and integration of Sustainable Urban Drainage Systems (SUDS), Water Sensitive Urban Design (WSUD) measures, Low Impact Development (LID) practices, and other sustainable storm water management approaches within the proposed Industrial Park infrastructure. The proposed framework shall aim to reduce runoff generation, attenuate peak discharge, improve groundwater recharge, minimize urban flooding, reduce burden on downstream drainage infrastructure, and improve long-term hydrological sustainability of the development.

Monitoring & Automation: The DPR shall establish the monitoring framework, instrumentation systems, alarm systems, flood-warning systems, and automation philosophy proposed for storm water pumping infrastructure.

#### **6.7 Project Cost Estimation & Lifecycle O&M Assessment:**

This section shall establish the phase-wise Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) assessment for the proposed Storm Water Drainage infrastructure under the DPR. The assessment shall include all civil, hydraulic, structural, electromechanical, utility, monitoring, environmental-protection, and allied infrastructure components required for development, operation, maintenance, and long-term sustainability of the complete storm water drainage system.

The cost estimation shall be based on applicable Schedule of Rates (SoR), approved market rates, recent comparable infrastructure projects, or other accepted estimation methodologies adopted by the implementing agency. The DPR shall clearly establish

the basis of estimation, year of pricing, rate basis, contingencies, escalation provisions, utility-shifting provisions, applicable taxes and duties, and project-specific assumptions considered during preparation of the cost estimates.

The CAPEX assessment shall include storm water drains, underground conduits, trunk drains, interceptor drains, culverts, cross-drainage structures, outfall systems, storm water inlets, manholes, recharge systems, detention systems, erosion-protection works, pumping infrastructure wherever applicable, utility shifting, road restoration, SCADA and monitoring infrastructure wherever proposed, electrical systems, landscaping restoration, and associated site-development works.

The OPEX assessment shall include desilting operations, drain cleaning, inspection and maintenance activities, pumping power consumption wherever applicable, manpower deployment, monitoring-system operation, preventive maintenance, flood-management preparedness, emergency-response requirements, periodic rehabilitation works, and long-term asset-maintenance requirements.

The DPR shall also establish phase-wise investment planning and assess long-term operational sustainability considering maintainability, desilting requirements, flood resilience, energy efficiency, lifecycle asset management, operational risks, and future augmentation requirements of the proposed storm water drainage infrastructure.

| Category                          | Indicative Components                                                                                                                      |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Civil & Hydraulic Infrastructure  | Roadside drains, covered drains, underground conduits, trunk drains, interceptor drains, culverts, outfall structures, headwalls, chambers |
| Storm water Collection Systems    | Inlets, gully pits, catch basins, gratings, inspection chambers, manhole.                                                                  |
| Structural & protection Works     | Retaining structures, erosion protection, slope protection, energy dissipation arrangements etc.                                           |
| Utility Shifting & Restoration    | Utility relocation, road restoration, pavement reinstatement, landscaping restoration etc, as applicable.                                  |
| Monitoring & Smart Infrastructure | Flood-warning systems, flow-monitoring systems, rainfall-monitoring systems, GIS integration                                               |
| O&M Cost                          | Power, manpower, maintenance Cost etc.                                                                                                     |

## 6.8 Checklist for Mandatory Deliverables.

The DPR shall include all technical deliverables, hydrological assessments, hydraulic calculations, engineering drawings, investigations, cost assessments, statutory considerations, and supporting documents necessary for technical appraisal, implementation, operation, maintenance, and future reference of the proposed Storm Water Drainage infrastructure.

All submissions shall be consistent with the adopted design criteria, rainfall analysis, runoff assessment, hydraulic design framework, grading strategy, flood-management philosophy, applicable CPHEEO guidelines, IRC codes, BIS codes, environmental requirements, and other adopted standards under the DPR.

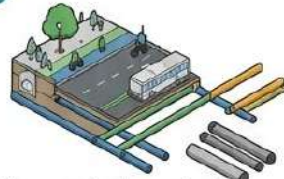
| Sl. No. | Mandatory Deliverable                                                  | Compliance               |
|---------|------------------------------------------------------------------------|--------------------------|
|         | <b>A. Planning, Investigations &amp; Design Basis</b>                  |                          |
| 1       | Approved Master Plan / Land-use Plan                                   | <input type="checkbox"/> |
| 2       | Planning Horizon & Development Phasing Assessment                      | <input type="checkbox"/> |
| 3       | Topographical Survey, Contour Plan & Existing Drainage Assessment      | <input type="checkbox"/> |
| 4       | Rainfall Analysis, Catchment Delineation & Runoff Assessment           | <input type="checkbox"/> |
| 5       | Hydrological & Hydraulic Design Basis Report                           | <input type="checkbox"/> |
| 6       | Design Criteria, Codes & Standards Statement                           | <input type="checkbox"/> |
| 7       | Service Level Benchmark Compliance Statement                           | <input type="checkbox"/> |
|         | <b>B. Storm Water Drainage Network &amp; Hydraulic Infrastructure</b>  |                          |
| 8       | Storm Water Drainage Network Design Report                             | <input type="checkbox"/> |
| 9       | Drainage Layout Drawings, Catchment Plan & Drainage Zoning Plan        | <input type="checkbox"/> |
| 10      | Hydraulic Profiles, Longitudinal Sections & Computation Sheets         | <input type="checkbox"/> |
| 11      | Drain Type Selection & Hydraulic Design Justification                  | <input type="checkbox"/> |
| 12      | Roadside Drainage, Storm Water Inlet & Manhole Details                 | <input type="checkbox"/> |
| 13      | Trunk Drains, Culverts, Cross-Drainage Structures & Outfall Design     | <input type="checkbox"/> |
| 14      | Utility Crossing, Road Crossing & Corridor Coordination Details        | <input type="checkbox"/> |
| 15      | Storm Water Pumping System Design wherever applicable                  | <input type="checkbox"/> |
| 16      | Erosion Protection, Scour-Control & Flood-Management Measures          | <input type="checkbox"/> |
|         | <b>C. Sustainable Drainage &amp; Smart Infrastructure Systems</b>      |                          |
| 17      | Rainwater Harvesting, Recharge & SUDS / WSUD Integration Framework     | <input type="checkbox"/> |
| 18      | Flood Routing, External Catchment & Waterlogging Mitigation Assessment | <input type="checkbox"/> |
| 19      | Monitoring, SCADA & Flood Warning Framework wherever applicable        | <input type="checkbox"/> |
| 20      | GIS-Based Utility Mapping & Asset Management Framework                 | <input type="checkbox"/> |
|         | <b>D. Costing, Implementation &amp; O&amp;M Framework</b>              |                          |
| 21      | Project Cost Estimation, BOQ & Lifecycle O&M Assessment                | <input type="checkbox"/> |
| 22      | O&M Philosophy, Desilting & Preventive Maintenance Framework           | <input type="checkbox"/> |
| 23      | Environmental & Statutory Compliance Assessment                        | <input type="checkbox"/> |
| 24      | Risk Assessment, Implementation Schedule & DPR Compliance Statement    | <input type="checkbox"/> |

## 1 DESIGN PERIOD



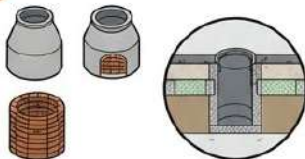
- 30-year horizon
- Phased expansion
- Superblock planning

## 2 SEWER NETWORK



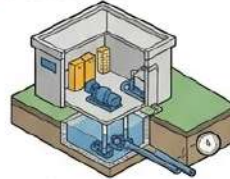
- Alignment, slope, depth
- Min size  $\geq 150\text{mm}$
- Pipe material selection

## 3 MANHOLES



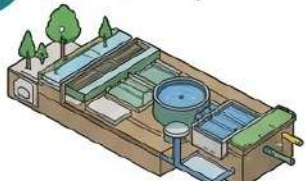
- At junctions, bends, intervals
- Based on function & spacing
- Access & maintenance

## 4 PUMPING



- Wet well, pumps, rising main
- Backup, surge protection
- Reliable operation

## 5 TREATMENT (STP/WWTP)



- Capacity & process
- Sludge handling & compliance
- Disinfection & treatment

## 6 CETP (INDUSTRIAL)



- Based on effluent type & load
- Monitor quality parameters
- Ensure regulatory compliance

## 7 REUSE / DISPOSAL



- Reuse (landscaping, cooling)
- Safe discharge
- Sustainable water management

## 8 O&M + MONITORING



- SCADA, flow meters, sampling
- Maintenance & emergency systems
- System performance monitoring

---

## Chapter 7: Solid Waste Management

---

## **7.1 About this Chapter:**

This chapter outlines the requirements and technical expectations for the Solid Waste Management (SWM) component of the Detailed Project Report (DPR) to be submitted by the State/SPV/implementing agency. It serves as the reference framework for preparation and technical evaluation of the proposed SWM system for the Industrial Park under BHAVYA Scheme.

The chapter aims to ensure development of an integrated, sustainable, efficient, and future-ready Solid Waste Management system covering waste generation assessment, collection, segregation, transportation, processing, recycling, treatment, disposal, monitoring, and institutional management.

The DPR shall demonstrate that the proposed SWM system is capable of managing municipal solid waste, industrial non-hazardous waste, commercial waste, horticulture waste, inert waste, and other identified waste streams generated within the project area across all development phases and up to the adopted design horizon.

## **7.2 Concept Note:**

BHAVYA Scheme envisages the development of future-ready, sustainable, and efficient Industrial Parks with high-quality infrastructure aimed at enhancing industrial productivity, operational reliability, and long-term resource efficiency. The infrastructure framework shall include integrated core utilities such as internal roads, underground utility networks, drainage systems, common treatment facilities, ICT infrastructure, and administrative systems. Considering water and power infrastructure as major lifecycle cost components, the planning approach shall prioritize efficiency, resilience, sustainability, and ease of operations.

The Solid Waste Management system for the proposed Industrial Park shall be planned as an integrated utility and environmental-management framework ensuring efficient collection, segregation, transportation, treatment, recovery, recycling, and scientific disposal of solid waste. The planning philosophy shall emphasize waste minimization, source segregation, circular-economy principles, resource recovery, composting, recycling, energy recovery, and reduction of landfill dependency. Separate assessment and planning shall be undertaken for biodegradable waste, recyclable waste, inert waste, industrial non-hazardous waste, and domestic hazardous waste.

The proposed SWM architecture may include waste-storage infrastructure, primary collection systems, transfer stations, Material Recovery Facilities (MRFs), composting/bio methanation facilities, waste-processing plants, sanitary landfill facilities, ICT-enabled monitoring systems, and associated transportation infrastructure.

The SWM plan preparation is based on a complete review and understanding of the special features of the project. Understanding the major sources generating solid wastes, type of waste, physical and chemical characteristics of the solid waste a Solid Waste Management Plan has been prepared. Different management for different type of wastes like Municipal Solid Waste (MSW), e-waste, Bio-Medical Waste, Construction and Demolition Waste, Hazardous and Other Wastes, Battery waste Management Plans are developed under the umbrella of Solid Waste Management Plan. Industrial waste management attracts totally different types of approach and its very industry specific. End to end management plans for all solid waste which will be generated in the Industrial Park are considered.

- Development of approach for waste management and service levels.
- Estimates of quantity of solid waste expected to be generated over the planning horizon and evolving the overall approach towards effective and safe management.
- Broad assessment of infrastructure for collection, transport, treatment (including recycling) and safe disposal of municipal solid waste.
- Designing waste management system under the paradigm of an eco-industrial park for maximizing waste recycling and resource recovery among different industrial units.

The DPR shall establish the technical basis for phase-wise infrastructure development, operational sustainability, environmental compliance, and long-term resilience of the proposed SWM system.

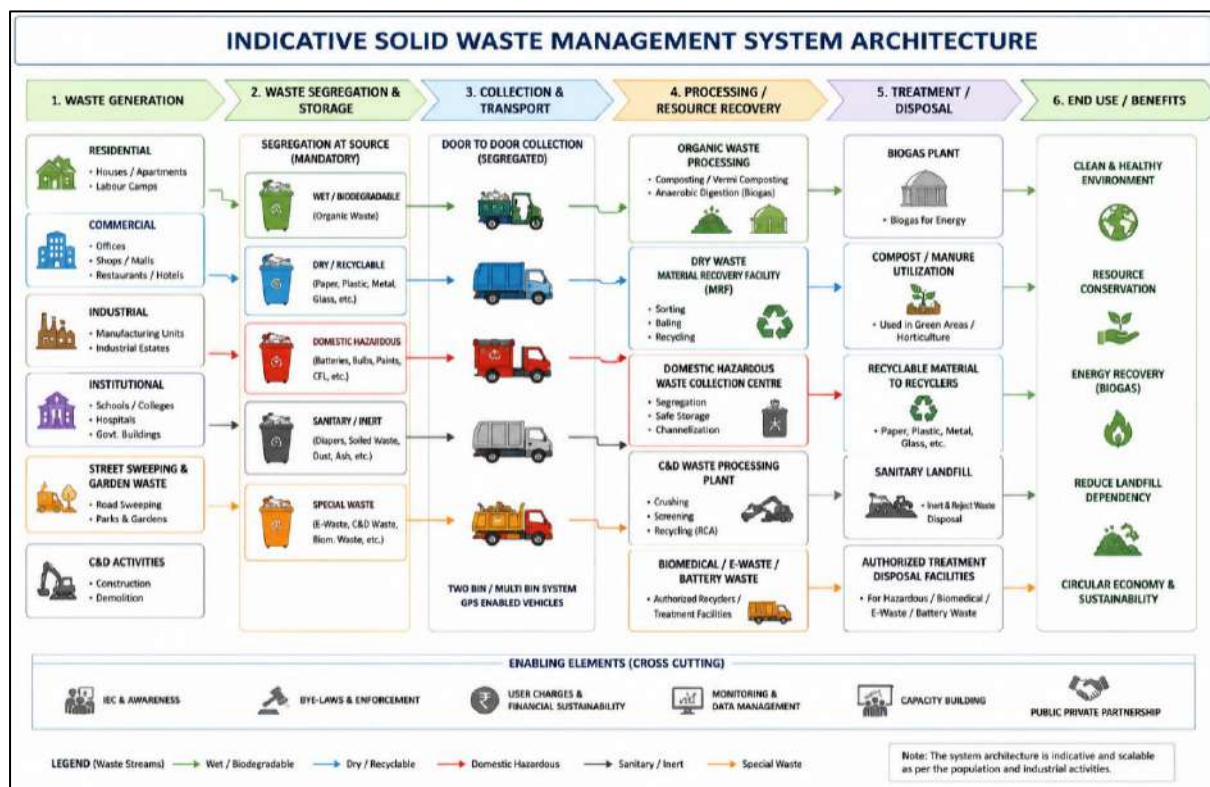


Figure 7.1: Indicative Solid Waste Management (SWM) System Architecture

### **7.3 Design Basis**

This section shall establish the overall planning philosophy, design criteria, operational objectives, and minimum service level requirements for the proposed Solid Waste Management (SWM) system. The DPR shall define the adopted planning horizon, waste-generation projections, waste characterization methodology, collection philosophy, transportation framework, processing strategy, environmental safeguards, and service-level objectives for the SWM system.

#### **7.3.1 Planning Horizon & Development Phasing**

The DPR shall define the adopted planning horizon, intermediate development stages, and phase-wise infrastructure augmentation strategy considering projected industrial growth, land development pattern, and future expansion requirements of the Industrial City.

#### **7.3.2 Basis of Population & Industrial Growth Projection**

The DPR shall establish the methodology and assumptions adopted for estimating resident population, floating population, worker population, industrial occupancy, and future industrial growth based on the approved master plan and proposed industrial typologies.

#### **7.3.3 Waste Generation & Characterization Methodology**

The DPR shall establish the methodology adopted for phase-wise and ultimate-year waste quantification and characterization based on projected population, industrial typologies, land use pattern, commercial activities, occupancy levels, and applicable waste-generation benchmarks supported through field studies, sampling, and waste-composition analysis.

#### **7.3.4 Source Segregation Philosophy**

The DPR shall define the source segregation philosophy for systematic separation of waste streams at the point of generation through a multi-bin collection system covering biodegradable, recyclable, domestic hazardous, sanitary, and special waste in accordance with applicable SWM Rules and resource-recovery objectives.

#### **7.3.5 Collection & Transportation Strategy**

The DPR shall establish an efficient and environmentally compliant collection and transportation strategy covering door-to-door collection, mechanized sweeping, transfer systems, route optimization, vehicle deployment, and GPS-enabled monitoring mechanisms.

### **7.3.6 Waste Processing & Resource Recovery Philosophy**

The DPR shall define the waste-processing and resource-recovery philosophy emphasizing segregation, recycling, composting, bio methanation, (Refuse-Derived Fuel) RDF generation, waste-to-energy integration, and maximization of material recovery to minimize landfill dependency.

### **7.3.7 Landfill & Scientific Disposal Framework**

The DPR shall establish the framework for scientific disposal of inert waste and process rejects through engineered landfill systems incorporating leachate management, environmental safeguards, gas venting, monitoring, and long-term closure provisions.

### **7.3.8 Reliability, Redundancy & Resilience Criteria**

The DPR shall define the reliability and redundancy provisions for critical SWM infrastructure including collection systems, processing facilities, backup equipment, emergency storage, and contingency arrangements to ensure uninterrupted operations during peak and emergency conditions.

### **7.3.9 Automation & Smart Monitoring Systems**

The DPR shall establish the proposed automation and digital monitoring framework including GPS-enabled vehicles, RFID systems, SCADA integration, weighbridges, IoT-based monitoring, MIS platforms, and centralized command-and-control systems for efficient SWM operations.

### **7.3.10 Sustainability & Circular Economy Measures**

The DPR shall establish sustainability measures focused on waste minimization, reuse, recycling, resource recovery, energy generation, reduction of carbon footprint, and promotion of circular-economy principles across the SWM value chain.

### **7.3.11 Applicable Codes, Standards & Technical References**

The DPR shall identify the applicable codes, standards, manuals, guidelines, benchmarks, and statutory provisions adopted for planning, design, construction, operation, and maintenance of the proposed Solid Waste Management system and its individual infrastructure components.

## **7.4 Service Level Benchmarks**

This section outlines the applicable Service Level Benchmarks (SLBs) for the proposed Solid Waste Management (SWM) system, primarily based on the benchmarks prescribed by the Ministry of Housing and Urban Affairs (MoHUA) Solid Waste Management Rules, 2016 and other relevant standards.

The DPR shall specify the adopted service levels against each benchmark parameter in a comparative tabular format, along with the proposed compliance approach. The adopted values shall generally meet or exceed the prescribed benchmark levels. Any deviation from the applicable benchmarks shall be supported with adequate project-specific technical justification.

| Sl. No | Service Level Benchmarks (SLBs)                                          | MoHUA Value                   |
|--------|--------------------------------------------------------------------------|-------------------------------|
| 1      | Household Level Coverage of Solid Waste Collection Services              | 100%                          |
| 2      | Efficiency of Municipal Solid Waste Collection                           | 100%                          |
| 3      | Extent of Segregation of Municipal Solid Waste                           | 100%                          |
| 4      | Extent of Scientific Processing of Municipal Solid Waste                 | Value                         |
| 5      | Extent of Scientific Disposal of Municipal Solid Waste                   | 100%                          |
| 6      | Frequency of Street Sweeping                                             | Daily / As per Road Hierarchy |
| 7      | Coverage of Door-to-Door Collection                                      | 100%                          |
| 8      | Coverage of Source Segregation System                                    | 100%                          |
| 9      | Complaint Redressal Efficiency                                           | >/80%                         |
| 10     | GPS/ICT Enabled Monitoring of Waste Transportation                       | 100%                          |
| 11     | Collection Efficiency of User Charges                                    | 100%                          |
| 12     | Landfill Disposal restricted only to Inert & Processing Rejects          | Mandatory                     |
| 13     | Processing of Wet/Biodegradable Waste through Composting/Bio methanation | Mandatory                     |
| 14     | Compliance with SWM Rules 2016                                           | 100%                          |
| 15     | Elimination of Open Dumping & Open Burning of Waste                      | 100% Compliance               |

## 7.5 Adopted Design Standards & Norms

This section shall summarize the design standards, codes, guidelines, reference manuals, and planning norms adopted for preparation of the Solid Waste Management System in the DPR. The objective of this section is to establish a consolidated technical reference framework for all design parameters and infrastructure components, thereby avoiding repetitive citation of standards in subsequent sections of the DPR.

The DPR shall clearly identify the adopted design criteria, corresponding reference standards, and applicable codal provisions for individual system components. In cases where project-specific requirements necessitate deviation from standard codal

provisions or commonly adopted engineering practices, the DPR shall provide adequate technical justification and supporting rationale for such deviations.

The following codes, standards, manuals, guidelines, and references may be considered during preparation of the DPR, including but not limited to:

### 7.5.1 Design Parameter

| Design Parameter / Component               | Reference Code / Manual                           | Commonly adopted Criteria/ Standards         |
|--------------------------------------------|---------------------------------------------------|----------------------------------------------|
| Waste Generation Rate                      | CPHEEO Manual on Municipal Solid Waste Management | 0.35–0.45 kg/capita/day (Residential)        |
| Commercial Waste Generation                | CPHEEO Manual / Project Specific Assessment       | 0.10–0.20 kg/capita/day                      |
| Industrial Non-Hazardous Waste Generation  | Project Specific / Industrial Benchmarking        | Based on Waste Quantity & Haul Distance      |
| Transfer Station Design Criteria           | CPHEEO Manual / CPCB Guidelines                   | 100% Collection Coverage                     |
| Processing Plant Design Period             | CPHEEO Manual                                     | Generally 15–20 Years                        |
| Material Recovery Facility (MRF) Design    | CPCB Guidelines / Industry Practices              | Based on Segregated Dry Waste Quantity       |
| Composting Plant Design Criteria           | CPHEEO Manual / CPCB Guidelines                   | Based on Organic Waste Fraction              |
| Bio methanation Plant Design Parameters    | MNRE / CPCB Guidelines                            | Based on Biodegradable Waste Characteristics |
| RDF/Waste-to-Energy Criteria               | CPCB / MoEFCC Guidelines                          | Waste with CV >1500 kcal/kg                  |
| Vehicle Routing & Transportation Criteria  | CPHEEO Manual / Industry Practices                | GPS Enabled Route Optimization               |
| Primary Collection Vehicle Capacity        | Industry Practice                                 | 2.5–3 Cum Mini Tippers                       |
| Secondary Transportation Vehicle Capacity  | Industry Practice                                 | 5–6 Cum Mechanized Tippers                   |
| Scientific Landfill Design Standards       | SWM Rules 2016 / CPCB Guidelines                  | Engineered Landfill with Leachate Management |
| Leachate Collection & Treatment            | CPCB Guidelines                                   | Mandatory for Landfill Facilities            |
| Construction & Demolition Waste Management | C&D Waste Rules 2016                              | Reuse/Recycling Preferred                    |

### 7.6 Waste Generation Assessment

This section of the DPR shall establish the phase-wise and ultimate-year solid waste generation assessment for the proposed Industrial/Manufacturing Cluster based on approved land use, projected population, industrial typologies, employment generation, commercial development, logistics activities, institutional facilities, utility areas, and applicable planning benchmarks. The assessment shall form the basis for

planning and sizing of all downstream Solid Waste Management (SWM) infrastructure components including collection systems, transfer stations, Material Recovery Facilities (MRFs), composting/bio methanation facilities, RDF/Waste-to-Energy systems, landfill facilities, and transportation infrastructure.

The DPR shall clearly define the adopted methodology, assumptions, generation factors, waste-characterization studies, segregation philosophy, collection efficiency, recycling targets, and design horizon adopted for preparation of the waste generation assessment. The waste assessment shall comprehensively cover the following waste streams:

#### **7.6.1 Domestic Solid Waste**

Domestic solid waste generation shall be assessed based on projected residential population, worker accommodation, dormitories, staff housing, transit accommodation, and associated residential facilities proposed within the project area. The adopted waste-generation norms shall be in accordance with CPHEEO guidelines, applicable state regulations, and project-specific benchmarking studies.

The DPR shall clearly establish:

- Phase-wise residential population projections
- Occupancy assumptions
- Per-capita waste generation norms
- Segregation ratios for wet, dry, and domestic hazardous waste
- Seasonal variation considerations
- Collection efficiency assumptions

Indicative domestic waste streams may include biodegradable waste, recyclable waste, sanitary waste, domestic hazardous waste, packaging waste, and inert fractions.

#### **7.6.2 Commercial Waste**

Commercial waste generation shall be assessed based on proposed commercial floor area, office spaces, retail developments, food courts, hospitality establishments, logistics facilities, administrative buildings, and common amenity areas within the industrial park. The DPR shall identify:

- Occupancy-based waste generation
- Floor-area-based waste generation criteria
- Waste composition characteristics
- Recyclable content assessment
- Food and organic waste quantities
- Collection frequency requirements

Separate consideration shall be given to high-footfall commercial zones and logistics hubs generating substantial packaging and dry recyclable waste.

### **7.6.3 Industrial Non-Hazardous Waste**

Industrial non-hazardous waste generation shall be assessed category-wise based on the proposed industrial mix, manufacturing typologies, process characteristics, utility requirements, and expected industrial occupancy within the industrial area. Generic per-capita norms shall not be adopted for industrial waste estimation.

The DPR shall preferably derive industrial waste-generation factors through:

- Benchmarking of comparable industrial estates
- Industrial case studies
- Process-specific waste assessments
- Sector-wise waste-generation studies

The assessment shall distinctly identify:

- Process waste
- Packaging waste
- Scrap materials
- Recyclable industrial waste
- Utility sludge
- Organic industrial waste
- Reusable by-products

The DPR shall also establish opportunities for industrial symbiosis, resource recovery, recycling, and circular-economy integration among industries within the cluster.

### **7.6.4 Horticulture & Green Waste**

Horticulture and green waste generation shall be assessed based on greenbelt areas, avenue plantation, landscaped zones, parks, open spaces, and seasonal vegetation management requirements proposed within the project area.

The DPR shall establish:

- Area-wise green waste generation
- Seasonal variations
- Mulching and composting potential
- Reuse strategy for manure generation and landscaping applications

The DPR shall preferably maximize reuse of horticulture waste through composting, mulching, and bio methanation applications.

### **7.6.5 Construction & Demolition Waste**

Construction & Demolition (C&D) waste assessment shall be undertaken for both construction-phase and operational-phase activities considering infrastructure development, industrial construction, utility works, road works, and future redevelopment activities within the project area. The DPR shall establish:

- Estimated C&D waste quantities
- Material composition (concrete, steel, bricks, soil, masonry, wood, asphalt, etc.)
- Reuse and recycling potential
- Temporary storage arrangements
- Disposal strategy
- Integration with authorized C&D waste recycling facilities

The DPR shall also identify opportunities for reuse of processed C&D waste in road subgrade, filling, landscaping, and non-structural applications.

### **7.6.6 Recyclable Waste Streams**

The DPR shall establish the recyclable waste generation potential within the project area including:

- Plastics
- Paper & cardboard
- Glass
- Metals
- Textiles
- Packaging waste
- E-waste components

The assessment shall include:

- Waste segregation ratios
- Recovery efficiency targets
- Material Recovery Facility (MRF) capacity assessment
- Recycling linkages with authorized recyclers
- EPR compliance requirements for plastic waste

The DPR shall also establish the proposed framework for resource recovery and recycling integration within the industrial ecosystem.

### **7.6.7 Inert Waste & Residual Rejects**

The DPR shall establish the quantity of inert waste, non-recyclable waste, street sweeping waste, processing rejects, and residual waste requiring scientific landfill disposal.

The assessment shall include:

- Street sweeping waste generation
- Drain desilting waste
- Landfill reject quantities
- Inert material characterization
- Seasonal and operational variation

The DPR shall establish measures to minimize landfill dependency through improved segregation, recycling, processing, and recovery systems.

#### **7.6.8 Hazardous / Domestic Hazardous Waste**

Where applicable, the DPR shall separately identify hazardous and domestic hazardous waste streams generated within residential, commercial, institutional, utility, and industrial areas.

Indicative waste streams may include:

- Paint containers
- Chemicals and solvents
- Batteries
- CFLs and tube lights
- Sanitary waste
- Household medical waste
- E-waste
- Laboratory waste

The DPR shall establish:

- Separate collection mechanisms
- Temporary storage arrangements
- Handling and transportation systems
- Linkages with authorized treatment and disposal facilities
- Compliance with applicable Hazardous Waste Rules and E-Waste Rules

#### **7.6.9 Waste Characterization Studies**

The DPR shall include detailed waste-characterization studies covering:

- Physical characteristics
- Chemical characteristics
- Moisture content
- Bulk density
- Calorific value
- Organic fraction
- Recyclable fraction

- Inert fraction
- Seasonal variation assessment

The characterization studies shall preferably be supported through:

- Field sampling
- Waste audits
- Laboratory analysis
- Benchmarking of comparable industrial parks
- CPHEEO/CPCB reference studies

#### **7.6.10 Waste Flow Diagram**

The DPR shall include a comprehensive waste-flow diagram illustrating:

- Waste generation sources
- Source segregation
- Primary collection
- Secondary transportation
- Transfer stations
- Processing facilities
- MRF operations
- Composting/bio methanation systems
- RDF/Waste-to-Energy systems
- Recycling pathways
- Landfill disposal systems
- Resource recovery loops
- Final treatment and disposal arrangements

The waste-flow diagram shall establish the overall sustainability, resource-efficiency, recycling, and circular-economy framework proposed under the project.

### **7.7 Major Project Components**

This section shall establish the technical configuration, sizing philosophy, operational framework, implementation strategy, environmental safeguards, redundancy provisions, and utility integration requirements for all major components of the proposed Solid Waste Management (SWM) system. The DPR shall demonstrate that the proposed infrastructure is adequately planned for phase-wise as well as ultimate-year waste generation conditions and is capable of ensuring reliable, sustainable, efficient, and environmentally compliant SWM operations throughout the project lifecycle.

The DPR shall include component-wise design basis, engineering calculations, layout drawings, equipment sizing, routing plans, processing-capacity assessment, environmental-management provisions, ICT integration framework, operational philosophy, and future scalability provisions for all SWM infrastructure components proposed under the project.

#### **7.7.1 Waste Storage & Segregation Infrastructure**

The DPR shall establish the planning philosophy and design framework for waste storage and source-segregation infrastructure proposed within residential, commercial, industrial, institutional, utility, and public areas of the Industrial City. The infrastructure shall support systematic segregation, temporary storage, efficient collection, operational hygiene, and prevention of cross-contamination among different waste streams.

The DPR shall establish:

- Source segregation philosophy
- Multi-bin storage systems
- Color coding standards
- Household/community bin sizing
- Common-area waste storage arrangements
- Public litter-bin requirements
- Industrial waste storage areas
- Hazardous waste segregation provisions
- Accessibility and collection compatibility

Separate storage arrangements shall be considered for:

- Wet/Biodegradable waste
- Dry/Recyclable waste
- Domestic hazardous waste
- Sanitary waste
- E-waste
- Biomedical waste
- Construction & Demolition waste
- Industrial hazardous waste

The DPR shall also establish maintenance arrangements, washing facilities, odour-control provisions, and public-awareness systems associated with waste storage infrastructure.

### **7.7.2 Primary Collection System**

The DPR shall establish the design basis and operational framework for the primary collection system covering door-to-door collection, household collection, institutional collection, commercial collection, and waste collection from common/public areas.

The DPR shall define:

- Collection frequency
- Collection coverage
- Route optimization
- Vehicle deployment strategy
- Collection manpower requirements
- Segregated collection methodology
- Community participation mechanisms
- Collection timing and operational schedules

The collection system shall ensure:

- 100% collection efficiency
- Segregated waste collection
- Minimal manual handling
- Prevention of littering and spillage
- Operational hygiene and safety

The DPR shall also establish:

- Bin lifting mechanisms
- Vehicle loading systems
- RFID/GPS integration
- Collection monitoring systems
- Grievance redressal mechanisms

### **7.7.3 Secondary Collection & Transportation System**

The DPR shall establish the transportation strategy and infrastructure for movement of segregated waste from collection points, transfer stations, processing facilities, and disposal sites.

The DPR shall include:

- Vehicle sizing and capacity assessment
- Transportation route plans
- Transfer logistics
- Collection efficiency assessment
- Haul-distance analysis

- Fuel optimization strategy
- Vehicle turnaround analysis
- Parking and maintenance infrastructure

Indicative transportation infrastructure may include:

- Mini tipper vehicles
- Mechanized tippers
- Covered compactors
- Hook-loader systems
- Containerized transportation systems
- Mechanized road sweepers

The DPR shall establish separate transportation arrangements for:

- Wet waste
- Dry recyclable waste
- Inert waste
- Hazardous waste
- Biomedical waste
- C&D waste
- Industrial waste streams

All transportation systems shall comply with applicable environmental, safety, and operational standards.

#### **7.7.4 Transfer Stations**

The DPR shall establish the requirement, sizing philosophy, operational framework, and siting criteria for transfer stations proposed under the SWM system. Transfer stations shall facilitate efficient transfer of waste from primary collection vehicles to larger transportation systems while minimizing operational inefficiencies and transportation costs.

The DPR shall establish:

- Waste throughput capacity
- Storage capacity
- Compaction requirements
- Vehicle circulation plans
- Odour-control systems
- Drainage arrangements
- Wash-water management
- Fire-safety provisions

- Environmental safeguards

The DPR shall also include:

- Traffic circulation analysis
- Loading/unloading arrangements
- Segregated waste handling systems
- Utility integration requirements
- Expansion provisions for future phases

#### **7.7.5 Material Recovery Facility (MRF)**

The DPR shall establish the planning, sizing philosophy, process configuration, operational framework, and integration strategy for the Material Recovery Facility (MRF) proposed under the SWM system.

The MRF shall be designed for:

- Sorting of recyclable waste
- Recovery of recyclable materials
- Temporary storage of recovered materials
- Baling and compaction operations
- Integration with recycling vendors

The DPR shall establish:

- Segregation methodology
- Mechanical/manual sorting systems
- Conveyor systems
- Baling systems
- Storage arrangements
- Fire protection systems
- Worker safety measures
- Resource recovery targets

Indicative recyclable streams may include:

- Paper & cardboard
- Plastics
- Metals
- Glass
- Textile waste
- Packaging materials

The DPR shall establish linkages with authorized recyclers and resource-recovery systems.

### **7.7.6 Composting / Bio methanation Facilities**

The DPR shall establish the design basis, treatment philosophy, sizing criteria, process configuration, and operational strategy for biodegradable-waste processing facilities proposed within the project area.

The assessment shall include:

- Organic waste generation
- Moisture characteristics
- Feedstock quality
- Seasonal variation
- Compost quality targets
- Biogas-generation potential

Indicative treatment technologies may include:

- Windrow composting
- In-vessel composting
- Vermicomposting
- Bio methanation systems
- Anaerobic digestion systems

The DPR shall establish:

- Processing capacity
- Retention periods
- Leachate management
- Odour-control systems
- Utility requirements
- Compost handling arrangements
- Biogas utilization strategy
- Environmental safeguards

The DPR shall also establish utilization plans for compost, digestate, and recovered energy.

### **7.7.7 Refuse Derived Fuel (RDF) / Waste-to-Energy Integration**

The DPR shall establish the planning framework and technical feasibility for RDF generation and Waste-to-Energy integration from non-recyclable combustible waste streams.

The DPR shall identify:

- Waste calorific value
- RDF suitability assessment
- Waste pre-processing requirements
- Shredding and drying requirements
- Energy recovery potential
- End-use applications

The DPR shall establish:

- RDF production systems
- Fuel storage arrangements
- Environmental safeguards
- Emission-control systems
- Regulatory compliance requirements

The DPR shall also establish potential integration with:

- Cement industries
- Industrial boilers
- Co-processing facilities
- Waste-to-energy plants

#### **7.7.8 Scientific Landfill Facility**

The DPR shall establish the planning, sizing philosophy, environmental safeguards, and operational framework for scientific disposal of inert waste, process rejects, and non-recoverable residual waste.

The landfill facility shall comply with applicable SWM Rules, CPCB guidelines, and environmental standards.

The DPR shall establish:

- Landfill-capacity calculations
- Landfill life assessment
- Cell development strategy
- Bottom-liner systems
- Leachate collection systems
- Gas venting systems
- Storm-water management
- Groundwater monitoring systems
- Closure and post-closure plans

The DPR shall establish measures for:

- Reduction of landfill dependency
- Prevention of groundwater contamination
- Odour and vector control
- Fire protection
- Environmental monitoring

#### **7.7.9 Construction & Demolition Waste Processing Facility**

The DPR shall establish the planning framework and infrastructure requirements for collection, segregation, processing, recycling, reuse, and disposal of Construction & Demolition (C&D) waste generated within the project area.

The DPR shall identify:

- C&D waste quantities
- Material composition
- Processing technologies
- Crushing and screening systems
- Recycled aggregate production
- Storage and stockpiling areas

The DPR shall establish reuse opportunities for:

- Road sub-base materials
- Filling applications
- Pavement layers
- Landscaping applications
- Non-structural construction applications

#### **7.7.10 ICT, GPS & SCADA-Based Monitoring Systems**

The DPR shall establish the digital monitoring and smart-management framework proposed for the SWM system. The framework may include:

- GPS-enabled waste vehicles
- RFID tagging systems
- SCADA integration
- Smart bins
- Weighbridge systems
- Centralized command-and-control systems
- Real-time monitoring dashboards
- Mobile applications
- MIS reporting systems

The DPR shall establish:

- Fleet monitoring systems
- Route optimization
- Complaint redressal systems
- Data analytics framework
- Predictive maintenance systems
- Performance-monitoring KPIs

#### **7.7.11 Environmental Monitoring Infrastructure**

The DPR shall establish the environmental monitoring systems required for operation of the SWM infrastructure in compliance with applicable environmental standards. The DPR shall establish monitoring systems for:

- Ambient air quality
- Noise levels
- Groundwater quality
- Surface-water quality
- Leachate quality
- Odour monitoring
- Stack emissions (where applicable)

The DPR shall establish:

- Sampling frequency
- Monitoring locations
- Laboratory requirements
- Compliance reporting framework
- Environmental audit systems

#### **7.7.12 Leachate Collection & Treatment Systems**

The DPR shall establish the planning and design framework for leachate management associated with composting facilities, transfer stations, waste-processing facilities, and landfill systems. The DPR shall establish:

- Leachate generation assessment
- Collection systems
- Drainage arrangements
- Storage facilities
- Treatment technologies
- Recirculation arrangements
- Disposal/reuse systems

Indicative treatment technologies may include:

- Equalization systems
- Biological treatment
- Physio-chemical treatment
- Membrane systems
- Evaporation systems

The DPR shall establish environmental safeguards to prevent contamination of groundwater, surface water, and surrounding ecosystems.

## 7.8 O&M framework

The DPR shall establish a comprehensive operation and maintenance framework covering manpower deployment, preventive maintenance, waste collection schedules, processing-facility operations, environmental monitoring, complaint management, ICT systems, and emergency-response arrangements.

| Category                           | Design Considerations                                                                                                                                      |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Preventive Maintenance Program     | Scheduled preventive maintenance framework for SWM infrastructure, vehicles, processing facilities, and utility systems.                                   |
| Vehicle & Equipment Maintenance    | Routine inspection, servicing, repair, fuel monitoring, and maintenance management for all SWM vehicles and equipment.                                     |
| Processing Plant Operations        | Standard operating procedures for MRF, composting, bio methanation, RDF, and landfill facilities including operational monitoring and manpower deployment. |
| Environmental Monitoring           | Periodic monitoring of air, water, leachate, noise, odour, and environmental compliance parameters as per CPCB/SPCB guidelines.                            |
| Odour & Vector Control Measures    | Provision of deodorization systems, sanitization, pest control, regular cleaning, and housekeeping arrangements for SWM facilities.                        |
| Fire & Emergency Response Plan     | Emergency preparedness framework including firefighting systems, emergency response procedures, spill management, and disaster-response arrangements.      |
| Digital Monitoring & MIS Reporting | ICT-enabled systems including GPS tracking, SCADA integration, RFID systems, MIS dashboards, and real-time monitoring mechanisms.                          |
| Health & Safety Management         | Occupational health and safety framework including PPE provisions, worker training, medical surveillance, hygiene management, and safety audits.           |

## 7.9 CAPEX & OPEX Assessment

This section shall establish the phase-wise Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) assessment for the proposed Solid Waste Management (SWM) system covering all infrastructure, utility, transportation, processing, environmental-management, automation, and operational components required for implementation and sustainable operation of the integrated SWM framework.

The assessment shall include all civil, mechanical, electrical, transportation, ICT, environmental, and allied infrastructure required for collection, segregation, transportation, treatment, recycling, recovery, monitoring, and scientific disposal of solid waste generated within the project area.

The cost estimation shall be based on applicable Schedule of Rates (SoR), approved market rates, recent comparable projects, OEM budgetary quotations, or other accepted estimation methodologies adopted by the implementing agency. The DPR shall clearly establish the basis of estimation, year of pricing, taxes and duties, contingencies, escalation provisions, and phasing assumptions considered in the cost assessment.

The CAPEX assessment shall establish phase-wise investment requirements linked with projected waste generation, development phasing, industrial occupancy, and infrastructure expansion strategy. The OPEX assessment shall establish long-term operational sustainability considering fuel consumption, manpower deployment, utility consumption, preventive maintenance, lifecycle replacement, environmental compliance, and operational reliability of the SWM system.

The DPR shall also establish opportunities for:

- Revenue generation through resource recovery
- Sale of recyclables
- Compost utilization
- RDF/Waste-to-Energy integration
- Carbon-credit opportunities
- User-charge recovery mechanisms
- PPP/Hybrid implementation models (where applicable)

The assessment shall also evaluate lifecycle replacement requirements for vehicles, mechanical equipment, ICT systems, and processing infrastructure to ensure long-term sustainability and uninterrupted operations.

| Category             | Key Considerations                                                                                                     |
|----------------------|------------------------------------------------------------------------------------------------------------------------|
| Civil Infrastructure | Transfer stations, processing facilities, landfill infrastructure, roads, drainage, buildings, parking, and utilities. |

|                           |                                                                                                                      |
|---------------------------|----------------------------------------------------------------------------------------------------------------------|
| Pipeline Infrastructure   | Leachate, drainage, water supply, firefighting, gas collection, and utility pipelines.                               |
| Electromechanical Systems | Processing equipment, conveyors, compactors, balers, pumps, blowers, DG sets, sweepers, and electrical systems.      |
| Automation & SCADA        | GPS, RFID, SCADA, weighbridges, CCTV, dashboards, and centralized monitoring systems.                                |
| Metering Systems          | Weighbridges, energy meters, water meters, fuel-monitoring systems, and flow meters.                                 |
| Utility Infrastructure    | Water supply, firefighting, electrical systems, DG backup, lighting, communication, and drainage systems.            |
| O&M Cost                  | Power, fuel, manpower, maintenance, consumables, environmental monitoring, and compliance costs.                     |
| Lifecycle Replacement     | Replacement of vehicles, equipment, SCADA systems, ICT hardware, pumps, electrical systems, and landfill components. |

### 7.10 Checklist for Mandatory Deliverables.

The DPR shall include all technical deliverables, studies, calculations, drawings, approvals, and reports necessary for technical appraisal and implementation.

| Sl. No | Deliverables                               | Checks                   |
|--------|--------------------------------------------|--------------------------|
| 1      | Waste Generation Assessment                | <input type="checkbox"/> |
| 2      | Waste Characterization Study               | <input type="checkbox"/> |
| 3      | Service-Level Benchmark Compliance Matrix  | <input type="checkbox"/> |
| 4      | Waste Flow Diagram                         | <input type="checkbox"/> |
| 5      | Collection & Transportation Plan           | <input type="checkbox"/> |
| 6      | Vehicle Routing & Fleet Assessment         | <input type="checkbox"/> |
| 7      | Transfer Station Design                    | <input type="checkbox"/> |
| 8      | Processing Facility Design Report          | <input type="checkbox"/> |
| 9      | MRF & Recycling Framework                  | <input type="checkbox"/> |
| 10     | Scientific Landfill Design                 | <input type="checkbox"/> |
| 11     | Environmental Impact & Mitigation Measures | <input type="checkbox"/> |
| 12     | ICT/GPS/Monitoring Framework               | <input type="checkbox"/> |
| 13     | O&M Framework                              | <input type="checkbox"/> |
| 14     | CAPEX & OPEX Assessment                    | <input type="checkbox"/> |
| 15     | Engineering Drawings & Layouts             | <input type="checkbox"/> |
| 16     | Statutory Approvals & Clearances           | <input type="checkbox"/> |
| 17     | Implementation Phasing Plan                | <input type="checkbox"/> |
| 18     | Any Other Applicable Supporting Document   | <input type="checkbox"/> |

---

## Chapter 8: Environment Guidelines

---

## 8.1 Background - Environment framework

Sustainability, environmental awareness, renewable resource management, etc plays a vital role in sustainable lifestyle. With the global carbon emissions rising day by day, it is essential to move towards reduction of environmental footprints. Govt of India has already committed to achieve the Net Zero emission target by year 2070. SPVs are expected to adopt the best practices of Environmental safeguards & Sustainability. Further the SPVs / Industries are expected to further perform better than the compliance of statutory obligation and set higher goals for adoption of innovative techniques & consistent improvement. A detailed note and presentation on Environment & Sustainability framework is enclosed as detailed note as **Annexure-2**. Additionally, corporate social responsibilities / corporate environmental responsibilities for need based environmental safeguards in vicinity to the project area may be integrated in the DPR.

Key considerations for EIA / EC proposals

Suitable due diligence is required for the issues mentioned as under:

- To ascertain whether proposed site is falling in proximity / or situated within Eco Sensitive Area (ESA)
- Flood plain zoning analysis.
- To assess whether proposed site is situated within / or proximity of Critically Polluted Area.
- Requirement of Tree Felling Permission.
- To ascertain whether any wildlife corridor / Wildlife sanctuary is situated in vicinity.
- Applicability of Coastal Regulation Zone (CRZ), Regulations (if any).

## 8.2 Environmental Clearance

As per Environment Impact Assessment (EIA) Notification, 2006 and its subsequent amendments all the projects listed under this notification requires prior Environmental Clearance (EC) from the concerned regulatory authority; MoEF&CC for matters falling under category 'A' and State Environmental Impact Assessment Authority (SEIAA) for matters falling under category 'B'.

#### 8.2.1. Category A projects:

- Industrial area projects housing atleast one category A industry, entire industrial area will be treated as category A project irrespective of the area.
- Industrial area greater than 500 ha area and housing at least one category B industry will be treated as category B project.

#### 8.2.2. Category B projects:

- Industrial area project less than 500 ha area and housing at least one category B industry.
- Industrial area greater than 500 ha area and not housing any industry belonging to category A or B is treated as category B project.

### **8.3 Classification of EC application**

- Industrial estate / park / area projects are classified at schedule 7(C)-Industrial estate / area under EIA Notification, 2006.
- Further Industrial area projects below 500 ha area and not housing any industry of Category 'A' or 'B' but contains building & construction projects > 20,000 Sq. mts built up area and / or development area more than 50 ha, are treated as Building Construction or Area Development Projects, listed at s.no 8(a) or 8(b) in the EIA Notification, 2006. Projects under this category requires EC from respective SEIAA at State level.
- Based on threshold of the project, the Environmental Clearance (EC) of the project is required to be obtained by the project proponent / SPV during pre construction stage. No construction work / development of trunk infrastructure is allowed before obtaining prior EC of the project.

### **8.4 Steps involved in the EC process are as under:**

- Authorization of an official for submitting EIA / EC application and registration on MoEF&CC's parivesh portal.
- Submission of Terms of Reference (ToR) application to MoEF&CC / SEIAA based on threshold of the project (by NABET accredited EC consultants).
- Deposition of ToR / EC application fee (as applicable for respective State).

- The baseline data used for preparation of EIA / EMP reports may be collected at any stage, irrespective of the request for ToR or the issue thereof. However, such a baseline data and the public consultation should not be older than 3 years, at the time of submission of the proposal, for grant of Environmental Clearance, as per ToRs prescribed.
- Consideration of ToR application by Expert Appraisal Committee (EAC), MoEF&CC / SEIAA.
- Grant of ToR by MoEF&CC / SEIAA for carrying out Environmental Impact Assessment (EIA) of the project.
- The Terms of Reference for the projects issued by the regulatory authority concerned, shall have the validity of four years from the date of issue.
- Submission of draft EIA to State Pollution Control Board (SPCB).
- Public Hearing to be conducted by the SPCB under chairmanship of District Collector (Public Hearing is exempted for Building Construction & Area Development Projects).
- Issuance of minutes of meeting of Public Hearing by SPCB.
- Submission of EC application along with final EIA to MoEF&CC / SEIAA (duly addressing comments / suggestions received during Public Hearing).
- Appraisal of EC proposal by the EAC, MoEF&CC / SEIAA based on the EIA report, EC application & outcome of the Public Hearing.
- Consideration of EC proposal by MoEF&CC / SEIAA.
- Grant of EC by MoEF&CC / SEIAA.
- Detailed work flow of Environmental Clearance for Category A and Category B project is enclosed as an **Annexure- 3 & Annexure- 4** respectively.

## 8.5 Advertisement of grant of Environmental Clearance

After grant of Environmental Clearance (EC) of the project, the project proponent shall prominently advertise grant of EC in at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days indicating that the project has been accorded environment clearance and the details of MoEF&CC SEIAA website where it is displayed.

Further, the copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal

Bodies in addition to the relevant offices of the Government who in turn must display the same for 30 days from the date of receipt.

## **8.6 Statutory compliance**

Following, the grant of EC, the project proponents / SPVs are required to mandatorily comply with the time bound statutory compliances throughout the project cycle; such as *submission of six monthly EC compliance report to the MoEF&CC, submission of periodic compliance to State Pollution Control Board (SPCB), Labour compliance, preparation of prescribed mitigation & conservation plan agreed during EC application stage, implementation of approved Environmental Management Plan (EMP) etc.* Further the project proponents also require to obtain consent to establish (CTE) and consent to operate (CTO) from State Pollution Control Board.

## **8.7 Statutory obligation stipulated under EC**

As per conditions stipulated in the EC letter, six monthly EC compliance comprises broadly of following parameters:

- Statutory filing of periodic compliance reports to MoEF&CC & SPCB.
- Preparation of site specific mitigation & conservation plan (as stipulated in EC).
- Self / third party Environmental audit.
- Establishment of EC cell at SPV.
- Compensatory afforestation & development of Green belt.
- Preparation of Environment policy.
- Action plan of Environmental Management Plan (EMP) implementation.
- Annual fund allocation for EMP and corporate Environmental Responsibility (CER).
- Hazard identification & risk assessment.
- Disaster management plan.
- Industrial effluent management.
- Air quality monitoring & preservation.
- Water quality monitoring & preservation.
- Energy conservation measures.
- Waste management.
- Noise monitoring & preservation.
- Rain water harvesting.

## 8.8 Applicable Legal & Policy framework

The applicable legal and policy framework for an Environmental Impact Assessment (EIA) and Environmental Clearance (EC) outlines the mandatory evaluations required for implementation of the project. Primarily, the Environmental Clearance is guided by the Environment (Protection) Act, 1986 and the EIA Notification, 2006 and subsequent amendments. Apart from Environmental Clearance, other applicable Environmental and other related regulations for the project are listed as below:

*Table 8.1: Applicable Environmental and other Regulations for the project*

| Sl.no | Applicable regulations                                                                                                    | Compliance / application                                                                             |
|-------|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| 1     | The Environmental (Protection) Act, 1986 and subsequent amendments                                                        | To protect and improve overall environment.                                                          |
| 2     | The EIA Notification, 2006 and subsequent amendments                                                                      | For Environmental Clearance of the project.                                                          |
| 3     | Coastal Regulation Zone (CRZ) Notification, 2019 and subsequent amendments                                                | Protection of coastal area and CRZ clearance.                                                        |
| 4     | The Air (Prevention and Control of Pollution) Act, 1981.                                                                  | For consent to establish (CTE) & consent to operate (CTO) for upcoming industries / industrial area. |
| 5     | The Water (Prevention and Control of Pollution) Act, 1974 and Cess Act of 1977.                                           | For consent to establish (CTE) & consent to operate (CTO) for upcoming industries / industrial area. |
| 6     | The Noise Pollution (Regulation and Control) rules, 2000. Noise Pollution (Regulation and Control) Amendment) Rules 2010. | Noise pollution regulation and control of noise pollution by the upcoming respective industries.     |
| 7     | Hazardous and other waste (Management and Trans boundary                                                                  | Hazardous wastes management                                                                          |

|           |                                                                                    |                                                                                                                                                                                                                     |
|-----------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Movement) Rules, 2016 and subsequent amendments                                    |                                                                                                                                                                                                                     |
| <b>8</b>  | Solid Waste Management Rules, 2026                                                 | Handling, treatment and disposal of solid waste generated at Industrial area.                                                                                                                                       |
| <b>9</b>  | E-Waste (Management) Rules, 2022 and subsequent amendments                         | Management of E-Waste as consumer / producer.                                                                                                                                                                       |
| <b>10</b> | Battery Waste Management Rules, 2022                                               | For appropriate handling of used batteries by the upcoming industries                                                                                                                                               |
| <b>11</b> | The Construction and Demolition (C&D) Waste Management Rules, 2025                 | Management of construction waste and materials as per the provisions of the storage and disposal of the Construction and Demolition (C&D) Waste Management Rules.                                                   |
| <b>12</b> | The Manufacture, Storage and Import of Hazardous Chemical Rules (as amended), 2000 | Regulatory framework to prevent major industrial accidents and regulate the handling of hazardous substances                                                                                                        |
| <b>13</b> | The Wildlife (Protection) Act, 1972 and subsequent amendments.                     | Applicable, if the proposed project is situated within eco sensitive zone and / or if in case any Wildlife Sanctuary is situated within 10 km of the proposed project and its eco sensitive zone is in draft stage. |
| <b>14</b> | The Van (Sanrakshan Evam Samvardhan) Adhiniyam, 1980                               | Applicable in case part & parcel of the proposed                                                                                                                                                                    |

|           |                                                                                                                                         |                                                                                                                                                                                                |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                                                                                                                                         | project / or project is situated within notified Forest Land.                                                                                                                                  |
| <b>15</b> | The Plastic Waste Management Rules, 2016 and subsequent amendments                                                                      | Processing & disposal of non-recyclable fraction of plastic waste.                                                                                                                             |
| <b>16</b> | The Ancient Monuments and Archaeological Sites & Remains Act, 1958 & subsequent amendments.                                             | In case archaeological monument located within 10 km of the project site.                                                                                                                      |
| <b>17</b> | The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 & subsequent amendments. | For Projects wherein land acquisition / re-settlement is involved.                                                                                                                             |
| <b>18</b> | Fly Ash Notification, 2021                                                                                                              | Use of fly ash as road laying, road and flyover embankments, shoreline protection structures in coastal districts and dams within 300 kms from the lignite or coal based thermal power plants. |
| <b>19</b> | Tree felling / Tree protection Rules                                                                                                    | For tree felling permission as per State specific regulations.                                                                                                                                 |
| <b>20</b> | Bio-Medical Waste Management (Second Amendment) Rules, 2019                                                                             | Disposal of bio medical waste.                                                                                                                                                                 |
| <b>21</b> | Ground Water NoC from CGWA / State Ground Water Authority.                                                                              | For withdrawal of ground water / dewatering etc.                                                                                                                                               |
| <b>22</b> | Motor Vehicles Act, And Its amendment, 2019                                                                                             | To operate vehicle havng Pollution Under Control Certificate (PUCC) and operation of construction vehicle.                                                                                     |

|           |                                                                                                                        |                                                                                                                                       |
|-----------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>23</b> | State level local bye laws                                                                                             | For change in land use and approval of Lay out / master plan.<br>Development of project in accordance with Land-use and Master plans. |
| <b>24</b> | No Objection Certificate for Height Clearance from Airport Authority of India (AAI)                                    | Height clearance from AAI in case project is situated in proximity to the Airport.                                                    |
| <b>25</b> | Labour Licence                                                                                                         | For deployment of workmen at construction site.                                                                                       |
| <b>26</b> | Registration under Building & other Construction Workers (Regulation of employment & conditions of services) Act, 1996 | For labour cess                                                                                                                       |
| <b>27</b> | Contractor All Risk (CAR) insurance and other applicable policy, permits & approval of contractor.                     | To be obtained by the contractor before start of work for development of trunk infrastructure.                                        |

---

## Chapter 9: Power System

---

## **9.1 About this Chapter:**

This chapter outlines the requirements and technical expectations for the Power Supply System component of the Detailed Project Report (DPR) to be submitted by the State/SPV/Implementing Agency under BHAVYA Scheme.

The chapter serves as the reference framework for planning, design, technical evaluation, implementation, operation, and maintenance of the proposed power infrastructure for the Industrial City.

The DPR shall establish an integrated, efficient, reliable, sustainable, and future-ready electrical infrastructure system capable of meeting the projected industrial, commercial, residential, utility, and common-area power requirements across all development phases and up to the adopted design horizon.

The proposed power infrastructure framework may include grid connectivity systems, receiving substations, transmission and distribution networks, ring-main systems, transformers, street-lighting systems, renewable-energy integration, SCADA systems, emergency power systems, smart metering systems, and associated electrical utility infrastructure.

## **9.2 Concept Note:**

The Power Supply System for the proposed Industrial Park shall be planned as an integrated electrical infrastructure framework ensuring uninterrupted, safe, reliable, and quality power supply for industrial operations, utilities, residential areas, commercial areas, and common infrastructure.

The planning philosophy shall emphasize:

- Reliable and redundant power supply systems
- Underground utility integration
- Energy-efficient electrical infrastructure
- Smart-grid and SCADA integration
- Renewable-energy integration
- Demand-side management
- Safety and resilience
- Ease of operation and maintenance
- Lifecycle sustainability

The proposed electrical infrastructure architecture may include:

- Grid connectivity infrastructure
- Receiving substations
- Transmission & distribution systems
- Ring-main distribution systems
- RMUs & distribution transformers

- Street-lighting systems
- Smart metering systems
- SCADA & ICT systems
- Renewable-energy systems
- DG backup systems
- Earthing & lightning-protection systems
- Utility corridors and electrical rooms

The DPR shall establish the technical basis for phase-wise power infrastructure development, load management, operational sustainability, energy efficiency, electrical safety, environmental compliance, and long-term resilience.

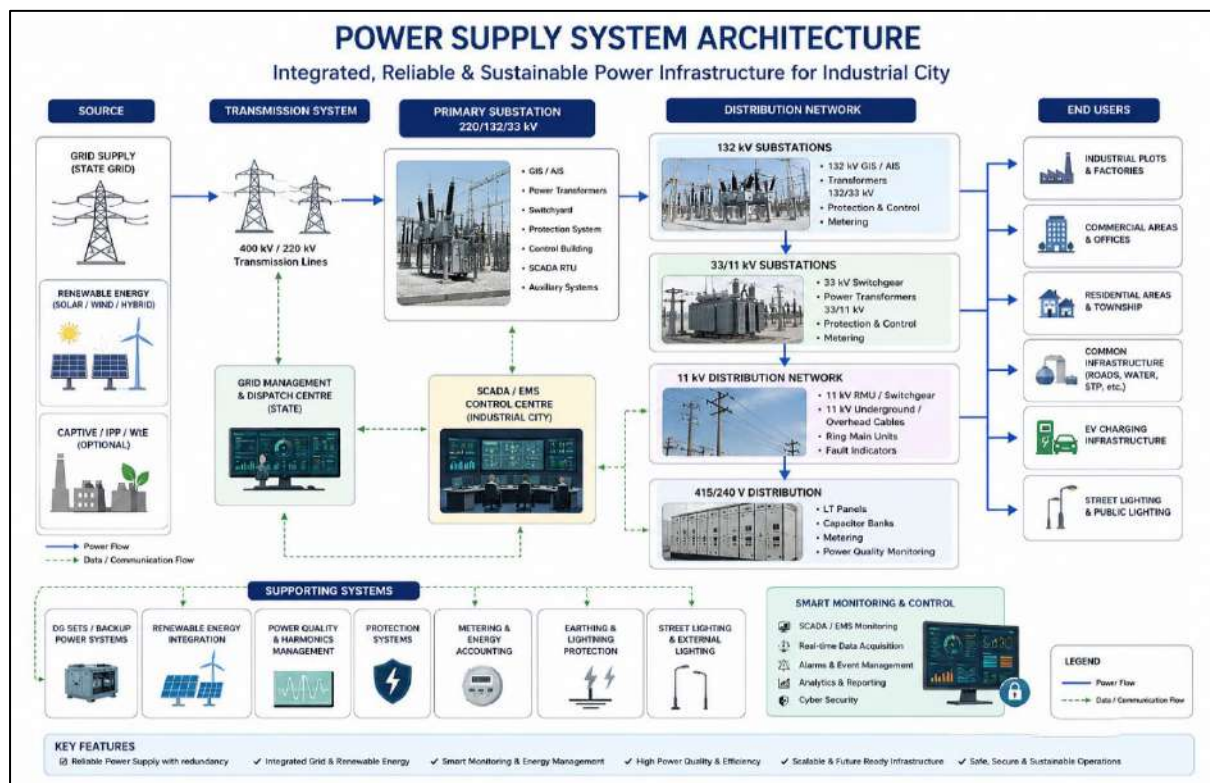


Figure9.1: Indicative Power Supply System Architecture

## 9.3 Design Basis

This section shall establish the overall planning philosophy, design criteria, operational objectives, and minimum service-level requirements for the proposed Power Supply System.

### 9.3.1 Planning Horizon & Development Phasing

The DPR shall define the adopted planning horizon, intermediate development stages, and phase-wise electrical infrastructure augmentation strategy considering projected industrial growth, occupancy, and future expansion requirements.

### **9.3.2 Basis of Demand Assessment**

The DPR shall establish the methodology and assumptions adopted for estimating industrial, commercial, residential, utility, institutional, and common-area power demand based on approved master plans and industrial typologies.

### **9.3.3 Power Demand Assessment Methodology**

The DPR shall establish the methodology adopted for connected-load estimation, maximum-demand analysis, diversity-factor assessment, load forecasting, load density assessment, and demand projections for all development phases.

### **9.3.4 Power Supply Philosophy**

The DPR shall define the overall power-supply philosophy including grid connectivity approach, voltage hierarchy, redundancy criteria, distribution philosophy, emergency backup provisions, and future scalability requirements.

### **9.3.5 Distribution Network Strategy**

The DPR shall establish the strategy for electrical transmission and distribution including underground cable systems, ring-main networks, transformer locations, feeder arrangements, and load balancing mechanisms.

### **9.3.6 Reliability, Redundancy & Resilience Criteria**

The DPR shall define reliability and redundancy provisions including dual-source supply, standby feeders, backup transformers, emergency power systems, and contingency arrangements.

### **9.3.7 Automation & Smart Monitoring Systems**

The DPR shall establish the proposed automation and smart-monitoring framework including SCADA systems, smart meters, GIS mapping, energy-monitoring systems, and centralized command-and-control systems.

### **9.3.8 Energy Efficiency & Sustainability Measures**

The DPR shall establish sustainability measures focused on energy efficiency, renewable-energy integration, smart lighting systems, energy conservation measures, and reduction of carbon footprint.

### **9.3.9 Applicable Codes, Standards & Technical References**

The DPR shall identify the applicable codes, standards, manuals, guidelines, benchmarks, and statutory provisions adopted for planning, design, construction, operation, and maintenance of the proposed Power Supply System.

#### Indicative References:

- Indian Electricity Act 2003
- Central Electricity Authority (CEA) Guidelines 2010
- National Electrical Code of India
- IEC Standards
- IEEE Standards
- BIS Standards
- Bureau of Energy Efficiency (BEE) Guidelines
- Local Utility / DISCOM Standards
- IS Standards (IS 732, 5613 & 3043)

### 9.4 Service Level Benchmarks

This section outlines the applicable Service Level Benchmarks (SLBs) for the proposed Power Supply system, primarily based on the benchmarks prescribed by the Central Electricity Authority (CEA) and other relevant standards.

The DPR shall specify the adopted service levels against each benchmark parameter in a comparative tabular format, along with the proposed compliance approach. The adopted values shall generally meet or exceed the prescribed benchmark levels. Any deviation from the applicable benchmarks shall be supported with adequate project-specific technical justification.

| Sl. No | Service Level Benchmarks (SLBs)         | Benchmark Value              |
|--------|-----------------------------------------|------------------------------|
| 1      | Power Supply Reliability                | 24X7 Supply                  |
| 2      | Redundancy Provision                    | N+1/Dual Source              |
| 3      | Voltage Regulation                      | As per CEA Norms             |
| 4      | Distributions Losses                    | As per Utility Norms         |
| 5      | SCADA Monitoring Coverage               | 100% Critical Infrastructure |
| 6      | Smart Metering Coverage                 | 100%                         |
| 7      | Street Lighting Coverage                | 100% Road Network            |
| 8      | Underground Cabling Coverage            | 100%                         |
| 9      | Renewable Energy Integration            | Project Specific             |
| 10     | Emergency Backup for Critical Utilities | Mandatory                    |

### 9.5 Adopted Design Standards & Norms

This section shall summarize the design standards, codes, guidelines, reference manuals, and planning norms adopted for preparation of the Power Supply System in

the DPR. The objective of this section is to establish a consolidated technical reference framework for all design parameters and infrastructure components, thereby avoiding repetitive citation of standards in subsequent sections of the DPR.

The DPR shall clearly identify the adopted design criteria, corresponding reference standards, and applicable codal provisions for individual system components. In cases where project-specific requirements necessitate deviation from standard codal provisions or commonly adopted engineering practices, the DPR shall provide adequate technical justification and supporting rationale for such deviations.

The following codes, standards, manuals, guidelines, and references may be considered during preparation of the DPR, including but not limited to:

### 9.5.1 Design Parameter

| Sl.No. | Design Parameter / Component  | Reference Code / Manual      |
|--------|-------------------------------|------------------------------|
| 1      | Load Density                  | Based on Industrial Typology |
| 2      | Demand Factor                 | Project Specific             |
| 3      | Diversity Factor              | Industry Standards           |
| 4      | Voltage Levels                | Utility/DISCOM Standards     |
| 5      | Transformer Loading           | CEA / IS Standards           |
| 6      | Underground Cabling           | IEC / IS Standards           |
| 7      | Street Lighting Levels        | IRC Codes                    |
| 8      | Earthing System               | IS 3043                      |
| 9      | Lightning Protection          | IEC Standards                |
| 10     | Energy Metering               | Smart Metering Standards     |
| 11     | SCADA Integration             | Utility Standards            |
| 12     | Renewable Energy Systems      | MNRE, CERC/SERC Guidelines   |
| 13     | Battery Energy Storage System | CEA Guidelines               |

## 9.6 Power Demand Assessment

This section shall establish the phase-wise and ultimate-year power demand assessment for the proposed Industrial City.

The DPR shall include:

- Connected load assessment
- Maximum demand estimation

- Load diversity analysis
- Demand forecasting
- Seasonal variation considerations
- Future expansion requirements
- Emergency load requirements
- Renewable-energy potential assessment

#### **9.6.1 Industrial Power Demand**

The DPR shall assess industrial power demand based on industrial typologies, process loads, utility requirements, and occupancy projections.

#### **9.6.2 Commercial Power Demand**

Commercial power demand shall be assessed based on commercial floor area, occupancy, HVAC requirements, lighting systems, and operational loads.

#### **9.6.3 Residential & Utility Demand**

The DPR shall establish residential and utility demand covering housing, hostels, administrative areas, utility buildings, and common facilities.

#### **9.6.4 Common Infrastructure Demand**

The assessment shall include power demand for street lighting, pumping systems, treatment plants, ICT infrastructure, and public utilities.

#### **9.6.5 Emergency & Essential Load Assessment**

The DPR shall identify critical and emergency loads requiring DG backup, UPS systems, or alternate supply arrangements.

#### **9.6.6 Connected Load & Maximum Demand Analysis**

The DPR shall establish connected-load assessment, maximum-demand calculations, and load-management philosophy.

#### **9.6.7 Diversity & Load Factors**

The DPR shall define diversity factors, coincidence factors, and load-factor assumptions adopted for sizing of electrical infrastructure.

#### **9.6.8 Future Expansion & Demand Forecasting**

The DPR shall establish phase-wise demand growth and future expansion provisions for substations, feeders, and utility corridors.

## **9.7 Major Project Components**

This section shall establish the technical configuration, sizing philosophy, operational framework, implementation strategy, environmental safeguards, redundancy provisions, and utility integration requirements for all major components of the proposed Power Supply system.

### **9.7.1 Grid Connectivity Infrastructure**

The DPR shall establish the proposed grid connectivity framework including incoming transmission lines, utility interface arrangements, and source substations.

### **9.7.2 Receiving Substation Infrastructure**

The DPR shall establish the sizing philosophy, configuration, redundancy provisions, and layout requirements for receiving substations.

### **9.7.3 Transmission & Distribution Network**

The DPR shall establish underground cable networks, feeder systems, voltage hierarchy, ring-main systems, and distribution arrangements.

### **9.7.4 RMU & Distribution Transformer System**

The DPR shall establish the planning framework for RMUs, compact substations, distribution transformers, and associated switching infrastructure.

### **9.7.5 Street Lighting Infrastructure**

The DPR shall establish the street-lighting system covering road hierarchy, illumination standards, smart-lighting systems, poles, cabling, and energy-efficient luminaires.

### **9.7.6 DG Backup & Emergency Power Systems**

The DPR shall establish backup power systems for critical utilities, emergency services, treatment plants, ICT infrastructure, and essential facilities.

### **9.7.7 Renewable Energy Integration**

The DPR shall establish renewable-energy integration opportunities including rooftop solar systems, utility-scale solar systems, battery-storage systems, and hybrid-energy solutions.

### **9.7.8 Metering Infrastructure**

The DPR shall establish smart metering systems, energy monitoring systems, feeder metering, utility metering, and centralized billing infrastructure.

### 9.7.9 SCADA, ICT & Smart Monitoring Systems

The DPR shall establish SCADA integration, energy-monitoring systems, fault-detection systems, centralized control systems, GIS mapping, and ICT infrastructure.

### 9.7.10 Earthing & Lightning Protection System

The DPR shall establish earthing systems, lightning-protection systems, bonding arrangements, and electrical safety measures.

### 9.7.11 Electrical Safety & Fire Protection Systems

The DPR shall establish electrical safety measures, fire-detection systems, firefighting systems, emergency shutdown systems, and statutory safety provisions.

## 9.8 O&M framework

The DPR shall establish a comprehensive operation and maintenance framework covering manpower deployment, preventive maintenance of substations and electrical equipment, distribution-network operations, power-quality monitoring, complaint management, SCADA and ICT systems, energy accounting, safety management, and emergency-response arrangements for ensuring reliable and uninterrupted power supply operations.

| O&M Framework Component             | Design Considerations                                                                                     |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Preventive Maintenance Program      | Scheduled preventive maintenance framework for substations, transformers, cables, and electrical systems. |
| Transformer & Equipment Maintenance | Inspection, servicing, oil testing, relay testing, and maintenance of electrical equipment.               |
| Distribution Network Operations     | Feeder management, load balancing, fault rectification, and outage management.                            |
| SCADA & Digital Monitoring          | Real-time monitoring, alarm management, analytics, and reporting systems.                                 |
| Street Lighting Maintenance         | Maintenance of poles, luminaires, control panels, and lighting systems.                                   |
| Fire & Emergency Response Plan      | Emergency preparedness for electrical faults, fire incidents, and power outages.                          |
| Electrical Safety Management        | PPE, safety audits, shutdown procedures, and worker safety systems.                                       |
| Energy Monitoring & MIS Reporting   |                                                                                                           |

## 9.9 CAPEX & OPEX Assessment

This section shall establish the phase-wise Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) assessment for the proposed Power Supply System covering all electrical, utility, automation, monitoring, renewable-energy, and associated infrastructure required for implementation, operation, and long-term

sustainability of the integrated power infrastructure framework. The assessment shall include all civil, electromechanical, transmission, distribution, SCADA, ICT, metering, street-lighting, backup power, and allied infrastructure components required for reliable and uninterrupted power supply within the project area.

The cost estimation shall be based on applicable Schedule of Rates (SoR), approved market rates, OEM budgetary quotations, recent comparable infrastructure projects, utility standards, and other accepted estimation methodologies adopted by the implementing agency. The DPR shall clearly establish the basis of estimation, year of pricing, taxes and duties, contingencies, escalation provisions, phasing assumptions, and utility interface requirements considered in the cost assessment.

The CAPEX assessment shall establish phase-wise investment requirements linked with projected power demand, development phasing, industrial occupancy, load growth, and infrastructure expansion strategy. The OPEX assessment shall establish long-term operational sustainability considering power procurement cost, energy losses, manpower deployment, preventive maintenance, utility consumption, SCADA operations, testing and monitoring requirements, lifecycle replacement of critical electrical equipment, and overall reliability of the Power Supply System. The DPR shall also evaluate opportunities for renewable-energy integration, energy-efficiency measures, smart-grid systems, carbon-emission reduction, user-charge recovery mechanisms, and PPP/Hybrid implementation models, wherever applicable.

| Category                            | Design Considerations                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------|
| Civil Infrastructure                | Substations, electrical rooms, cable trenches, utility corridors, control buildings, and foundations.   |
| Cable & Transmission Infrastructure | HT/LT cable networks, feeders, transmission systems, and utility connections.                           |
| Electromechanical Systems           | Transformers, RMUs, switchgear, panels, DG systems, and electrical equipment.                           |
| Automation & SCADA                  | SCADA systems, communication systems, GIS systems, and centralized monitoring infrastructure.           |
| Metering Systems                    | Smart meters, feeder meters, energy meters, and billing infrastructure.                                 |
| Utility Infrastructure              | Street lighting, electrical utilities, utility poles, emergency systems, and associated infrastructure. |
| O&M Cost                            | Power losses, manpower, maintenance, consumables, testing, energy monitoring, and utility charges.      |
| Lifecycle Replacement               | Replacement of transformers, switchgear, SCADA systems, cables, meters, and electrical equipment.       |

### 9.10 Checklist for Mandatory Deliverables.

The DPR shall include all technical deliverables, studies, calculations, drawings, approvals, and reports necessary for technical appraisal and implementation.

| Sl. No | Deliverables                               | Checks                   |
|--------|--------------------------------------------|--------------------------|
| 1      | Power Demand Assessment                    | <input type="checkbox"/> |
| 2      | Load Forecasting & Diversity Analysis      | <input type="checkbox"/> |
| 3      | Grid Connectivity Assessment               | <input type="checkbox"/> |
| 4      | Substation Design Report                   | <input type="checkbox"/> |
| 5      | Transmission & Distribution Network Layout | <input type="checkbox"/> |
| 6      | Electrical Single-Line Diagrams (SLD)      | <input type="checkbox"/> |
| 7      | Transformer & RMU Sizing Calculations      | <input type="checkbox"/> |
| 8      | Street Lighting Layout & Design            | <input type="checkbox"/> |
| 9      | SCADA & ICT Framework                      | <input type="checkbox"/> |
| 10     | Renewable Energy Assessment                | <input type="checkbox"/> |
| 11     | Electrical Safety & Earthing Design        | <input type="checkbox"/> |
| 12     | Emergency Power Backup Framework           | <input type="checkbox"/> |
| 13     | CAPEX & OPEX Assessment                    | <input type="checkbox"/> |
| 14     | O&M Framework                              | <input type="checkbox"/> |
| 15     | Utility Coordination Drawings              | <input type="checkbox"/> |
| 16     | Statutory Approvals & Clearances           | <input type="checkbox"/> |
| 17     | Implementation Phasing Plan                | <input type="checkbox"/> |
| 18     | Any Other Applicable Supporting Documents  | <input type="checkbox"/> |

---

## Chapter 10: ICT Infrastructure

---

## **10.1 Introduction**

Information and Communication Technology (ICT) infrastructure constitutes the digital nervous system of the proposed Smart Industrial Park. It underpins the real-time operational intelligence, safety, utilities management, connectivity, and governance services that distinguish a BHAVYA park from a conventional industrial estate. The ICT framework presented in this chapter has been designed to align with the national priorities articulated under PM GatiShakti National Master Plan, the National Industrial Corridor Programme (NICP), the Smart Cities Mission architecture, and the Digital India initiative.

The park spanning 100 to 1,000 acres, shall be planned, designed, and delivered as a fully integrated digital park, wherein all physical assets—roads, utilities, buildings, gates, poles, and open spaces—shall be embedded with smart sensing, connectivity, and monitoring capabilities from inception. The ICT architecture shall ensure that the park is future-proof for at least 20 years, accommodating evolving Industry 4.0 technologies including Artificial Intelligence (AI), Internet of Things (IoT), Digital Twins, 5G private networks, and advanced robotics ecosystems.

This chapter presents a comprehensive techno-commercial description of the ICT infrastructure proposed for the park, covering passive infrastructure, active networking, command and control, cybersecurity, smart systems, and sustainability. All specifications, standards, and implementation guidelines herein conform to applicable national and international standards and Government of India policy frameworks.

## **10.2 ICT Vision & Objectives**

The ICT vision for BHAVYA Smart Industrial Park is to establish a Unified, Intelligent, and Resilient Digital Ecosystem that enables real-time situational awareness, operational excellence, and a superior investor experience, while supporting sustainable and compliant industrial operations at global standards.

### **10.2.1 Strategic Objectives**

- Provide high-bandwidth, low-latency, and always-on digital connectivity to every plot, building, and common area facility within the park.
- Deploy an Integrated Command & Control Centre (ICCC) as the operational brain of the park, enabling centralized monitoring and management of all smart systems.
- Ensure physical and cyber security across the entire park perimeter, entry-exit points, and critical utility corridors.

- Deliver plug-and-play ICT readiness enabling allottees to connect enterprise networks and operational systems from day one.
- Enable data-driven management through IoT sensing, AI analytics, and a GIS-based asset management platform.
- Establish a robust cybersecurity posture conforming to ISO/IEC 27001:2022 and CERT-In directives.
- Achieve Green ICT objectives by optimizing energy consumption of ICT assets and aligning with LEED/GRIHA sustainability criteria.
- Future-proof the ICT infrastructure for integration with 5G private networks, Digital Twin platforms, and emerging Industry 4.0 technologies.
- Align Park ICT operations with the PM GatiShakti data-sharing framework and State Industrial Infrastructure Corporation (SIIC) digital platforms.

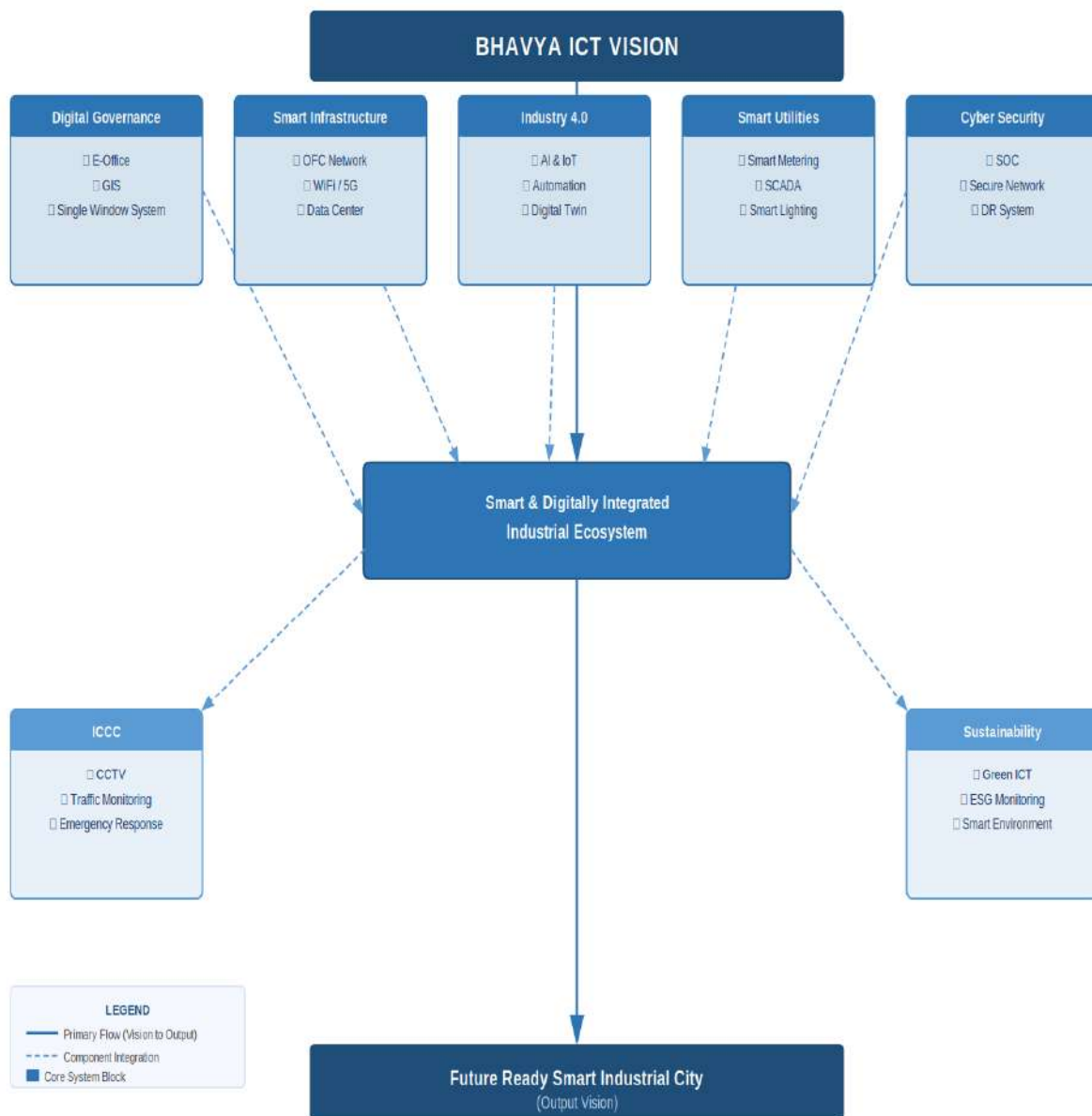


Figure 10.1: Integrated Block Diagram — Smart Industrial Ecosystem

### 10.3 ICT Master Planning Approach

The ICT Master Planning for the park adopts an integrated, layered approach aligned with the NICDC Smart Industrial Park Framework. The master plan is developed concurrently with the physical infrastructure master plan to ensure that ICT conduits, chambers, manholes, and passive infrastructure are embedded at the civil works stage, eliminating the cost and disruption of retrofitting.

The ICT Master Plan is structured around five functional layers: (i) Passive Infrastructure Layer comprising OFC ducts, chambers, and cabling pathways; (ii) Active Network Layer comprising switches, routers, and wireless systems; (iii) Application & Services Layer comprising ICCC, SCADA, BMS, and smart systems; (iv)

Data & Analytics Layer comprising the park data centre, AI platforms, and GIS; and (v) Cybersecurity & Governance Layer comprising perimeter security, SIEM, and policy enforcement.

The planning process integrates GIS-based zoning with utility corridor mapping under PM GatiShakti principles, ensuring that all ICT infrastructure is aligned with roads, storm-water drains, water supply, sewerage, power, and gas networks. Dedicated underground utility corridors (UUCs) accommodating HDPE ducts for OFC and power cabling shall be provided along all primary and secondary roads, enabling maintenance-free access through pre-installed draw-wires and junction chambers.

Scalability is a core design principle. The passive infrastructure shall be designed for at least 150% of initial active cable fill, and the data centre shall be planned for phased expansion from an initial 50 racks to 200 racks at full build-out. All active network equipment shall support hot-standby redundancy, and the ICCC platform shall be architected on a microservices-based, cloud-ready framework to accommodate future applications without system-wide replacement.

### **10.3.1 Zone-wise ICT Planning**

The park shall be subdivided into functional zones including Core Industrial Zones (heavy and light manufacturing), a Business and Administration Zone, a Worker Amenity and Residential Zone, a Logistics and Warehousing Zone, a Green & Open Space Zone, and a Utility Zone. Each zone shall receive differentiated ICT provisioning based on bandwidth demand, criticality, and operational requirements, as summarised in the zone-wise connectivity matrix forming part of Annexure ICT-01.

## **10.4 Passive ICT Infrastructure**

Passive ICT infrastructure constitutes the foundational layer of the park's digital ecosystem and shall be installed during civil construction to preclude the need for future road-cutting or retrofitting. All passive infrastructure shall be designed to a design life of minimum 30 years and shall comply with TIA-568-D, ISO/IEC 11801, and applicable BIS standards.

### **10.4.1 Optical Fibre Cable (OFC) Backbone**

The OFC backbone shall form a ring-and-spur topology connecting all zones, nodes, and critical facilities within the park. The backbone shall utilize Single-Mode Optical Fibre conforming to ITU-T G.652.D specification with a minimum core count of 96 fibres per duct on primary backbone routes and 48 fibres on secondary distribution routes. The ring topology shall ensure path redundancy such that a single cable cut or node failure does not interrupt network services to any zone.

The total estimated backbone OFC route length for a park ranging from 100 to 1,000 acres shall be between 8 and 58 route kilometres, scaled proportionally to the final notified park area and internal road/zone layout. For planning and cost estimation purposes, a 500-acre reference case assumes approximately 28–32 route kilometres of backbone OFC route.

Each backbone node—typically co-located at street-level cabinets or sub-ICCC rooms—shall be equipped with 19-inch rack-mounted fibre distribution frames (FDFs) with pre-terminated LC/PC connectors for ease of patching and future reconfiguration. The OFC splicing shall be carried out using fusion splicing technology with average splice loss not exceeding 0.02 dB, tested and OTDR-documented for each fibre.

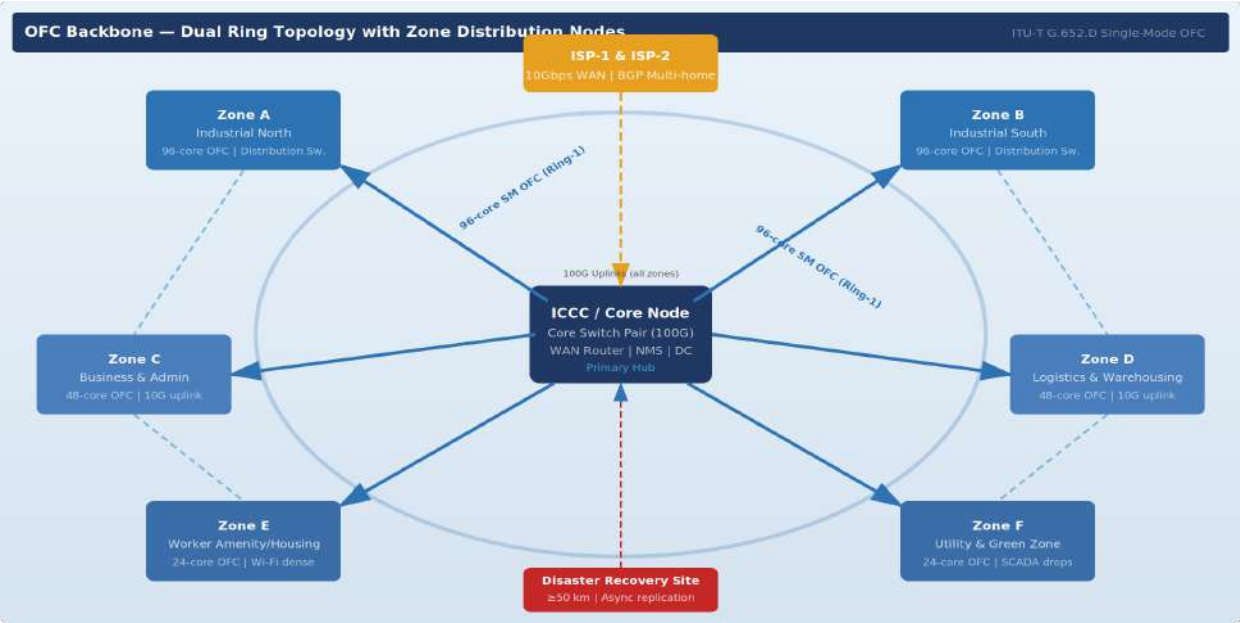


Figure 10.2: OFC Backbone Ring Topology — Zone Connectivity

|                                     |                              |                     |
|-------------------------------------|------------------------------|---------------------|
| ■ Primary OFC Backbone (96-core SM) | ■ Inter-Zone Ring Redundancy | ■ WAN / ISP Uplink  |
| ■ DR Replication Link               | ■ Core / ICCC Node           | ■ Primary Zone Node |
| ■ Secondary Zone Node               | ■                            | ■                   |

### 10.4.2 HDPE Duct Network

A comprehensive network of High-Density Polyethylene (HDPE) micro-duct and macro-duct pipes shall be installed along all primary and secondary roads within the park. The primary backbone ducts shall comprise a bank of 4×50mm HDPE ducts (2 active, 1 reserved, 1 for future) and 2×32mm micro-duct bundles for ICT services.

Secondary roads shall be served by 2×40mm HDPE ducts supplemented by 4×7mm micro-duct bundles for low-count service drops.

All HDPE ducts shall conform to IS 4984 and shall be furnished with internal silicon-coated liners and factory-installed pull-tapes to facilitate installation and future cable replacement without excavation. Duct route markers of UV-resistant HDPE shall be installed at every 50 metres and at each change of direction. All ducts shall be pressure-tested to 0.5 bar for 30 minutes prior to backfilling to certify integrity.

#### **10.4.3 Telecom Chambers & Manholes**

Pre-cast reinforced concrete (RCC) telecom inspection chambers conforming to TEC specifications shall be installed at maximum 50-metre intervals on backbone routes, at all route intersections, and at each plot service exit point. Chambers shall be of Type B (900mm × 600mm × 750mm) for secondary routes and Type D (1200mm × 900mm × 900mm) for backbone junctions. All chambers shall be fitted with anti-theft cast-iron frame and covers with appropriate load ratings (B125 for footpaths, D400 for carriageways) and tamper-proof bolt closure.

#### **10.4.4 Structured Cabling within Common Facilities**

Common area facilities including the Administration Building, ICCC, Employee Amenity Centre, Skill Development Centre, Convention Centre, and Security Cabins shall be wired with a structured cabling system conforming to ISO/IEC 11801 Class EA (Category 6A minimum). All horizontal cable runs shall not exceed 90 metres, with 10-metre patch cord allowance. Cable installation shall be carried out in dedicated cable trays (perforated steel, hot-dip galvanized) routed through false ceilings and service shafts, segregated from power cables with a minimum 300mm separation.

#### **10.4.5 Underground Utility Corridor Integration**

Wherever the master plan provides for a Common Utility Corridor (CUC) or Service Tunnel beneath primary roads, ICT HDPE duct banks shall be incorporated as a dedicated ICT compartment within the CUC cross-section, in accordance with the PM GatiShakti utility corridor standards. The CUC design shall allow for walk-in access for maintenance and cable pulling without excavation, significantly reducing long-term O&M costs. All ICT duct entries and exits from the CUC shall be protected with RCC end-caps and fire-rated sealing compounds at building penetrations.

### **10.5 Active ICT Infrastructure**

The active ICT infrastructure shall constitute a carrier-grade, Software-Defined Networking (SDN) capable, multi-layer network supporting the park's internal operational networks, tenant connectivity, and smart system communications. The

network shall be designed with full redundancy at core and distribution layers and shall support IPv6 natively alongside IPv4 dual-stack operation.

#### **10.5.1 Core Switching Layer**

The park's network core shall be deployed at the ICCC facility and shall comprise a pair of fully redundant, chassis-based core switches operating in an active-active Virtual Switch Unit (VSU) or Stacked configuration. Core switches shall provide minimum 40G/100G uplink ports for inter-chassis links and 10G/25G downlinks to distribution switches. The core switching platform shall support full L3 routing with OSPF/BGP, MPLS, QoS with DiffServ, NetFlow/sFlow monitoring, and MACsec encryption on all trunk ports. Hardware-based Line Rate switching capacity shall not be less than 12.8 Tbps per chassis. A dedicated out-of-band (OOB) management network with console access to all active devices shall be provided.

#### **10.5.2 Distribution Switching**

Distribution switches shall be deployed at each zone-level ICT room or outdoor street cabinet (minimum one per 50-acre zone) and shall interconnect the core via dual uplinks on diverse OFC paths. Distribution switches shall operate at a minimum of 10G uplink capacity and provide 1G/2.5G access downlinks to access switches. All distribution switches shall support IEEE 802.1ag OAM for link fault management, Power over Ethernet Plus Plus (PoE++) delivery of up to 90W per port for powering IoT devices and smart poles, and VLAN segmentation aligned with the park's network segmentation architecture.

#### **10.5.3 Routers & WAN Connectivity**

A dedicated WAN router cluster at the ICCC shall manage external internet connectivity, State NIC network peering, and NICDC's central network interconnection. The park shall procure primary internet bandwidth from at least two diverse ISPs, with automatic failover configured through BGP multi-homing. Minimum contracted internet bandwidth shall be 10 Gbps (expandable to 100 Gbps) for initial phase, with a Service Level Agreement mandating 99.9% uptime. Additionally, a dedicated MPLS link to the NICDC central data centre and the nearest National Knowledge Network (NKN) PoP shall be provisioned.

#### **10.5.4 Wi-Fi Infrastructure**

The active wireless infrastructure shall deploy Wi-Fi 6E (IEEE 802.11ax) Access Points (APs) across all indoor common areas and outdoor zones. APs shall operate across 2.4 GHz, 5 GHz, and 6 GHz bands simultaneously, with individual AP throughput of not less than 3.5 Gbps. A cloud-managed or on-premise Wireless LAN Controller (WLC) shall provide centralized RF management, automatic channel optimization,

client steering, and integrated RADIUS-based user authentication. Outdoor APs shall be IP-67 rated and mounted on smart poles at 50–80 metre inter-AP spacing to ensure ubiquitous –65 dBm coverage. A minimum of 1,200 access points (scalable to 2,000+) shall be deployed at full park build-out.

#### **10.5.5 Network Management System (NMS)**

A comprehensive Network Management System shall be deployed at the ICCC for real-time visibility, fault management, configuration management, accounting, and performance monitoring (FCAPS) of all active ICT assets. The NMS shall support automated topology discovery, threshold-based alerting via email/SMS/push notifications, root-cause analysis, and SLA compliance dashboards. Integration with the ICCC's central monitoring platform shall be through standardized APIs (REST/GraphQL) to enable cross-domain correlation of network events with physical security and utility incidents.

### **10.6 Integrated Command & Control Centre (ICCC)**

The Integrated Command & Control Centre (ICCC) shall serve as the operational nerve centre of the Smart Industrial Park, consolidating real-time data streams from all smart systems—surveillance, access control, utilities, environment, parking, smart poles, and building management—into a unified operational intelligence platform. The ICCC shall be housed in a purpose-built, environmentally controlled facility of approximately 2,000–3,000 sq.ft. within the Administration Complex, designed to operate 24 hours a day, 365 days a year, with a minimum staffing of six operators and one supervisor per shift.

#### **10.6.1 Centralized Monitoring Platform**

The ICCC platform shall be built on a microservices-based, API-first architecture to enable seamless integration with existing and future smart systems without vendor lock-in. The platform shall feature a unified Geographical Information System (GIS) interface enabling operators to visualize all park assets, alarms, and events on a geo-referenced park map. The platform shall support role-based access control (RBAC), audit logging of all operator actions, automated alarm correlation and prioritization, and escalation workflow management. The system shall maintain a minimum of 5 years of historical operational data on integrated storage with a 5-minute data granularity for all IoT telemetry streams.

#### **10.6.2 Video Wall System**

The ICCC operator hall shall be equipped with a high-resolution video wall comprising not less than 12 units of 55-inch narrow-bezel ( $\leq 1.7\text{mm}$ ) LED-backlit or Direct View LED panels arranged in a 4×3 matrix configuration, delivering an aggregate resolution

of not less than 4K×2K. The video wall management system shall support real-time tiling of CCTV feeds, GIS maps, utility dashboards, and alarm panels, with drag-and-drop windowing capability from the operator workstations. The video wall shall be driven by a dedicated video wall processor with hardware-accelerated decoding supporting H.265 streams from all connected IP cameras simultaneously.

### **10.6.3 Emergency Response Integration**

The ICCC shall serve as the primary Emergency Response Hub (ERH) for the park, maintaining direct communication links with the park's fire station, ambulance bay, police post, and the State Emergency Operations Centre (SEOC). Emergency protocols including fire evacuation, chemical spill, security breach, and natural disaster shall be encoded as Standard Operating Procedures (SOPs) within the ICCC platform, enabling one-click emergency activation, PA system broadcast, barrier-arm lifting at all entry gates, and automatic notification to allottee safety officers via mobile app. The ICCC shall maintain a UPS-backed emergency power supply ensuring continuous operation for a minimum of 4 hours in the event of total power failure.

## **10.7 Data Centre & Disaster Recovery Infrastructure**

The park shall be served by a dedicated on-premise Data Centre (DC) designed and constructed to TIA-942 Tier III equivalent standards, offering concurrently maintainable power and cooling infrastructure with an annual uptime commitment of 99.982%. The DC shall be located within the Administration and ICCC Complex in a dedicated secure room of approximately 400–600 sq.m., with raised flooring, pre-action dry-pipe fire suppression, precision air conditioning, and 24×7 card-access security.

The initial DC build-out shall provision 50 standard 42U server racks at 10 kW average rack density, with the civil and power infrastructure pre-designed for horizontal expansion to 200 racks without structural modification. The DC power architecture shall follow a 2N UPS topology with static bypass, fed by dual independent LT panels from separate transformer feeders, supplemented by a dedicated DG set with Automatic Transfer Switch (ATS) for extended backup. Power Usage Effectiveness (PUE) shall be targeted at ≤1.4 through the deployment of hot-aisle/cold-aisle containment, free-cooling economizers, and variable-speed precision cooling units.

A geographically separated Disaster Recovery (DR) site shall be co-located at the NICDC Regional/National DC or at a Meity-empanelled third-party Tier III/IV data centre, located at a minimum distance of 50 km from the primary DC. Replication shall be achieved through synchronous/asynchronous OFC-connected links with Recovery Time Objective (RTO) of ≤4 hours and Recovery Point Objective (RPO) of ≤15 minutes for Tier 1 applications. Annual DR drills shall be mandated under the O&M SLA.

The DC shall serve as the hosting platform for all park ICT applications including the ICCC platform, SCADA servers, GIS, BMS, NMS, and tenant-facing portals. A co-location facility within the DC shall also be offered to tenant industries requiring on-premise server hosting, providing a managed, secure, and resilient alternative to independent server rooms within individual factory buildings.

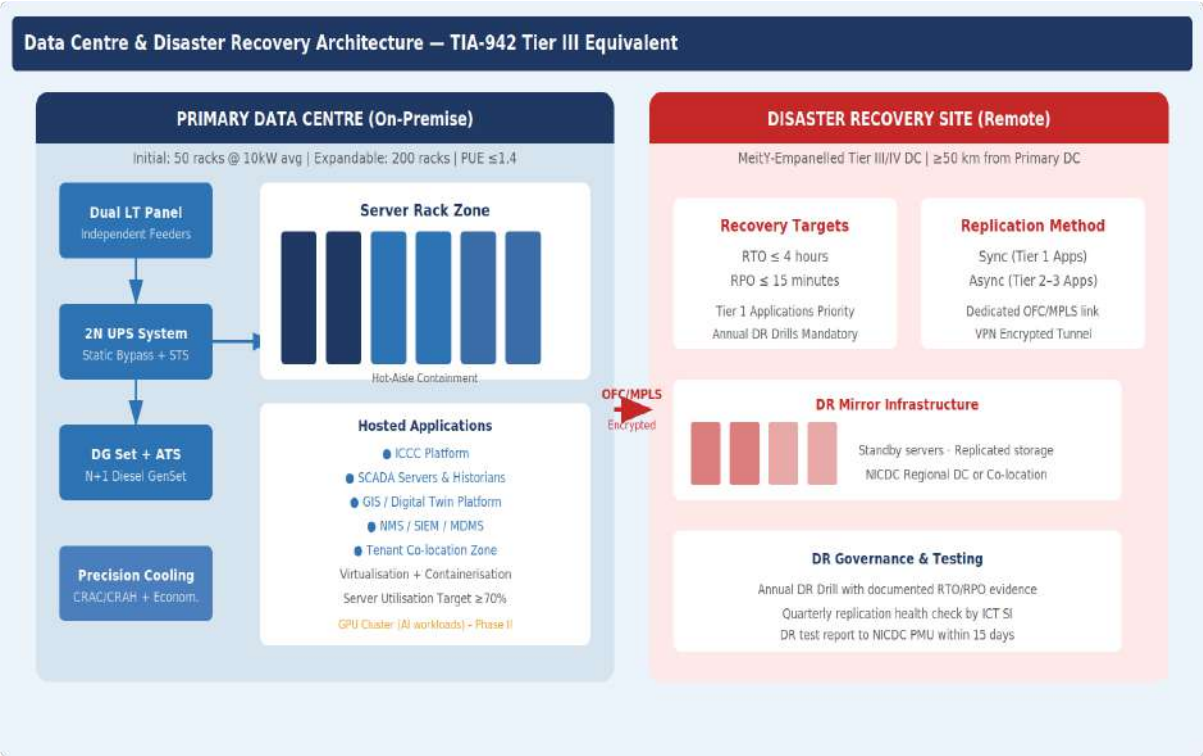


Figure 10.3: Data Centre & Disaster Recovery Architecture

Legend

|                                         |                                   |                          |
|-----------------------------------------|-----------------------------------|--------------------------|
| ■ Primary DC Core Systems               | ■ Power Infrastructure (2N)       | ■ Disaster Recovery Site |
| ■ OFC/MPLS Replication Link (Encrypted) | ■ Hosted Applications / DR Mirror | ■                        |

10.8 Smart Surveillance System

A comprehensive end-to-end IP Video Surveillance System (VSS) shall be deployed across the park to ensure perimeter security, internal monitoring, traffic management, and incident documentation. The system shall be designed as a scalable, edge-intelligent surveillance network capable of supporting a total of 2,000+ IP cameras at full park build-out, managed through a centralized Video Management Software (VMS) platform at the ICCC.

### **10.8.1 IP CCTV Cameras**

Standard fixed surveillance cameras shall be deployed across all roads, common areas, utility zones, parking areas, and entry-exit points. Cameras shall conform to a minimum specification of 4MP (2688×1520) resolution, H.265+ compression, Wide Dynamic Range (WDR) of ≥120 dB, and integrated IR illumination effective to 50 metres. All outdoor cameras shall be rated IP-67/IK-10 and designed for an ambient operating temperature of -20°C to +60°C. Cameras shall be ONVIF Profile S and T compliant. PoE+ (IEEE 802.3at) powered cameras shall be preferred to minimize field cabling. The initial phase deployment shall encompass approximately 600 cameras.

### **10.8.2 PTZ Cameras**

Pan-Tilt-Zoom (PTZ) cameras shall be installed at critical monitoring points including perimeter corners, main entry plazas, emergency assembly areas, and perimeter fence mid-points at intervals not exceeding 200 metres. PTZ cameras shall provide a minimum 36× optical zoom, 360° continuous rotation, auto-tracking capability with on-board deep learning object detection, and a minimum 4MP sensor at 30 fps. PTZ cameras shall be integrated with the VMS for preset positioning, patrol programming, and auto-response to alarm-triggered slewing.

### **10.8.3 Video Analytics Platform**

A deep-learning Video Analytics Engine shall be deployed, integrated with the VMS, to process streams from all IP cameras in real time. The analytics platform shall support the following minimum algorithmic capabilities: perimeter intrusion detection, loitering detection, abandoned object detection, crowd density analysis, fire and smoke detection, wrong-way vehicle movement detection, and object counting. All analytics events shall be timestamped, geo-tagged, and logged in the ICCC event management system with camera snapshots and 30-second pre/post event video clips. The platform shall be GPU-accelerated and shall achieve a minimum of 95% detection accuracy under specified operating conditions as demonstrated during Factory Acceptance Testing (FAT).

### **10.8.4 Automatic Number Plate Recognition (ANPR)**

ANPR cameras shall be installed at all park entry and exit lanes, internal checkpoint gates, and the logistics zone weighbridge approaches. ANPR cameras shall achieve a minimum 96% plate recognition accuracy under standard operating conditions including partial occlusion and adverse lighting, validated against a test dataset of 10,000 vehicle images. The ANPR system shall integrate with the park's Vehicle Access Management System to enable automatic permit verification, vehicle whitelist/blacklist management, and entry-exit time stamping for commercial vehicles.

ANPR data shall be retained for a minimum of 90 days and available for forensic retrieval.

## **10.9 Access Control & Visitor Management System**

A multi-modal, technology-converged Access Control and Visitor Management System (ACVMS) shall be deployed to manage and control the movement of persons and vehicles across the park with precision, traceability, and real-time auditability. The ACVMS shall operate as an integrated module within the ICCC platform, providing a unified interface for access event management, visitor scheduling, and security exception handling.

### **10.9.1 RFID-based Access**

Long-range Passive UHF RFID readers (ISO/IEC 18000-63 compliant) operating at 865–868 MHz (TRAI regulated band) shall be installed at vehicular entry lanes, warehouse dock doors, and internal checkpoint gates. RFID readers shall provide a read range of 3–8 metres at vehicle speeds up to 60 kmph, enabling non-stop transit verification for pre-authorized vehicles. All registered park vehicles—delivery trucks, staff vehicles, and service vehicles—shall be issued windshield-mount RFID tags with tamper-evident labels. RFID data shall integrate directly with the Vehicle Management and ANPR systems for dual-factor vehicle verification.

### **10.9.2 QR Code Integration**

A digital visitor pass system based on time-bound, cryptographically signed QR codes shall be deployed for visitor access management. Visitors shall pre-register through the park's web/mobile portal, receive a one-time-use QR pass via email/SMS, and scan at entry QR readers for automatic gate authorization. QR passes shall encode visitor identity, host factory ID, permitted access zones, and valid time window, and shall be rendered invalid upon single use or time expiry. The system shall support bulk visit scheduling for contractors, auditors, and delegations.

### **10.9.3 Biometric Access Control**

Biometric access terminals—integrating fingerprint (FAR  $\leq 0.0001\%$ , FRR  $\leq 0.1\%$ ) and facial recognition capabilities—shall be deployed at all pedestrian entry points, ICCC access doors, Data Centre entry, and high-security utility control rooms. Facial recognition terminals shall operate on liveness-detection enabled algorithms to prevent spoofing, and shall function as a standalone mode with local database for 10,000 enrolled identities, synchronizing with the central access control server. The biometric system shall conform to FIDO2/WebAuthn standards and shall not store raw biometric data in transmittable form, in compliance with applicable data protection guidelines.

#### **10.9.4 Turnstiles & Flap Barriers**

Speed gates (bi-directional flap barriers) with integrated card reader and biometric terminal mounting provision shall be installed at all pedestrian entry vestibules, administration buildings, and common facility entrances. Turnstiles shall be full-height rotor-type at perimeter pedestrian gates for high-security sections, and waist-high retractable flap barriers at indoor facilities. All gates shall include ADA-compliant wide-lane provision, anti-tailgating sensors, and fire-safety mode enabling automatic free-egress upon fire alarm activation.

#### **10.10 Smart Parking Management System**

A sensor-based Smart Parking Management System (SPMS) shall be deployed across all designated parking areas within the park, including the Administration Complex car park, Employee Amenity Zone, Visitor Parking, and Heavy Vehicle Staging Yard, with an initial capacity provisioning of 2,000 car equivalent units (CEUs), scalable to 5,000 CEUs.

Individual parking bays shall be fitted with in-ground ultrasonic or magnetic parking sensors (IP-68 rated, 5-year maintenance-free battery life) transmitting bay occupancy status (available/occupied) via LoRaWAN or NB-IoT to the SPMS server. Dynamic Parking Guidance Signage (PGS)—LED variable message signs—shall be installed at all parking zone entry points and at internal junctions, displaying real-time available bay counts per zone. Integration with the ANPR system shall enable automatic vehicle-to-bay assignment tracking, enabling forensic retrieval of vehicle parking history.

A mobile application and web portal shall be provided for park users to view real-time parking availability, pre-book parking slots (for large events and delegations), and receive navigation to the nearest available bay. Integration with the park's Enterprise Resource Planning (ERP) portal shall enable parking charges to be automatically billed to allottee accounts based on vehicle type and duration. SPMS data shall feed the ICCC dashboard to enable real-time park-wide traffic flow management.

#### **10.11 Smart Utility Metering & SCADA**

The park shall be equipped with an Advanced Metering Infrastructure (AMI) system covering electricity, piped water, treated wastewater (for recycled water supply), and compressed air/gas, enabling automated billing, demand forecasting, and anomaly detection across all utility consumers—both common area and individual allottees.

Smart electricity meters conforming to IS 16444 (Part 1 & 2) and IS 15884 (for Net Metering enabled plots with rooftop solar) shall be installed at every allottee's incomer

switchgear location and at all common service connection points. Meters shall communicate via DLMS/COSEM protocol over RF Mesh or GPRS/NB-IoT to the central Meter Data Management System (MDMS). Tamper alarms, power quality event logging (harmonics, voltage sags, outages), and remote disconnection relay shall be standard meter features.

The Supervisory Control and Data Acquisition (SCADA) system shall provide centralized real-time monitoring and control of the park's utility networks including the 33/11 kV substation, Water Supply and Treatment Plants, Sewage Treatment Plant (STP), Effluent Treatment Plant (ETP), Storm-water Pumping Stations, and Gas Distribution Network. The SCADA platform shall conform to IEC 61850 (for electrical systems) and shall use IEC 62443 security architecture for OT network segregation. Historians shall log all process parameters at 1-minute intervals with 10-year data retention. All SCADA field RTUs and PLCs shall communicate via IEC 101/104 DNP3 or Modbus TCP/IP protocols over a dedicated, air-gapped OT communication network.

#### **10.12 Building Management System (BMS) Integration**

The key common area buildings within the park—ICCC & Administration Building, Convention and Business Centre, Skill Development Centre, Employee Amenity Block, and the Data Centre facility—shall each be equipped with a Building Management System (BMS) conforming to BACnet/IP (ANSI/ASHRAE 135) or LonWorks protocols, enabling comprehensive automated management of HVAC, electrical, lighting, fire alarm, lifts, and water management subsystems within each facility.

The individual building BMS systems shall be integrated with the ICCC central platform through a BACnet/IP gateway or MODBUS TCP/IP middleware layer, enabling park operations staff to monitor aggregate energy consumption, occupancy, and fault alarms from all buildings through a single dashboard. AI-assisted energy optimization algorithms deployed at the BMS level shall automatically adjust HVAC setpoints, lighting levels, and equipment schedules based on occupancy sensor data and weather forecasts, targeting a minimum 20% reduction in common area energy consumption against baseline.

The Data Centre BMS shall maintain environmental parameters—temperature, humidity, differential pressure, and airflow—within ASHRAE TC 10.9 A1 class thresholds, with automatic failover to standby cooling units on threshold exceedance. All BMS alarms of Priority 1 (critical) and Priority 2 (urgent) shall be simultaneously transmitted to the ICCC operator console within 30 seconds of detection.

### **10.13 Environmental Monitoring System**

A distributed Environmental Monitoring Network (EMN) shall be installed across the park to provide continuous, real-time measurement of ambient air quality, noise, and meteorological parameters, in compliance with CPCB's National Ambient Air Quality Monitoring Standards (NAAQMS) and applicable MoEF&CC Environmental Clearance conditions.

A minimum of four Continuous Ambient Air Quality Monitoring Stations (CAAQMS) shall be installed at strategic locations—windward and leeward of industrial zones, at the park boundary, and in the Worker Residential Zone—measuring PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>2</sub>, CO, O<sub>3</sub>, VOCs, and Ammonia. Monitoring stations shall transmit real-time data to the ICCC and simultaneously to the State Pollution Control Board (SPCB) CAAQMS network portal as mandated by regulatory conditions.

Noise monitoring sensors shall be deployed at the park perimeter, sensitive receptor locations (residential/amenity zones), and major noise-generating industrial zones to provide real-time Leq (A-weighted equivalent noise level) data. The EMN shall integrate with the SCADA system to trigger automated source investigation workflows when ambient thresholds are breached, enabling compliance documentation without manual intervention.

A compact weather station (measuring wind speed/direction, temperature, relative humidity, rainfall, solar radiation, and atmospheric pressure) shall be installed atop the ICCC building, providing hyperlocal meteorological data to support stack emission dispersion modelling and emergency response planning.

### **10.14 Public Wi-Fi Infrastructure**

In alignment with the PM-WANI (Prime Minister Wi-Fi Access Network Interface) framework, a park-wide Public Wi-Fi network shall be deployed to serve the connectivity needs of workers, visitors, contractors, and the public within common areas, amenity zones, food courts, and transit corridors. The Public Wi-Fi network shall be segregated from the park's private operational and tenant networks through dedicated VLANs and firewall policies, with no routing path between public and private network domains.

Public Wi-Fi access points—co-located on smart poles, building facades, and canopy structures—shall provide minimum 100 Mbps aggregate throughput per access point under full load. User authentication shall be via mobile OTP (one-time password) linked to Aadhaar-verified or VID-based identity, ensuring traceability while preserving user privacy as per Supreme Court guidelines on surveillance. Data retention of user

session logs shall comply with TRAI/DoT mandated requirements. A content filtering system shall block access to blacklisted URLs as per MeitY's prohibited content lists.

### **10.15 Cybersecurity Framework**

The cybersecurity architecture for the park shall be founded on a Zero Trust Security Model, recognizing that threats may originate from both external and internal sources and that no device, user, or network segment shall be inherently trusted. The cybersecurity framework shall conform to ISO/IEC 27001:2022 (Information Security Management System), NIST Cybersecurity Framework (CSF) Version 2.0, CERT-In Guidelines for Critical Infrastructure Protection, and MeitY's Cloud Security Framework for government digital infrastructure.

Network segmentation shall form the first principle of the cybersecurity architecture. The park's networks shall be segregated into distinct security zones: (i) Operational Technology (OT) Network for SCADA, BMS, and smart metering; (ii) Information Technology (IT) Network for ICCC applications and data centre; (iii) Tenant Network for allottee connectivity; (iv) Surveillance Network for IP cameras and access control; and (v) Public Wi-Fi Network. Inter-zone traffic shall be controlled by next-generation firewalls (NGFWs) with application-layer inspection, intrusion prevention, and SSL decryption capabilities.

A Security Operations Centre (SOC) function—initially operated as a managed SOC service from a CERT-In empanelled vendor—shall deploy a Security Information and Event Management (SIEM) platform to aggregate and correlate logs from all ICT systems, firewalls, endpoints, and OT devices. The SIEM shall have pre-built detection rules for OT-specific attack patterns (ICS/SCADA threats) and shall generate alerts for anomalous behaviour within 5 minutes of event detection. An Endpoint Detection and Response (EDR) solution shall be deployed on all ICCC workstations, servers, and DC hosts.

All inter-system communications shall use TLS 1.3 minimum encryption. Privileged Access Management (PAM) shall be deployed for all administrator-level access to servers and network equipment, enforcing multi-factor authentication (MFA) and just-in-time access provisioning. Regular penetration testing (minimum bi-annually) by a CERT-In empanelled cybersecurity firm, and quarterly vulnerability assessments, shall be mandated under the O&M SLA. A cybersecurity incident response plan aligned with CERT-In's National Cyber Crisis Management Plan shall be tested through tabletop exercises annually.

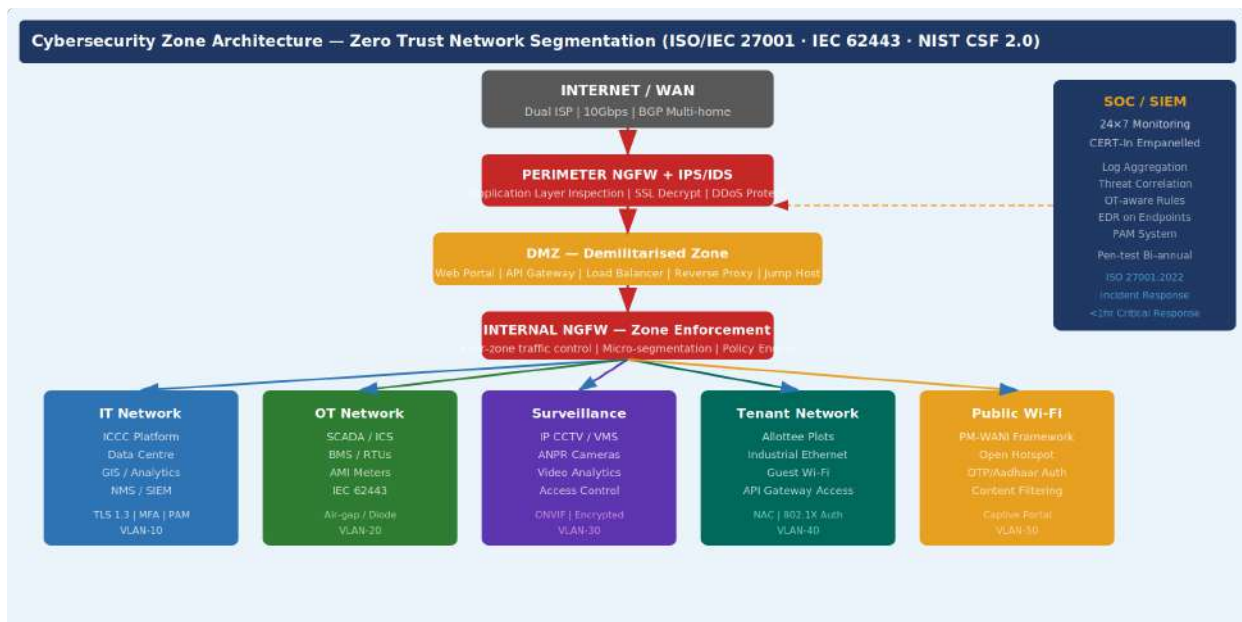


Figure 10.4: Cybersecurity Zone Architecture — Network Segmentation

#### Legend

|                                   |                                 |                                       |
|-----------------------------------|---------------------------------|---------------------------------------|
| ■ NGFW / IPS – Enforcement Points | ■ IT Network Zone (VLAN-10)     | ■ OT Network Zone – Air-gap (VLAN-20) |
| ■ Surveillance Zone (VLAN-30)     | ■ Tenant Network Zone (VLAN-40) | ■ Public Wi-Fi Zone (VLAN-50)         |

### 10.16 Smart Poles & IoT Infrastructure

Smart multifunctional poles shall be deployed along all primary and secondary roads, at pedestrian plazas, and at parking areas within the park at intervals of 30–50 metres (road type dependent). Each smart pole shall serve as a vertical utility spine, integrating multiple functions: LED street lighting, Wi-Fi 6E access point, surveillance camera (fixed), environmental sensor, digital display panel (select locations), EV charging point provision (fast & slow charging), and emergency SOS push-button intercom.

The smart pole design shall be structurally engineered to IS 2713 standards, fabricated in hot-dip galvanized steel with polyester powder coating, with a minimum design life of 25 years. An integrated pole controller module housed within the pole base compartment shall manage all connected devices, provide a PoE switch for camera and AP power, and communicate with the ICCC via OFC or LoRaWAN. The street lighting circuit shall be separately protected and independently controllable. Adaptive dimming of street lighting based on ambient luminance sensors shall be standard, targeting a minimum 40% energy savings over conventional non-controlled LED lighting.

An IoT sensor platform built on open-standard LPWAN protocols—LoRaWAN 1.0.4 (868 MHz) as the primary IoT backhaul and NB-IoT as secondary—shall be deployed park-wide to support a heterogeneous ecosystem of IoT devices. LoRaWAN network servers (compliant with LoRa Alliance specifications) shall be hosted at the ICCC DC, provisioned with a minimum of eight LoRaWAN gateways to ensure 99%+ park coverage at SF7. The IoT platform shall expose northbound APIs (MQTT, REST) for integration with the ICCC analytics engine and tenant IoT applications.

### **10.17 GIS & Digital Twin Readiness**

A comprehensive Geographic Information System (GIS) platform shall be established as the geospatial backbone of the park's digital infrastructure management, asset registry, and operational dashboards. The GIS shall be developed on an open-standards platform (OGC WFS/WMS/WMTS compliant) and shall integrate all physical assets—roads, utilities, buildings, plots, smart poles, cameras, sensors, and green spaces—georeferenced to sub-metre accuracy using DGPS survey.

The GIS platform shall form the primary interface of the ICCC, enabling operators to spatially query, visualize, and respond to events. Asset management workflows—maintenance scheduling, fault resolution, and condition monitoring—shall be managed through the GIS-linked Asset Management System (AMS). All physical infrastructure as-built documentation shall be submitted in GIS-compatible formats (shapefile, GeoJSON, GeoPackage) and imported into the GIS database for perpetual record maintenance.

The park ICT design shall include provisions and specifications for a future Digital Twin platform, ensuring that from inception, all physical assets are assigned unique Asset IDs, BIM models are prepared to LOD 300 minimum (LOD 400 for key structures), and IoT sensor data streams are structured for ingestion into a 3D simulation environment. The Digital Twin shall replicate the park's physical environment in real-time, enabling scenario simulation for emergency response, infrastructure capacity planning, maintenance optimization, and investor onboarding. The Digital Twin platform shall conform to CityGML 3.0 and IFC 4.x standards for interoperability with national GIS databases under the PM GatiShakti NMP.

### **10.18 AI-based Analytics Readiness**

The ICT architecture shall be designed with AI-readiness as a first-class design principle, ensuring that the data infrastructure, compute capacity, and application APIs are prepared to onboard AI and Machine Learning (ML) based analytics modules as the park matures. The Data Centre shall provision a dedicated GPU cluster rack

(expandable from initial 2×NVIDIA A100 equivalent to 8 GPUs) for hosting AI inference workloads.

In the initial operational phase, AI analytics shall be applied to the following high-priority use cases: (i) Video analytics for perimeter intrusion, fire/smoke detection, and crowd analysis as described in Section 10.3; (ii) Predictive maintenance of rotating equipment in utility plants through vibration, temperature, and current signature analysis; (iii) Energy demand forecasting and load optimization using SCADA and smart meter data; and (iv) Traffic flow prediction and smart parking optimization using vehicle count and occupancy data.

As the park's data ecosystem matures through Phase II and Phase III, additional AI modules shall be progressively onboarded including: anomaly detection in utility consumption patterns indicative of theft or leakage; AI-assisted emergency dispatch routing based on real-time traffic and incident location data; intelligent document processing for permit and NOC applications at the park administration portal; and supply chain visibility AI integrated with allottee ERP systems through secure API gateways.

### **10.19 Sustainability & Green ICT**

The ICT infrastructure shall be planned and delivered in adherence to Green ICT principles, minimizing the environmental footprint of digital infrastructure while maximizing the operational sustainability contribution of smart systems across the park. Green ICT shall be integrated as a cross-cutting requirement across all ICT component specifications, procurement, and operational management.

The Data Centre shall target a Power Usage Effectiveness (PUE) of  $\leq 1.4$ , consistent with globally recognized efficient data centre operations (ISO 30134 standard for DC energy metrics). This shall be achieved through hot-aisle/cold-aisle containment, variable-speed EC fans in precision cooling units, economizer-mode free cooling where ambient conditions permit, and right-sizing of UPS capacity for actual load with projected 80% maximum loading. DC server utilization rates shall be maintained above 70% through virtualization and containerization mandates.

All ICT equipment procured for the park—switches, routers, APs, servers, workstations, displays—shall carry a minimum 4-Star BEE energy efficiency rating or equivalent (Energy Star, 80 Plus Gold for power supplies). The smart street lighting system shall deliver a minimum 40% energy reduction versus baseline through LED technology and adaptive dimming. All ICT active equipment shall be RoHS compliant, and electronic waste management shall follow E-Waste (Management) Rules, 2022 through empanelled recyclers.

The ICCC platform shall include an ICT Carbon Footprint Dashboard, tracking energy consumption of all park ICT assets, their carbon equivalent emissions based on the applicable state grid emission factor, and progress against sustainability targets. This dashboard shall interface with the park's overall Environmental, Social, and Governance (ESG) Reporting System, enabling transparent disclosure to investors, regulatory authorities, and NICDC.

## 10.20 Standards & Compliance Framework

All ICT systems, equipment, and installations within the Smart Industrial Park shall conform to the applicable national and international standards, regulatory mandates, and Government of India policy frameworks. The following consolidated Standards and Compliance Matrix shall govern design, procurement, installation, testing, and operation of all ICT infrastructure components.

| Domain                          | Applicable Standards & Protocols                                                     |
|---------------------------------|--------------------------------------------------------------------------------------|
| <b>Network Infrastructure</b>   | TIA-568, ISO/IEC 11801, IEEE 802.3/802.11ax, ITU-T G.652.D                           |
| <b>Data Centre</b>              | TIA-942 (Tier III equivalent), EN 50600, ASHRAE TC 10.9                              |
| <b>Cybersecurity</b>            | ISO/IEC 27001:2022, NIST CSF 2.0, CERT-In Guidelines, MeitY Cloud Security Framework |
| <b>Surveillance &amp; ANPR</b>  | ONVIF Profile S/T/G, H.265/H.264 compression, IEC 62676                              |
| <b>Smart Metering</b>           | IS 16444, IS 15884, DLMS/COSEM protocol, OpenADR 2.0                                 |
| <b>SCADA &amp; Automation</b>   | IEC 61850, IEC 62443, DNP3, Modbus TCP/IP, OPC-UA                                    |
| <b>GIS &amp; Digital Twin</b>   | OGC WFS/WMS/WMTS, CityGML 3.0, IFC 4.x, ISO 19100 series                             |
| <b>Environmental Monitoring</b> | IS 5182, CPCB NAAQMS guidelines, IEC 61724                                           |
| <b>Access Control</b>           | ISO/IEC 14443 (RFID), ISO 18092 (NFC), FIDO2/WebAuthn                                |
| <b>Green ICT</b>                | ISO 30134 (PUE), Energy Star, BEE 5-Star for IT equipment, LEED v4.1                 |

Compliance with the above standards shall be verified through a structured Testing & Commissioning (T&C) process comprising Factory Acceptance Testing (FAT) by NICDC-appointed PMC, Site Acceptance Testing (SAT) upon installation, and Integrated System Testing (IST) prior to ICCC go-live. All T&C documentation, including FAT/SAT/IST reports, OTDR test records, cable certification reports, and

penetration testing certificates, shall be submitted to NICDC as part of the As-Built documentation package.

## 10.21 Implementation Phasing

The implementation of ICT infrastructure shall be phased to align with the civil infrastructure development schedule and to ensure that ICT systems are available for use at the time of first allottee handover. The phasing strategy ensures that core digital infrastructure—backbone OFC, ICCC, network, and security—is operational before the park opens for occupancy, with advanced smart systems and AI analytics platforms progressively deployed as the park reaches higher occupancy levels.

| Phase                                | Scope of Work                                                                                                                   | Timeline     | Key Deliverables                                                      |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------|
| <b>Phase I (Foundational)</b>        | OFC backbone, passive ducts, ICCC shell, core network, 50-node surveillance, smart entry gates, smart poles (Zones 1–3)         | Months 1–18  | Operational network; ICCC live; core surveillance & access control    |
| <b>Phase II (Operational)</b>        | Full surveillance coverage, SCADA integration, smart parking, BMS integration, public Wi-Fi, EMS dashboard, AI analytics module | Months 19–30 | Full operational ICT; SCADA & BMS live; Public Wi-Fi activated        |
| <b>Phase III (Advanced / Future)</b> | Digital Twin deployment, predictive AI analytics, 5G private network readiness, blockchain-based access, AR/VR ICCC integration | Months 31–48 | Digital Twin operational; advanced analytics; 5G-ready infrastructure |

Phase I implementation shall be the critical path for park operationalization. The ICCC must be commissioned at least 30 days prior to the first allottee handover to enable testing, staff training, and SOP validation. All passive OFC and HDPE duct infrastructure shall be installed and tested prior to road finalization to avoid post-construction excavation.

## 10.22 O&M Framework and Service Level Agreements

The Operations and Maintenance (O&M) of the park's ICT infrastructure shall be carried out under a comprehensive Managed Services Agreement (MSA) awarded to a qualified ICT System Integrator through a competitive tendering process by NICDC or the park's Special Purpose Vehicle (SPV). The MSA shall be structured as a 5-year contract (extendable by 3+2 years) with clearly defined Service Level Agreements (SLAs), Key Performance Indicators (KPIs), & a financial penalty framework for non-performance.

The O&M service scope shall encompass preventive maintenance (quarterly for passive infrastructure, monthly for active systems), corrective maintenance, software patch management, annual cybersecurity audits, staff training, end-user helpdesk support (16×5 minimum, 24×7 for critical systems), spare management with critical spares on-site, and annual SLA compliance reporting to NICDC.

| Service Parameter                        | Performance Benchmark            | Penalty (per incident)                  | Measurement Frequency |
|------------------------------------------|----------------------------------|-----------------------------------------|-----------------------|
| <b>Core Network Uptime</b>               | 99.9% per quarter                | 0.5% of quarterly AMC charge            | Real-time monitoring  |
| <b>ICCC System Availability</b>          | 99.5% per month                  | 0.25% of monthly O&M charge             | Monthly               |
| <b>CCTV Uptime (operational cameras)</b> | ≥ 95% at all times               | ₹500 per camera/day below threshold     | Weekly audit          |
| <b>ANPR System Accuracy</b>              | ≥ 95% recognition rate           | 0.1% of monthly charge per 1% deviation | Monthly               |
| <b>Cybersecurity Incident Response</b>   | Critical: < 1 hr; High: < 4 hrs  | As per SLA schedule                     | Per incident          |
| <b>Smart Metering Data Accuracy</b>      | ± 0.5% tolerance                 | Penalty as per AMC terms                | Quarterly calibration |
| <b>Helpdesk Response (ICT faults)</b>    | Priority 1: < 2 hrs; P2: < 8 hrs | Escalation to NICDC PMU                 | Per ticket            |
| <b>SCADA System Availability</b>         | 99.5% per month                  | 0.25% of monthly AMC                    | Monthly               |

The O&M contractor shall maintain a dedicated on-site team comprising a minimum of: 1 ICT Site Manager, 2 Network Engineers, 2 CCTV/Security System Technicians, 1 Cybersecurity Analyst (remote SOC from empanelled CERT-In vendor), and 1 Data Centre Operations Specialist. Key personnel qualifications and experience requirements shall be specified in the MSA RFP and shall be verified prior to contract award.

---

## Chapter 11: Project Financing & Implementation

---

## 11.1 Implementation Strategy & Execution Framework

The implementation and phasing of a master plan involve a strategic approach to execute its objectives and projects over a designated timeline. For an industrial park, this process includes integrating governance mechanisms such as Special Purpose Vehicles (SPVs) or Industrial Area Development Authorities (IADA) with the overall master plan and ensuring compliance with state and national legal frameworks.

## 11.2 Implementation Mechanisms & Phasing

Implementation of various proposals and identified projects requires a thorough assessment and step-by-step approach. Phasing breaks down the park's implementation into manageable segments, prioritizing infrastructure projects based on urgency, market demand, and investment attractions. The development is typically organized into short-term, medium-term, and long-term phases to align with the financial capacity and land absorption rates.

*Table 11.1: Implementation Mechanisms for Industrial Parks*

| Implementation Mechanism  | Industrial Planning Application                                                                                                                                                                                                                     |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Micro-level Block Plans / | Delineating development schemes for specific industrial blocks, allowing for flexible plot amalgamation or subdivision based on tenant requirements.                                                                                                |
| Development Regulations   | Utilizing customized Building Byelaws and Zoning Regulations (e.g., separating Red/Orange industries from green zones) to regulate safe development.                                                                                                |
| Governance Policy &       | Establishing an Industrial Area Development Authority (IADA) or SPV and integrating approvals via online single-window clearance systems. Indicative compliance/clearances generally required for Industrial Parks is placed at <b>Annexure-4</b> . |
| Development Projects      | Executing anchor infrastructure projects first, such as trunk roads, Common Effluent Treatment Plants (CETPs), and multi-modal logistics hubs.                                                                                                      |

*Table 11.2: Base Factors for Development Phasing*

| Base Factor                     | Strategic Focus for Industrial Phasing                                                                                                                                   |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Economic Potential & Investment | Prioritize areas with high economic potential, immediate availability of developable land, and maximum investment attraction (e.g., plots closest to National Highways). |
| Infrastructure Deficiencies     | Focus initial phases on establishing critical utilities (water, power, sewerage) that are essential for the operation of early anchor tenants.                           |
| Workforce & Social Factors      | Phase in worker housing, healthcare, and skill development centres in tandem with industrial cluster operationalization to support the "walk-to-work" concept.           |

### 11.3 Cost Estimates, Revenue Generation and Funding Mechanism

To ensure financial sustainability and promote economic growth, the identified proposals must be costed out accurately, with inflation rates considered over the phased timeline. Rates for any pending land acquisition must be calculated in accordance with the relevant state policies, Schedule of Rates (SORs), and prevailing market rates, rates shall be considered based on the royalties on the basis of government orders.

*Table 11.3: Cost Components and Revenue Sources for Funding*

| Financial Component                        | Elements / Sources                                                                                                                                                                               |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cost Estimates for Infrastructure Projects | Capital expenditures (CAPEX) for Water treatment plants, Water supply networks, Sewage treatment plants, Stormwater drains, Solid waste treatment, Electrical substations, and Telecom networks. |
| Revenues from Authority's Own Resources    | Generating returns through the sale of plots, sale of purchasable FSI, development charges, and user charges for common utilities (e.g., CETP, water).                                           |
| Funding from State & Central Govt.         | Leveraging state equity (in the form of land), central grants/equity (e.g., NICDC), and funding from missions like AMRUT or PMAY.                                                                |
| Leveraging External Funding & Partnerships | Low-interest loans from organizations like HUDCO, World Bank, JICA, ADB, Joint Ventures, and Public-Private Partnerships (PPP) for specialized facilities.                                       |

### 11.4 Project Cost Estimates

The creation and development of trunk infrastructure in an industrial park shall be taken up at an estimated cost. Along with the estimated civil construction cost, it will include contingencies, escalations, construction supervision charges, applicable administrative charges, quality control charges, construction safety charges and interests during construction period. The above mentioned will have to be factored in the calculation of the overall project cost. Based on the implementation schedule of planned construction packages, the phasing of expenditure and the sources of funds will be derived.

A broad framework for costing of aforementioned components is provided in the table below:

*Table 11.4: Project Cost Estimates (CAPEX)*

| Sr. No.   | Description                | UOM   | Qty / Capacities | Cost (₹ Crore) |
|-----------|----------------------------|-------|------------------|----------------|
| (1)       | (2)                        | (3)   | (4)              | (5)            |
| <b>A.</b> | <b>Core infrastructure</b> |       |                  |                |
| <b>1</b>  | Site Development           | acres |                  |                |

|          |                                                                                                          |          |  |  |
|----------|----------------------------------------------------------------------------------------------------------|----------|--|--|
| 2        | Compound Wall / Fencing                                                                                  | KM       |  |  |
| 3        | Roads including street furniture, sidewalks & cross drainage                                             | KM       |  |  |
| 3.1      | Arterial Road- 45m ROW                                                                                   | KM       |  |  |
| 3.2      | Sub Arterial Road- 30m ROW                                                                               | KM       |  |  |
| 3.3      | Collector Road- 24m ROW                                                                                  | KM       |  |  |
| 3.4      | Local Streets- 18m/12m ROW                                                                               | KM       |  |  |
| 4        | Minor/Major Bridges                                                                                      | Nos      |  |  |
| 5        | Storm Water drain including outfalls                                                                     | KM       |  |  |
| 6        | Potable Water network including Firefighting system, Rising main, storages and associated pumping, SCADA | KM       |  |  |
| 7        | Recycle Water Supply network storages and associated pumping, SCADA                                      | KM       |  |  |
| 8        | Sewage Network                                                                                           | KM       |  |  |
| 9        | Industrial Effluent collection network                                                                   | KM       |  |  |
| 10       | Main Receiving Substation (MRSS) incl. civil works                                                       | Nos      |  |  |
| 10.1     | Main Receiving Substation (MRSS) with SCADA                                                              | MVA & KV |  |  |
| 10.2     | Associated Civil works                                                                                   | LS       |  |  |
| 11       | Zonal Substations (ZSS) incl. civil works                                                                | Nos      |  |  |
| 11.1     | Zonal Substations (ZSS) with SCADA                                                                       | KVA/KV   |  |  |
| 11.2     | Associated Civil works                                                                                   | LS       |  |  |
| 12       | Power Distribution system (cabling, RMUs, streetlights for roads and common areas etc.)                  | LS       |  |  |
| 13       | Utility Ducts / Trench for cables                                                                        | KM       |  |  |
| 14       | Water Treatment Plant                                                                                    | MLD      |  |  |
| 15       | Common Effluent Treatment Plant (in ZLD if applicable)                                                   | MLD      |  |  |
| 16       | Sewage Treatment Plant                                                                                   | MLD      |  |  |
| 17       | Solid Waste Management                                                                                   | TPD      |  |  |
| 18       | Information and Communication Technology incl. security infrastructure                                   | LS       |  |  |
| 19       | ICCC cum Admin Building                                                                                  | Sq mtr   |  |  |
| 20       | Entrance Plaza / gates                                                                                   | LS       |  |  |
| 21       | Area Landscaping                                                                                         | Sq mtr   |  |  |
| 22       | Any other item (misc.)                                                                                   | LS       |  |  |
|          | <b>Sub Total (A)</b>                                                                                     |          |  |  |
| <b>B</b> | <b>Value-added infrastructure</b>                                                                        |          |  |  |
| 1        | Renewable energy                                                                                         | KW       |  |  |
| 2        | Built to Suit facilities (BTS)                                                                           | Sq mtr   |  |  |
| 3        | Ready Built Factories (RBF)                                                                              | Sq mtr   |  |  |
| 4        | Storage and warehousing facilities                                                                       | Sq mtr   |  |  |

|          |                                                                                  |        |  |  |
|----------|----------------------------------------------------------------------------------|--------|--|--|
| 5        | Common Facilities like R&D centres and testing labs, Weighbridge, Tool room etc) | Sq mtr |  |  |
|          | <b>Sub Total (B)</b>                                                             |        |  |  |
| <b>C</b> | <b>Social Infrastructure (preferably on PPP basis)</b>                           |        |  |  |
| 1        | SAFE worker housing                                                              | Sq mtr |  |  |
| 2        | On-site day care facilities including health services                            | LS     |  |  |
| 3        | Skill Development Centre                                                         | Sq mtr |  |  |
|          | <b>Sub Total (C)</b>                                                             |        |  |  |
| <b>D</b> | <b>External Infrastructure</b>                                                   |        |  |  |
| 1        | Access road from site to nearest NH or SH                                        | KM     |  |  |
| 2        | Power transmission line from nearest substation                                  | KM     |  |  |
| 3        | Water supply pipeline from nearest source / reservoir                            | KM     |  |  |
| 4        | Gas supply pipeline from nearest source                                          | KM     |  |  |
|          | <b>Sub Total (D)</b>                                                             |        |  |  |
| <b>E</b> | <b>Sub-Total (A+B+C+D) Project Construction Cost</b>                             |        |  |  |
| <b>F</b> | GST @ 18% on Sub-Total (E)                                                       | %      |  |  |
| <b>G</b> | <b>Project Construction Cost including GST (E+F)</b>                             |        |  |  |
| <b>H</b> | <b>Soft Costs (over sub-total G)</b>                                             |        |  |  |
| 1        | Contingencies on Project Construction Cost on (G)                                | %      |  |  |
| 2        | Escalation on Project Construction Cost on (G)                                   | %      |  |  |
| 3        | Construction supervision on Project Construction Cost on (E)                     | %      |  |  |
| 4        | Administrative charges on Project Construction Cost on (E)                       | %      |  |  |
| 5        | Quality control charges on Project Construction Cost on (E)                      | %      |  |  |
| 6        | Construction safety on Project Construction Cost on (E)                          | %      |  |  |
| 7        | Any other mandatory charges applicable in the state                              | %      |  |  |
|          | <b>Sub-Total Other Costs (H)</b>                                                 |        |  |  |
|          | <b>Total Infrastructure Cost (G+H)</b>                                           |        |  |  |

**Note: Capacities / Qty / Area/ Length of each infrastructure component shall mandatorily be mentioned under column 4.**

**II O&M Charges (OPEX) in % of CAPEX (G) and in Rs. (Crores).**

### **11.4.1 Financial Analysis**

An initial financial analysis of an industrial park is essential to assess its economic viability and long-term sustainability. While capital and operational costs—such as land, infrastructure, utilities, and maintenance—can be reasonably estimated, revenue projections are more uncertain as they depend on land uptake, user demand, pricing mechanisms, and policy support. Although industrial parks require significant upfront investment, efficient planning, modern infrastructure, and technology-enabled management can improve operational efficiency, enhance investor attractiveness, and generate sustainable long-term returns.

#### **11.4.1.1 Financial Structuring and Viability Assessment**

This chapter presents a BHAVYA-aligned financial framework for development of an industrial park through a Special Purpose Vehicle (SPV). All figures are indicative placeholders and should be replaced with project-specific DPR estimates, State policy rates, approved financing terms and supporting documents before submission.

##### Objective of the Financial Chapter

- Estimate the total project cost in a manner consistent with BHAVYA DPR template, including land cost / valuation, eligible infrastructure components, taxes, contingencies, escalation, supervision, O&M and external infrastructure, wherever applicable.
- Define the means of finance, including State / State Nodal Agency/CPSEs equity through land, Central assistance, approved debt where applicable, private developer equity where applicable, and internal accruals from land monetisation.
- Demonstrate compliance with BHAVYA funding caps, release pre-conditions, fund utilization restrictions, convergence principles and non-duplication of funding.
- Set out revenue assumptions, O&M recovery framework, O&M Corpus Fund, financial viability indicators, sensitivity cases, and approval / monitoring dashboards required for appraisal.

#### **11.4.1.2 BHAVYA-aligned Financial Architecture**

The financial architecture should be structured around BHAVYA requirements rather than a generic financing model. The SPV should function as the accountable entity for planning, procurement, execution, land allotment, O&M and financial sustainability.

Table 11.5 Bhavya aligned financial architecture

| Parameter                      | BHAVYA-aligned approach                                                                                                                           | Responsibility / source                                                                                       | Financial implication                                                                                   |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| (1)                            | (2)                                                                                                                                               | (3)                                                                                                           | (4)                                                                                                     |
| <b>Land</b>                    | Minimum eligible land to be encumbrance-free and transferred to SPV as prescribed. Land transferred to the SPV is treated as equity contribution. | State / UT Government, State Nodal Agency, CPSE or Private Developer, as applicable                           | Land value forms part of shareholder contribution; transfer of land is a precondition for fund release. |
| <b>Eligible infrastructure</b> | Core, value-added, social and external infrastructure as approved in DPR and permitted under BHAVYA.                                              | SPV through EPC mode for core infrastructure; PPP may be used for appropriate value-added / social components | Only approved eligible components can be financed from BHAVYA funds.                                    |
| <b>Central assistance</b>      | Provided through NICDIT as equity and, where specifically approved, debt; NICDIT equity not to exceed 50% of paid-up equity capital.              | Government of India through NICDIT                                                                            | Subject to funding cap, land value linkage, tranche conditions and NLSC approval.                       |
| <b>External infrastructure</b> | Last-mile Road, power, water and gas connectivity may be included                                                                                 | State / UT Government / Private Developer                                                                     | Up to 25% of approved funding may be allocated for external                                             |

|                |                                                                                                               |                                      |                                                                                                       |
|----------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------|
|                | subject to BHAVYA limits.                                                                                     | with coordination                    | SPV infrastructure and limited to 25% of external infrastructure cost.                                |
| <b>O&amp;M</b> | Dedicated O&M framework through user charges, PPP, other sustainable mechanisms and optional O&M Corpus Fund. | SPV / facility manager / PPP partner | Up to 5% of gross allotment premium may be set aside in a separate escrow account as O&M Corpus Fund. |

#### 11.4.1.3 Project Cost Framework under BHAVYA

The DPR should present project cost under separate heads for eligible, ineligible and externally funded / converged components. This segregation is necessary because BHAVYA assistance can be used only for approved components and cannot be used for expressly ineligible cost heads.

Table 11.6: Project cost framework under BHAVYA

| Cost head                                       | Treatment under BHAVYA                                                                        | Remarks                                                                                                                    |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| (1)                                             | (2)                                                                                           | (3)                                                                                                                        |
| <b>Land acquisition / land development cost</b> | Not admissible for Scheme funding; land transferred to SPV is treated as equity contribution. | Show separately as State / private developer / CPSE contribution and support valuation basis.                              |
| <b>Core infrastructure</b>                      | Eligible, if approved in DPR.                                                                 | Internal roads, underground utilities, storm water drainage, streetlights, landscaping, CETP, WTP, STP, SWM, ICT, security |

|                                                                                                          |                                                                                      |                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                          |                                                                                      | infrastructure, administrative block and fire safety systems.                                                                                                                      |
| <b>Value-added infrastructure</b>                                                                        | Eligible, if approved in DPR.                                                        | Built-to-suit facilities, warehousing, sector-specific support infrastructure, R&D / testing / training centres and renewable energy infrastructure; PPP preferred where suitable. |
| <b>Social infrastructure</b>                                                                             | Eligible, preferably on PPP basis.                                                   | S.A.F.E worker housing, common facility centres, day care / health services and skill development centre.                                                                          |
| <b>External infrastructure</b>                                                                           | Eligible within specified limits.                                                    | Last-mile link road, power transmission line, water pipeline and gas connectivity from nearest source; balance funding commitment to be shown.                                     |
| <b>Preliminary / pre-operative expenses, IDC, working capital, vehicles, royalty, commissioning fees</b> | Not admissible for Scheme funding.                                                   | To be funded from other sources, if required; avoid including in BHAVYA funding claim.                                                                                             |
| <b>Taxes, contingencies, escalation, supervision, QA/QC, safety</b>                                      | May be included only if part of approved eligible components and DPR cost estimates. | Show assumptions clearly and reconcile with package estimates and tender benchmarks.                                                                                               |

#### 11.4.1.4 Land Valuation and Equity Contribution

Land-related treatment should be aligned with BHAVYA land ownership, transfer and valuation framework. The financial model should not treat land as a reimbursable Scheme-funded item.

*Table 11.7: Land Valuation and Financial treatment model*

| Land source / mode<br>(1)                         | Valuation basis<br>(2)                                                                                                                                                                                                        | Financial model treatment<br>(3)                                                                                  |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Land pooling / aggregation / town planning</b> | Higher of applicable circle rate / DLC or fair market value of reconstituted and serviced parcels determined by valuation committee.                                                                                          | Recognize as equity contribution of the concerned shareholder after transfer to SPV.                              |
| <b>Land acquisition by State / UT Government</b>  | Compensation paid or payable under applicable law, including statutory interest under LARR Act, 2013, excluding specified premiums, charges, subsequent enhanced compensation, stamp duty / registration and borrowing costs. | Recognize as State equity, subject to documentation and transfer to SPV.                                          |
| <b>Private developer contribution</b>             | Higher of applicable circle rate / DLC or fair market value determined by prescribed valuation committee.                                                                                                                     | Treat primarily as private developer equity in project-specific SPV; shareholding to reflect valued contribution. |
| <b>Transfer timeline and condition precedent</b>  | Ownership of land to be transferred to SPV within the stipulated period after project approval; 90% encumbrance-free land required for Tranche I.                                                                             | Fund release cannot be assumed unless land transfer and other preconditions are met.                              |

#### 11.4.1.5 Means of Finance and Funding Limits

The means of finance should be structured to comply with BHAVYA funding framework, while ensuring that the SPV remains financially sustainable during implementation and post-completion operations.

*Table 11.8: Means of Financing*

| Source of finance                        | Permissible / indicative treatment                                                                                                                                  | Key control point                                                                                                                                     |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)                                      | (2)                                                                                                                                                                 | (3)                                                                                                                                                   |
| <b>State / State Nodal Agency equity</b> | Primarily through transfer of project land to SPV; additional cash support may be provided for external infrastructure, viability support or non-funded components. | Land must be encumbrance-free and valued in accordance with BHAVYA.                                                                                   |
| <b>NICDIT / Central assistance</b>       | Equity contribution and, where specifically approved, debt; linked to value of land transferred and capped at 50% of paid-up equity capital.                        | For ordinary public projects, maximum assistance up to Rs. 1 crore per acre, subject to approval.                                                     |
| <b>Private developer contribution</b>    | Land and/or cash equity in project-specific SPV, where applicable.                                                                                                  | For private developer collaboration, assistance is equity only and limited to Rs. 50 lakh per acre or 50% of infrastructure cost, whichever is lower. |
| <b>Debt / project borrowing</b>          | May be considered only where specifically approved and where cash flows can service debt.                                                                           | Debt assumptions should not dilute BHAVYA conditions or create encumbrance inconsistent with reserved matters.                                        |
| <b>Internal accruals</b>                 | Receipts from land allotment / lease, user charges, maintenance charges and other SPV revenues.                                                                     | Treat conservatively; link to demand validation, allotment schedule and escrow / O&M arrangements.                                                    |
| <b>Convergence / other schemes</b>       | Permitted for components not funded or partially funded under BHAVYA.                                                                                               | No double financing of the same component; identify convergence at DPR stage.                                                                         |

#### 11.4.1.6 Tranche-wise Release of Funds and Drawdown Plan

The annual cash-flow projections shall be provided and should be aligned with BHAVYA milestone-linked release schedule. The model should not assume upfront receipt of full Central assistance.

*Table 11.9: Tranche wise fund release*

| Tranche                     | Percentage | Key pre-conditions / milestones to be reflected in financial model                                                                                                                                                                 |
|-----------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1)                         | (2)        | (3)                                                                                                                                                                                                                                |
| <b>Tranche I - Part A</b>   | 30%        | Approval by NLSC; transfer of 90% encumbrance-free land to SPV; delegation of development / planning powers for single-window clearance; allocation of power and water by State / UT Government.                                   |
| <b>Tranche I - Part B</b>   | 10%        | Environmental clearance obtained and commencement of work.                                                                                                                                                                         |
| <b>Tranche II</b>           | 40%        | Utilisation of 75% of first tranche; proportionate physical progress; land allotment to at least two manufacturing units with required investment commitment. Remaining 10% land transfer should be completed before this release. |
| <b>Tranche III - Part A</b> | 10%        | Utilisation of 90% of first and second tranches; proportionate physical progress; completion of external infrastructure components; commencement of construction of at least two independent manufacturing facilities.             |
| <b>Tranche III - Part B</b> | 10%        | Certification for final completion.                                                                                                                                                                                                |

The cash-flow model should map project expenditure, State / private contribution, NICDIT assistance, debt drawl, internal accruals and O&M corpus creation year-wise. Funding approved under the Scheme should not be revised at any stage; therefore, cost escalation and under-recovery risks should be handled through contingencies, value engineering and committed non-Scheme funding sources.

### 11.4.1.7 Revenue, Land Monetisation and O&M Corpus Strategy

Project revenues should be modelled through a transparent land allotment / lease policy, user charges, maintenance charges and other receipts. The pricing framework should support investor affordability while ensuring project sustainability.

Table 11.10: Revenue approach

| Revenue / reserve item                           | BHAVYA-aligned approach                                                                                                                     | Financial requirement                                                                                                                    | model |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (1)                                              | (2)                                                                                                                                         | (3)                                                                                                                                      |       |
| <b>Industrial land allotment / lease</b>         | Primary revenue stream from saleable / leasable plots; allotment to be transparent and non-discriminatory.                                  | Area, rate, escalation, absorption schedule, receivable cycle and GST / tax treatment to be separately shown.                            |       |
| <b>Anchor investor / self-allotment</b>          | Where private developer acts as anchor investor, self-allotment up to 25% of developed land may be permitted, subject to scheme conditions. | Pricing should be transparent and not more favourable than terms available to other allottees.                                           |       |
| <b>Commercial / amenity / mixed-use receipts</b> | May support overall financial sustainability subject to approved master plan and land policy.                                               | Show separately from industrial revenue; avoid cross-subsidy assumptions unless approved.                                                |       |
| <b>User charges and maintenance charges</b>      | To fund operation, maintenance and management of assets created under the Scheme.                                                           | Charges should be enforceable under allotment / lease terms and reviewed periodically.                                                   |       |
| <b>O&amp;M Fund Corpus</b>                       | SPV may set aside up to 5% of gross allotment premium in a separate escrow account.                                                         | Use only for first five-year operational deficit, including utilities, maintenance, security, housekeeping and replacement of short-life |       |

|                             |                                                                                      |                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
|                             |                                                                                      | assets, with SPV Board approval.                                         |
| <b>Surplus and reserves</b> | Surplus after five years from O&M Corpus may be transferred to SPV general reserves. | Define reserve policy, renewal fund and periodic maintenance provisions. |

#### 11.4.1.8 Key Financial and Operational Assumptions

Table 11.11: Key Financial and Operation Assumptions

| Assumption category          | BHAVYA-aligned assumption                                                                                                                   | Rationale / note                                                                    |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| (1)                          | (2)                                                                                                                                         | (3)                                                                                 |
| <b>Appraisal period</b>      | 30 years or as appropriate for DPR, with construction, ramp-up, operations and renewal cycles.                                              | Should capture land absorption, O&M, periodic maintenance and debt service, if any. |
| <b>Implementation period</b> | 24 months for approved development works; longer period for 500-1000 acre parks may be considered by NLSC based on justified requirements.  | Model milestones should match approved implementation schedule.                     |
| <b>Cost escalation</b>       | Base costs to be supported by DPR quantities, SOR / market benchmarks and tender package estimates; escalation to be tested as sensitivity. | Funding is not revised after approval.                                              |
| <b>Demand and absorption</b> | Based on demand validation, competing park vacancy and sectoral ecosystem analysis.                                                         | Land monetisation should be stress-tested for slower absorption.                    |
| <b>Power and water</b>       | Availability of uninterrupted power and assured water supply                                                                                | Important for eligibility / evaluation and investor readiness.                      |

|                         |                                                                                                             |                                                              |
|-------------------------|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
|                         | should be confirmed as per projected demand.                                                                |                                                              |
| <b>O&amp;M recovery</b> | Through user charges, PPP models or other sustainable mechanisms, supported by O&M Corpus where applicable. | Prevents deterioration of assets and SPV operating deficits. |
| <b>Digital systems</b>  | Single-window, e-land management, utilities and compliance mapping should be reflected wherever relevant.   | Supports operational readiness and evaluation scoring.       |

#### 11.4.1.9 Financial Analysis and Viability Indicators

The DPR should present a complete financial assessment, including capital cost, funding, revenues, expenditure, depreciation, O&M plan and key financial indicators. Since BHAVYA is an infrastructure-enabling scheme, viability assessment should demonstrate financial discipline, sustainability and investor affordability, not merely commercial return maximisation.

*Table 11.12 Financial Analysis and Scheme Interpretation*

| Indicator / test                  | Base case                                                      | Downside case                                           | Management interpretation                                                 |
|-----------------------------------|----------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------|
| (1)                               | (2)                                                            | (3)                                                     | (4)                                                                       |
| <b>Funding compliance</b>         | Central assistance within applicable per-acre and equity caps. | Funding gap due to cost overrun or ineligible costs.    | Identify non-Scheme funding and avoid assuming revised BHAVYA assistance. |
| <b>Land valuation adequacy</b>    | Land value supports proposed equity structure.                 | Land valuation lower than expected or transfer delayed. | May reduce permissible GoI equity / delay tranche release.                |
| <b>Project IRR / cash surplus</b> | Positive project cash flow over appraisal period.              | Lower land prices / slower absorption.                  | Assess sustainability of SPV, not only accounting surplus.                |

|                               |                                                               |                                                      |                                                                 |
|-------------------------------|---------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------|
| <b>Debt service ability</b>   | DSCR acceptable if debt is proposed.                          | Delayed revenue and higher interest burden.          | Limit debt unless clearly serviceable from project cash flows.  |
| <b>O&amp;M recovery</b>       | Full recovery through user charges and corpus support.        | Partial recovery or delayed collections.             | Strengthen enforceability of O&M charges and ring-fence corpus. |
| <b>Investor affordability</b> | Land pricing aligned to target sectors and market benchmarks. | Pricing too high for demand or too low for recovery. | Balance competitiveness with lifecycle cost recovery.           |

#### 11.4.1.10 Convergence and Non-duplication of Funding

The SPV, State / UT Government and implementing agencies may leverage relevant Central and State Government schemes for components not funded or only partly funded under BHAVYA. The DPR should identify convergence areas such as external infrastructure, last-mile connectivity, utilities, logistics infrastructure, skill development, renewable energy, water management, waste treatment and testing / laboratory facilities. The financial model should include safeguards to ensure that the same component is not funded twice.

*Table 11.13 Convergence and Non-Duplication*

| <b>Component / area</b>                     | <b>Potential convergence route</b>                                                                             | <b>Control required</b>                                                    |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <b>(1)</b>                                  | <b>(2)</b>                                                                                                     | <b>(3)</b>                                                                 |
| <b>External infrastructure balance cost</b> | State budget, State schemes, line departments, PM Gati Shakti-aligned works or private developer contribution. | SSA to include mandatory commitment for balance funding where required.    |
| <b>Skill ecosystem / training</b>           | State skill missions, Central skill schemes, industry partnerships or PPP.                                     | Clearly separate capital cost, operating support and partner contribution. |

|                                               |                                                                        |                                                                        |
|-----------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>Renewable energy / sustainability</b>      | Renewable energy schemes, DISCOM / open access frameworks, PPP models. | Avoid double counting of renewable infrastructure funded under BHAVYA. |
| <b>Testing labs / common facilities</b>       | Relevant sectoral schemes, industry associations, PPP models.          | Show component owner, capex source and user-charge model.              |
| <b>Worker housing / social infrastructure</b> | PPP, State housing schemes, employer participation.                    | Land, construction and O&M responsibilities to be documented.          |

#### 11.4.1.11 Financial Risks and Mitigation Measures

Table 11.14: Financial Risks and mitigation

| <b>Risk</b>                                           | <b>Financial impact</b>                                            | <b>BHAVYA-aligned mitigation</b>                                                                                  |
|-------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>(1)</b>                                            | <b>(2)</b>                                                         | <b>(3)</b>                                                                                                        |
| <b>Delay in land transfer / encumbrance clearance</b> | Defers tranche release, construction and investor allotment.       | Ensure 90% encumbrance-free possession at application stage; complete transfer to SPV within stipulated timeline. |
| <b>Ineligible cost included in funding claim</b>      | Creates funding gap or rejection during appraisal.                 | Segregate eligible, ineligible and converged components in DPR and financial model.                               |
| <b>External infrastructure not funded / delayed</b>   | Affects investor readiness and tranche conditions.                 | Include SSA commitment and convergence plan; document State responsibility and timelines.                         |
| <b>Cost escalation after approval</b>                 | Funding approved under Scheme will not be revised.                 | Use updated SOR, tender benchmarks, contingencies, value engineering and non-Scheme funding buffer.               |
| <b>Slow land absorption</b>                           | Reduces internal accruals and weakens debt service / O&M recovery. | Anchor investor strategy, sector targeting, flexible plot sizes and phased pricing.                               |

|                                           |                                                        |                                                                                                                       |
|-------------------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>O&amp;M under-recovery</b>             | Creates asset deterioration and SPV operating deficit. | Notify enforceable user charges, maintain O&M Corpus in escrow and ring-fence maintenance collections.                |
| <b>Double financing / audit objection</b> | Risk of fund recovery or non-compliance.               | Maintain component-wise funding register, separate accounts for BHAVYA funds and asset register under GFR principles. |

#### 11.4.1.12 Approval, Monitoring and Compliance Dashboard

The NLSC shall consider approval of the project cost, eligible components, funding structure, SPV implementation arrangements, land transfer, delegation of powers, external infrastructure commitments, tranche schedule and monitoring framework based on the inputs provided in the DPR. The financial model should be updated at DPR finalisation, tender award, construction commencement, major variation approval, tranche release, land monetisation review and O&M review.

*Table 11.15 Monitoring Metrics*

| Monitoring area | Metric                                                                                              | Frequency           | Escalation trigger                                                                   |
|-----------------|-----------------------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------|
| (1)             | (2)                                                                                                 | (3)                 | (4)                                                                                  |
| <b>Cost</b>     | Approved cost vs actual / tendered cost; eligible vs ineligible component reconciliation.           | Monthly / quarterly | Package-level variation above approved tolerance or ineligible expenditure detected. |
| <b>Funding</b>  | Equity received, NICDIT assistance released, debt drawn, cash balance and utilisation certificates. | Monthly             | Utilisation below tranche requirement or cash runway below 3 months.                 |

|                           |                                                                                                                       |                     |                                                                           |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------|
| <b>Land</b>               | Land transferred to SPV, encumbrance status, valuation documentation and allotment progress.                          | Monthly / quarterly | Land transfer milestone missed or allotment below approved plan.          |
| <b>Tranche compliance</b> | Milestones achieved, EC status, work commencement, utilisation, physical progress and manufacturing-unit commitments. | At each tranche     | Any precondition not satisfied before drawdown.                           |
| <b>Revenue</b>            | Allotment premium, lease receipts, receivables, maintenance charges and O&M corpus balance.                           | Monthly / quarterly | Receipts below base case by more than 20% or O&M reserve below threshold. |
| <b>Assets and audit</b>   | Asset register, separate BHAVYA accounts, audit observations and public disclosure status.                            | Quarterly / annual  | Diversion, encumbrance or non-approved use of Scheme-funded assets.       |

#### 11.4.1.13 Indicative approval items

- Approval of total project cost with clear segregation of land, eligible infrastructure, ineligible costs, external infrastructure, taxes, contingencies, O&M and convergence components.
- Approval of equity contribution by participating entities, including recognition of land as equity contribution after valuation and transfer to SPV.
- Approval of financial assistance within applicable caps and release linked to BHAVYA milestones.
- Approval of EPC package structure for core infrastructure and PPP / partnership approach for value-added and social infrastructure, where applicable.
- Approval of land monetisation policy, pricing framework, user charges, O&M Corpus Fund, escrow arrangements and asset management responsibilities.

- Approval of monitoring dashboard, reporting format, utilisation certificate mechanism, audit process and asset register requirements.

**Note: All figures and assumptions in this chapter are indicative. Replace them with project-specific DPR estimates, valuation reports, State policy rates, approved financing terms, market assessment, tax assumptions and signed support / shareholder documents before submission under BHAVYA.**

## Annexure 1

| Sr. No.                                          | Nature of Compliances/Clearances                                                          |
|--------------------------------------------------|-------------------------------------------------------------------------------------------|
| <b>Pre-Operative Registrations</b>               |                                                                                           |
| 1                                                | Incorporation of Company                                                                  |
| 2                                                | Registration of Permanent Account Number (PAN)                                            |
| 3                                                | Registration of Tax Account Number (TAN)                                                  |
| 4                                                | Registration under Goods and Service Tax (GST)                                            |
| 5                                                | Registration under Industrial Enterprises Memorandum - Part-I                             |
| 6                                                | Registration under Import Export Code                                                     |
| 7                                                | Registration under Profession Tax Enrolment Certificate for Company                       |
| 8                                                | Registration under Profession Tax (EC) for Directors of Company                           |
| 9                                                | Possession Letter for Acquisition of Land                                                 |
| 10                                               | Stamp Duty Exemption for Registration of Land                                             |
| 11                                               | Registration under Maharashtra Pollution Control Board (MPCB) Consent to Establish        |
| 12                                               | Registration as Principal Employer under Contract Labour Act                              |
| 13                                               | Registration under Building and Other Construction Works                                  |
| 14                                               | Registration of Lease Deed of Land                                                        |
| 15                                               | Temporary Electricity Connection                                                          |
| 16                                               | Temporary Water Connection                                                                |
| 17                                               | Trees Cutting Permission                                                                  |
| 18                                               | Building Plan Approval and Fire No Objection Certificate                                  |
| 19                                               | Registration under Employee State Insurance Corporation (ESIC)                            |
| 20                                               | Registration under Provident Fund (PF)                                                    |
| 21                                               | NOC from Airport Authority                                                                |
| 22                                               | Preliminary Layout Drawing Approval and license for Storage of Gases                      |
| 23                                               | Factory layout plan approval, 1948                                                        |
| 24                                               | Registration under Payment of Gratuity Act, 1972                                          |
| <b>Post Construction/Operative Registrations</b> |                                                                                           |
| 25                                               | Registration with Common Hazardous Waste Treatment, Storage & Disposal Facility (CHWTSDF) |
| 26                                               | Registration of Centralised/Common Effluent Treatment Plant at AURIC                      |
| 27                                               | Consent to operate (CTO) & Authorization to store Hazardous waste                         |
| 28                                               | Fire No Objection Certificate                                                             |

|    |                                                                                                            |
|----|------------------------------------------------------------------------------------------------------------|
| 29 | Building Completion Certificate and all other related clearances required                                  |
| 30 | NOC from Collector Office for Storage of Gases                                                             |
| 31 | NOC from Superintendent of Police for Storage of Gases                                                     |
| 32 | NOC from Deputy Superintendent of Police for Storage of Gases                                              |
| 33 | NOC from Jurisdictional Police Station for Storage of Gases                                                |
| 34 | NOC from Regional Fire Officer for Storage of Gases                                                        |
| 35 | NOC from Sub Divisional Office for Storage of Gases                                                        |
| 36 | NOC from Town Planning Authority for Storage of Gases                                                      |
| 37 | Final Approval from PESO for Nitrogen and Gases                                                            |
| 38 | Approval for utilisation of Natural Gas through Pipeline                                                   |
| 39 | Factories License                                                                                          |
| 40 | Registration of Occupation under Factories Act                                                             |
| 41 | Registration of Establishment under the Interstate Migrant Workmen Act, 1979                               |
| 42 | Employer Registration under the respective states and Other Manual Workers Act, 1969                       |
| 43 | Registration under Industrial Enterprises Memorandum - Part-B                                              |
| 44 | New Power Connection for Industrial Use                                                                    |
| 45 | Permanent water connection                                                                                 |
| 46 | Registration under private Security Guards Act 1981                                                        |
| 47 | Permission for Boiler                                                                                      |
| 48 | Solvent License, if req.                                                                                   |
| 49 | Obtain Registration as Manufacturer under Legal Metrology Act                                              |
| 50 | Stamping & Calibration of Machinery from Legal Metrology                                                   |
| 51 | Layout Approval for Diesel Generator sets (if applicable)                                                  |
| 52 | Registration of Diesel Generator Sets (if applicable)                                                      |
| 53 | Permission for charging Diesel Generator Sets for more than 250 KVA (if applicable)                        |
| 54 | Permission for erection of lift                                                                            |
| 55 | License to operate lift                                                                                    |
| 56 | Boiler Erection certificate                                                                                |
| 57 | Renewal of Registration as Principal Employer under Contract Labour Act                                    |
| 58 | Application for Lower Income Tax Rate for Company                                                          |
| 59 | Obtaining Eligibility Certificate from Directorate of Industries under Package Scheme of Incentives - 2019 |
| 60 | Electricity Duty Exemption                                                                                 |

## **ANNEXURE 2**

### **Environment & Sustainability framework for Industrial Parks under BHAVYA scheme**

In addition to periodic statutory compliance being carried out by the SPV. The adoption of the environment & sustainability rating system would further help SPVs / industries to strengthen their commitment towards environment safeguards and improve their performance to meet sustainable standards.

Further the Industrial rating framework would enable SPVs to ensure compliance with the statutory obligation and assess performance of industrial park (IP) / individual industries during construction as well as operational stage.

#### **(a) Sustainability rating in Indian scenario**

In September, 2025, Industrial Park Rating System (IPRS) 3.0 was announced by Gol. The IPRS is being developed through Department for Promotion of Industry and Internal Trade (DPIIT) with support from the Asian Development Bank (ADB).

It is being conceptualized to enhance the transparency, competitiveness, and investment attractiveness of India's industrial ecosystems by benchmarking industrial parks.

#### **(b) Environment & Sustainability framework**

Sustainability, environmental awareness, renewable resource management, etc plays a vital role in sustainable lifestyle. With the global carbon emissions rising day by day, it is essential to move towards reduction of environmental footprints. Govt of India has already committed to achieve the Net Zero emission target by year 2070.

Environment & Sustainability framework (ESF) for projects proposed to be developed under BHAVYA scheme has been developed in-house by NICDC, considering statutory conditions imposed in Environmental Clearance (EC) by the MoEF&CC & SEIAA, social safeguards, internal infrastructure, public health, monitoring & surveillance, Net zero / innovation initiatives, labour compliance & proposed key pillars under Industrial Park Rating System (IPRS) and UNIDO's Eco Industrial Park framework etc. The Environment & sustainability framework has been conceptualized on *fourteen evaluation indicators* to have coverage of the Industrial Park in a holistic manner.

SPVs are expected to adopt the best practices as prescribed in the Environment & Sustainability framework and assess performance of respective industrial park through evaluation indicators. The ESF rating programme is aimed at creating a green industry landscape in industrial parks being developed under BHAVYA scheme. The SPVs / Industries are expected to further perform better than the compliance of statutory obligation and set higher goals for adoption of innovative techniques & consistent improvement.

The ESF rating system has been designed to evaluate the participating Industrial parks based on their overall performance, environmental safeguards and assess whether the entities have made efforts to perform better than the prescribed standards. Besides the above, parameters such as efficiency in terms of use of natural resources, waste management, performance of the industrial parks on the social & public health aspects etc are important part of the rating system for a holistic evaluation of the overall performance of Industrial parks.

ESF rating is the “*first of its kind rating system for Industrial parks*” which provides a holistic framework, which evaluates industrial parks on the environmental friendliness of their activities using a life cycle approach. Implementation of the ESF rating may provide leadership and guidance to SPVs / Industries on sustainable operations.

The Environment & Sustainability framework comprises of following indicators.

**(i) Evaluation Indicators:**

|                               |                                                     |
|-------------------------------|-----------------------------------------------------|
| <b>Evaluation Indicator 1</b> | <b>Environmental Planning &amp; site selection.</b> |
| <b>Evaluation Indicator 2</b> | Statutory compliance & Environmental Safeguards.    |
| <b>Evaluation Indicator 3</b> | Energy conservation.                                |
| <b>Evaluation Indicator 4</b> | Water quality monitoring & preservation.            |
| <b>Evaluation Indicator 5</b> | Solid waste disposal.                               |
| <b>Evaluation Indicator 6</b> | Air & Noise monitoring.                             |
| <b>Evaluation Indicator 7</b> | Social Infrastructure & Safeguards.                 |

|                                |                                                   |
|--------------------------------|---------------------------------------------------|
| <b>Evaluation Indicator 8</b>  | Grievance redressal / Tenant outreach & dialogue. |
| <b>Evaluation Indicator 9</b>  | Labour rights & compliance.                       |
| <b>Evaluation Indicator 10</b> | Gender equality.                                  |
| <b>Evaluation Indicator 11</b> | Public Health.                                    |
| <b>Evaluation Indicator 12</b> | Net Zero / Innovation initiatives.                |
| <b>Evaluation Indicator 13</b> | Monitoring & surveillance.                        |
| <b>Evaluation Indicator 14</b> | Internal Infrastructure.                          |

The indicator / assessment parameters are aimed to ensure sustainable implementation of the industrial parks. The framework would enable a tool for measuring statutory, environmental & sustainability safeguards, social safeguards, internal infrastructure implementation etc. Further, the framework would encourage competitiveness among SPVs / industries, and enable to rate the industrial parks by their best practices, and also to receive feedback from stakeholders.

In the form of a prescribed framework, these *14 indicators* have to be assessed through parameter of total of *68 questions*. The weightage of the assessment framework is prescribed for total *500 marks*, having *score methodology of 5 to maximum 10 score* based on the nature of the parameter. Documentation required to assess the prescribed parameters has been mentioned in the framework.

## **(ii) Rating of Industrial Parks**

The industrial parks shall be rated as per following categories;

- (a) Leaders – high performing industrial parks securing more than 80 % score.
- (b) Challengers- growing industrial parks securing 60 % score
- (c) Aspirers – Industrial parks secured above 40 % score.

## **(iii) Implementation Process**

For implementation of ESF at respective industrial parks, the SPVs will conduct an annual rating / annual audit through prescribed indicator / parameter. The ESF rating will be carried out by a three-member committee, comprising officials from SPV, PMNC & EPC contractor in consultation with NICDC. Based on requirement, the SPV may

also opt for approved EIA consultants, Govt Environmental Institutions, State Industries Association, Confederation of Indian Industries (CII) etc.

**Benefits of ESF rating system:**

Adoption of ESF rating system addresses statutory obligation of the SPVs, energy efficiency, water conservation, renewable energy, waste management, internal infrastructure etc. Some of the major benefits are highlighted below:

- a. Enable SPVs to track compliance of industrial parks through standardised framework.
- b. Initiatives beyond compliance & provide scope for innovation & improvement.
- c. Provide an opportunity to the SPVs for a green corporate image for meeting performance beyond regulations and compliances.
- d. Overall natural resource conservation & management.
- e. Monitor development of Internal infrastructure etc.















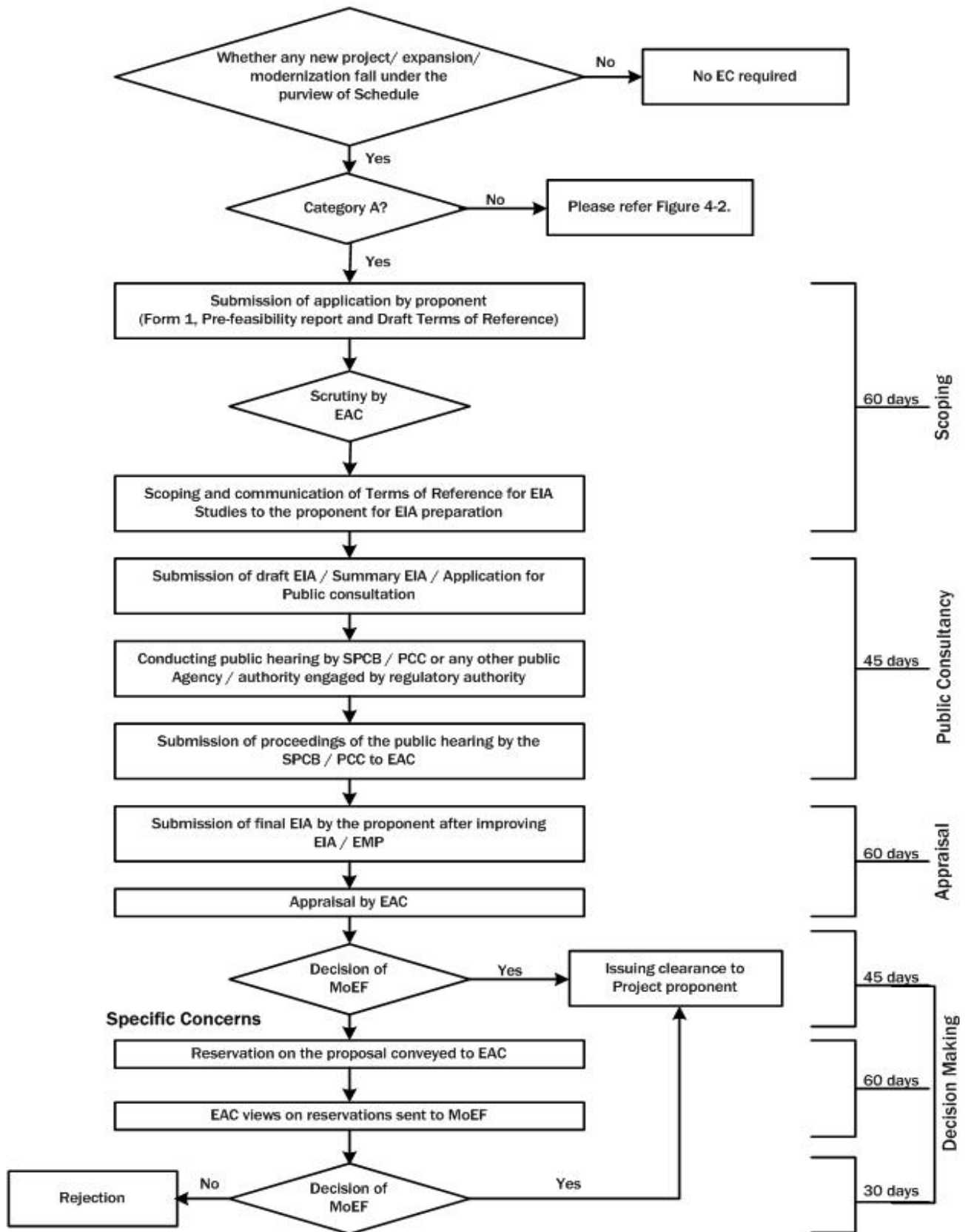






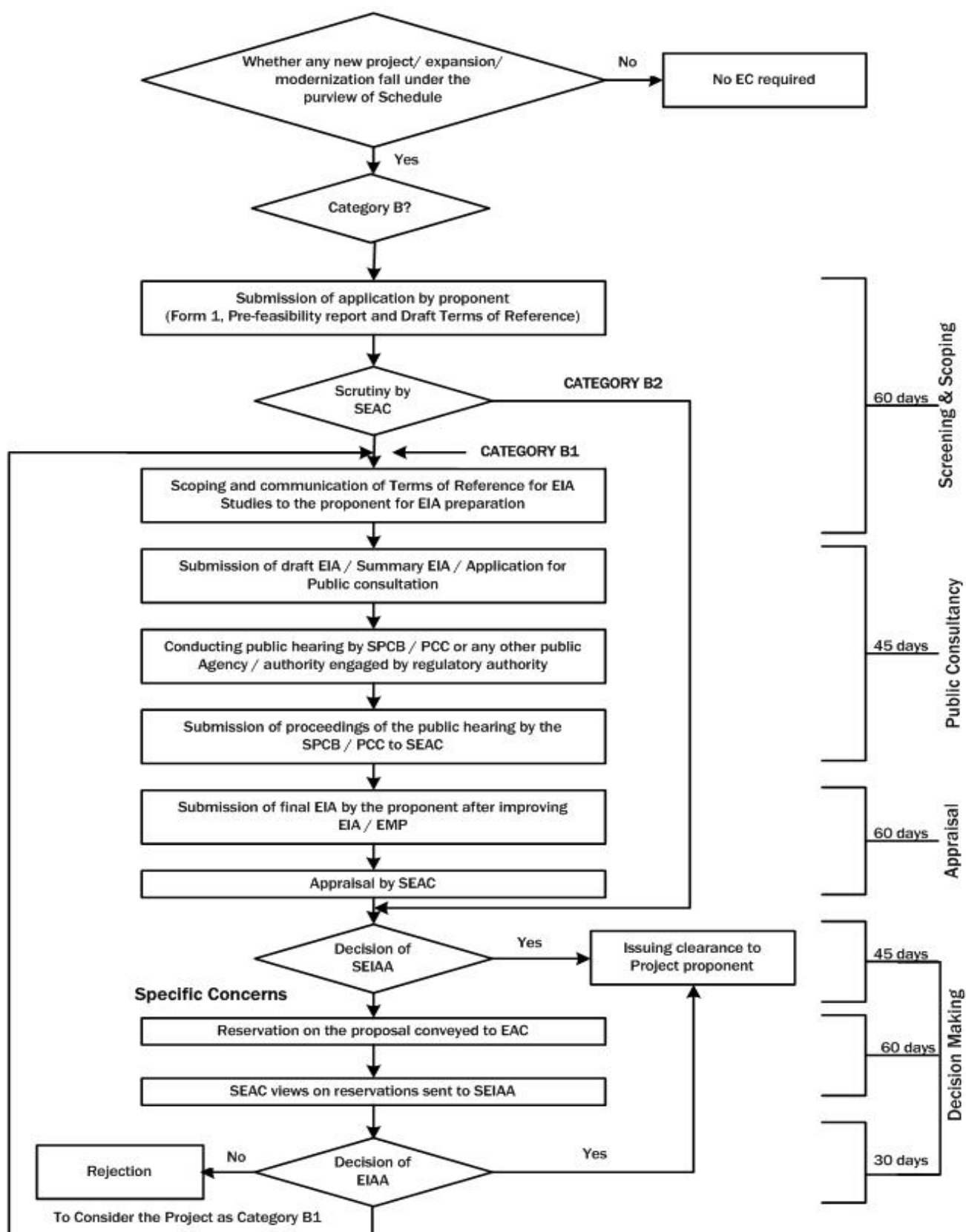
### Annexure 3

#### Work flow of Environmental Clearance for Category A projects



## Annexure 4

### Work flow of Environmental Clearance for Category B projects



## Annexure 5

| STEP-1 INDUSTRIAL PARK DETAILS: BASIC PROJECT INFORMATION & LOCATION |                                                                                                                  |  |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--|
| Sl.NO.                                                               | 1.1 Land Ownership and Encumbrance                                                                               |  |
| 1                                                                    | Sponsoring Agency *                                                                                              |  |
| 2                                                                    | Name of the Park *                                                                                               |  |
| 3                                                                    | Whether an SPV with NICDIT Exists or Process has been Initiated? *                                               |  |
| 4                                                                    | State / UT *                                                                                                     |  |
| 5                                                                    | Hilly State/Non-Hilly State                                                                                      |  |
| 6                                                                    | District *                                                                                                       |  |
| 7                                                                    | Sub-Division Name *                                                                                              |  |
| 8                                                                    | Village                                                                                                          |  |
| 9                                                                    | PIN Code *                                                                                                       |  |
| 10                                                                   | Latitude *                                                                                                       |  |
| 11                                                                   | Longitude *                                                                                                      |  |
| Sl.NO.                                                               | 1.2- Land Valuation and Private Entity                                                                           |  |
| 1                                                                    | Proposed Land Valuation of Industrial Park (In crores) *                                                         |  |
| 2                                                                    | Ratio of Private Entity Equity to State Equity *                                                                 |  |
| 3                                                                    | Name of the Private Entity                                                                                       |  |
| 4                                                                    | Type of Industrial Park *                                                                                        |  |
| 5                                                                    | Gross Area (Acres) *                                                                                             |  |
| 6                                                                    | Is proposed land for Industrial Park contiguous?*                                                                |  |
| 7                                                                    | Specify the radial distance between the nearest edge of two land parcels*                                        |  |
| 8                                                                    | Net Developable Area Under Proposed Industrial Park (Inclusive of Industrial, Commercial, and Residential Use) * |  |
| 9                                                                    | Proposed Area Under Industrial Use (Acres) *                                                                     |  |
| 10                                                                   | Percentage of Total Park Area (%) *                                                                              |  |
| 11                                                                   | KML/KMZ Maps Upload *                                                                                            |  |
| 12                                                                   | Encumbrance-free Area (%) *                                                                                      |  |
| 13                                                                   | HT Lines Passing Through the Proposed Land Parcel                                                                |  |
| 14                                                                   | Litigation / Court Cases Pending in Balance Area                                                                 |  |
| 15                                                                   | Land Use is in Conformity with Nearest ULB's Notified Master Plan                                                |  |
| 16                                                                   | DPR (including Master Plan Report and Minimum Indicative Component in Annexure II) (max file size - 600MB) *     |  |
| 17                                                                   | Upload Master Plan Layout (max file size - 600MB)*                                                               |  |

### STEP-2 Connectivity and Land Suitability:Transport and Infrastructure Access

| SI.NO. | 2.1 Nearest National Highway                                                              |  |
|--------|-------------------------------------------------------------------------------------------|--|
| 1      | NH ID/Number *                                                                            |  |
| 2      | Route Distance to NH (km) *                                                               |  |
| 3      | ROW (metres) *                                                                            |  |
| 4      | Upload * (Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB |  |
|        | <b>2.2- Nearest State Highway</b>                                                         |  |
| 5      | SH ID/Number *                                                                            |  |
| 6      | Route Distance to SH (km) *                                                               |  |
| 7      | ROW (metres) *                                                                            |  |
| 8      | Upload * (Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB |  |
|        | <b>2.3- Planned Road Access</b>                                                           |  |
| 9      | Access Road Surface Type *                                                                |  |
| 10     | Access Road Length (km) *                                                                 |  |
| 11     | Access Road Length (km) *                                                                 |  |
| 12     | Upload * (Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB |  |
|        | <b>2.4- Rail Connectivity</b>                                                             |  |
| 13     | Name of the Rail Siding *                                                                 |  |
| 14     | Distance to Railway Siding (km) *                                                         |  |
| 15     | Adjacent to Rail Siding                                                                   |  |
| 16     | Upload *(Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB  |  |
|        | <b>2.5- Distance from Multi Modal Logistics Park (MMLP)</b>                               |  |
| 17     | Name of the MMLP *                                                                        |  |
| 18     | Distance from MMLP (km) *                                                                 |  |
| 19     | Upload *(Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB  |  |

|    |                                                                                                                                                         |  |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|    | <b>2.6- Airport and Port Access</b>                                                                                                                     |  |
| 20 | Name of the Cargo Airport *                                                                                                                             |  |
| 21 | Distance to Airport (km) *                                                                                                                              |  |
| 22 | Upload *(Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB                                                                |  |
| 23 |                                                                                                                                                         |  |
| 24 | Name of the Sea Port *                                                                                                                                  |  |
| 25 | Distance to Sea Port (km) *                                                                                                                             |  |
| 26 | Upload *(Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB                                                                |  |
| 27 | Name of the Operational ICD *                                                                                                                           |  |
| 28 | Distance from Operational ICD (km) *                                                                                                                    |  |
| 29 | Upload *(Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB                                                                |  |
|    | <b>2.7- Land Suitability - Gradient of Site *</b>                                                                                                       |  |
| 30 | Input in % *                                                                                                                                            |  |
| 31 | Upload *(Digital Elevation Model (DEM)Maximum file size: 5MB                                                                                            |  |
|    | <b>2.8- Proximity to Nearest Urban Local Body (ULB)</b>                                                                                                 |  |
| 33 | Name Of Nearest ULB *                                                                                                                                   |  |
| 34 | Distance from Nearest ULB *                                                                                                                             |  |
| 35 | Population(as per Census 2011)*                                                                                                                         |  |
| 36 | Upload *(Gatishakti / GIS Relevant Platform Map - PDF files only)*Maximum file size: 5MB                                                                |  |
| 37 | Notifications for ULB / Extension of ULB Boundary *                                                                                                     |  |
|    | <b>2.9- Mode of Land Acquisition*</b>                                                                                                                   |  |
| 38 | LAND POOLING/Town planning Scheme/any other mode                                                                                                        |  |
| 39 | Upload *(Upload supporting documents: notification, approval or consent letter)Maximum file size: 5MB                                                   |  |
| 40 | Land Acquired under Land Pooling/Town Planning Scheme (%) *                                                                                             |  |
| 41 | Land Acquired (%) Through other Modes                                                                                                                   |  |
| 42 | Proposed Land Valuation of Industrial Park (Rs. Per Acre) *                                                                                             |  |
| 43 | Upload Supporting Document (Purchase Deed / Land Registry for Land Pooling) *One of: Purchase Deed, Land Registry, or equivalent Maximum file size: 5MB |  |

|                                                          |                                                                                                                 |  |
|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--|
| 44                                                       | Total Funding for External Infrastructure Development (%) *Maximum cap: 25%                                     |  |
| <b>2.10- Confirmation of Water Availability at Site*</b> |                                                                                                                 |  |
| 45                                                       | Is Water Available? *                                                                                           |  |
| 46                                                       | Upload Supporting Document *(Upload supporting documentary proof for water availability)Maximum file size: 5MB  |  |
| <b>2.11- Confirmation of Power Availability at Site*</b> |                                                                                                                 |  |
| 47                                                       | Is Power Available? *                                                                                           |  |
| 48                                                       | Upload Supporting Document *(Upload supporting documentary proof for power availability)*Maximum file size: 5MB |  |
| <b>2.12- Gas Pipeline Connectivity*</b>                  |                                                                                                                 |  |
| 49                                                       | Name of Nearest Gas Pipeline                                                                                    |  |
| 50                                                       | Distance (km) *                                                                                                 |  |
| 51                                                       | Upload *(Upload relevant pipeline document)Maximum file size: 5MB                                               |  |

| STEP -3 Effluent Treatment Plant - Core, Value Added, Social Infrastructure |                                                                               |                     |                    |                     |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------|--------------------|---------------------|
| <b>Sl.NO.</b>                                                               | <b>3.1- Sector specific park</b>                                              |                     |                    |                     |
| 1                                                                           | Sector Specific Park *                                                        |                     |                    |                     |
|                                                                             | Yes/No                                                                        |                     |                    |                     |
|                                                                             | <b>3.2- Internal Road hierarchy (meters)</b>                                  |                     |                    |                     |
|                                                                             | <b>Road Type</b>                                                              | <b>ROW (Meters)</b> | <b>Length (Km)</b> | <b>Type of Road</b> |
| 2                                                                           | Arterial Road                                                                 |                     |                    |                     |
| 3                                                                           | Sub Arterial                                                                  |                     |                    |                     |
| 4                                                                           | Collector                                                                     |                     |                    |                     |
| 5                                                                           | Local                                                                         |                     |                    |                     |
| 6                                                                           | Total Length of Roads (Km)                                                    |                     |                    |                     |
|                                                                             | <b>3.3- Pathways along the road</b>                                           |                     |                    |                     |
|                                                                             | <b>Type</b>                                                                   | <b>ROW (Meters)</b> | <b>Length (Km)</b> |                     |
| 7                                                                           | Pedestrian                                                                    |                     |                    |                     |
| 8                                                                           | Cycle Track                                                                   |                     |                    |                     |
|                                                                             | <b>3.4- Drainage along the roads</b>                                          |                     |                    |                     |
| 9                                                                           | Length of Drains (Km)                                                         |                     |                    |                     |
| 10                                                                          | Covered (Km)                                                                  |                     |                    |                     |
| 11                                                                          | Open (Km)                                                                     |                     |                    |                     |
|                                                                             | <b>3.5- WATER</b>                                                             |                     |                    |                     |
| 12                                                                          | Demand (MLD) *                                                                |                     |                    |                     |
| 13                                                                          | Potable (MLD) *                                                               |                     |                    |                     |
| 14                                                                          | Non Potable (MLD)                                                             |                     |                    |                     |
| 15                                                                          | Source of Water                                                               |                     |                    |                     |
| 16                                                                          | SURFACE                                                                       |                     |                    |                     |
| 17                                                                          | SUB-SURFACE                                                                   |                     |                    |                     |
| 18                                                                          | HYBRID                                                                        |                     |                    |                     |
| 19                                                                          | DISTANCE OF SOURCE (KM)                                                       |                     |                    |                     |
| 20                                                                          | Confirmation of Allocation from Concerned Department/BoardUpload Letter / PDF |                     |                    |                     |
| 21                                                                          | SCADA Controlled Water Network *                                              |                     |                    |                     |
| 22                                                                          | If Water Treatment Plant Exist at Source for Desired Demand*                  |                     |                    |                     |
|                                                                             | <b>3.6- Effluent Network &amp; Treatment Plant</b>                            |                     |                    |                     |
| 21                                                                          | Recycled Water Network *                                                      |                     |                    |                     |
| 22                                                                          | Treatment Capacity in MLD *                                                   |                     |                    |                     |
| 23                                                                          | Zero Liquid Discharge Plant (ZLD) *                                           |                     |                    |                     |
| 24                                                                          | SCADA Control *                                                               |                     |                    |                     |

|    |                                                                                                                |  |
|----|----------------------------------------------------------------------------------------------------------------|--|
|    | <b>3.7- Power</b>                                                                                              |  |
| 25 | Demand (in MVA) *                                                                                              |  |
| 26 | Voltage Available (in KV) *                                                                                    |  |
| 27 | Name of the MRSS/Substation *                                                                                  |  |
| 28 | Total Capacity (in MVA) *                                                                                      |  |
| 29 | Surplus Capacity (in MVA) *                                                                                    |  |
| 30 | Distance to MRSS (in Km) *                                                                                     |  |
| 31 | Substation *                                                                                                   |  |
| 32 | GIS/HIS/HYBRID                                                                                                 |  |
| 33 | Distribution Cable in RCC Trench/Utility Duct *                                                                |  |
| 34 | SCADA Controlled Distribution *                                                                                |  |
| 35 | Total Power Consumption Proposed from Green Energy (%) *                                                       |  |
| 36 | Open access to State Grid Available *                                                                          |  |
|    | <b>3.8- Skill Development Facility or Integration with Local Skill Development Institute*</b>                  |  |
| 37 | <b>Select Option</b>                                                                                           |  |
|    | Internal Skill development authority                                                                           |  |
|    | local skill development institute                                                                              |  |
|    | Both                                                                                                           |  |
|    | <b>3.9- Value Added Infrastructure : Built to Suit Factories Shed considered in DPR*</b>                       |  |
| 38 | <b>Select Option</b>                                                                                           |  |
|    | Proposed                                                                                                       |  |
|    | Not Proposed                                                                                                   |  |
|    | <b>3.10- Common Facilities Center (Testing lab, Research and Development Center or Training Center, etc.)*</b> |  |
| 39 | <b>Select Option</b>                                                                                           |  |
|    | Proposed                                                                                                       |  |
|    | not proposed                                                                                                   |  |
| 40 | User Remarks                                                                                                   |  |
| 41 | Upload *(Upload supporting documentary proof)*Maximum file size: SMB                                           |  |
|    | <b>3.11- Worker Housing*</b>                                                                                   |  |
| 42 | <b>Select Option</b>                                                                                           |  |
|    | Proposed                                                                                                       |  |
|    | not proposed                                                                                                   |  |
| 43 | Number of Dwelling Unit for Workers                                                                            |  |
| 44 | Upload(Upload dwelling unit plan)*Maximum file size: SMB                                                       |  |
|    | <b>3.12- O&amp;M Mechanism*</b>                                                                                |  |
| 45 | Overall Cost (Per Annum)                                                                                       |  |
| 46 | Overall Cost (%)                                                                                               |  |
|    | <b>3.13- Digital Infrastructure (OFC+High Speed) Data Connectivity.*</b>                                       |  |
| 47 | <b>Select Option</b>                                                                                           |  |
|    | Proposed                                                                                                       |  |
|    | not proposed                                                                                                   |  |

|    |                                                                      |  |
|----|----------------------------------------------------------------------|--|
| 48 | User Remarks(enter detail)                                           |  |
| 49 | Distance from Existing OFC (Km)                                      |  |
| 50 | Upload *(Upload supporting documentary proof)*Maximum file size: 5MB |  |
| 51 | Upload Proposed Infrastructure Cost Sheet. *Sample file download     |  |

| STEP-4 Industrial Ecosystem:                                                                                   |                                                                                     |                                                          |  |  |
|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------|--|--|
| <b>Sl.NO.</b>                                                                                                  | <b>4.1- Employment Potential*</b>                                                   |                                                          |  |  |
| 1                                                                                                              | Jobs (Number) *                                                                     |                                                          |  |  |
| 2                                                                                                              | User Remarks                                                                        |                                                          |  |  |
| <b>4.2- Demand Assessment of Proposed Sectors in the DPR *</b>                                                 |                                                                                     |                                                          |  |  |
| 3                                                                                                              | Select Option                                                                       | YES/No                                                   |  |  |
| 4                                                                                                              | Upload *(Upload Supporting Documentary Proof)*Maximum file size: 5MB                |                                                          |  |  |
| <b>4.3- Nearest Existing Industrial Area /Park/Cluster (Non SEZ) Within 100 Km (Upload PM Gatishakti Map)*</b> |                                                                                     |                                                          |  |  |
| 5                                                                                                              | Park Name                                                                           |                                                          |  |  |
| 6                                                                                                              | Total Plots                                                                         |                                                          |  |  |
| 7                                                                                                              | Allotted                                                                            |                                                          |  |  |
| 8                                                                                                              | Year of Commission                                                                  |                                                          |  |  |
| 9                                                                                                              | Distance (km)                                                                       |                                                          |  |  |
| 10                                                                                                             | User Remarks                                                                        |                                                          |  |  |
| 11                                                                                                             | Upload Gatishakti map *(Upload Supporting Documentary Proof)*Maximum file size: 5MB |                                                          |  |  |
| <b>4.4- Proposed Demand Assessment Study for Industries*</b>                                                   |                                                                                     |                                                          |  |  |
| 12                                                                                                             | <b>Select Option</b>                                                                |                                                          |  |  |
|                                                                                                                | Demand assessment study                                                             |                                                          |  |  |
|                                                                                                                | Existing Industrial Ecosystem in vicinity                                           |                                                          |  |  |
| 13                                                                                                             | Upload *(Upload Supporting Documentary Proof)*Maximum file size: 5MB                | Choose file to upload Cost Sheet.*Maximum file size: 5MB |  |  |