Table 88: Detailed breakdown of Hazardous Waste Stream and its Management

Fraction	Amount of Hazardous Waste (MT)	
	2020-2021	2019 –2020
Landfillable	224.297	208.03
Incinerable	22.79	48.462
Recyclables	1032.011	2470.565
Total	1279.098	2727.057

Source: Member Secretary CPCC, Chandigarh

A breakdown of the generated hazardous waste over the years has been visually presented below in Figure 65:

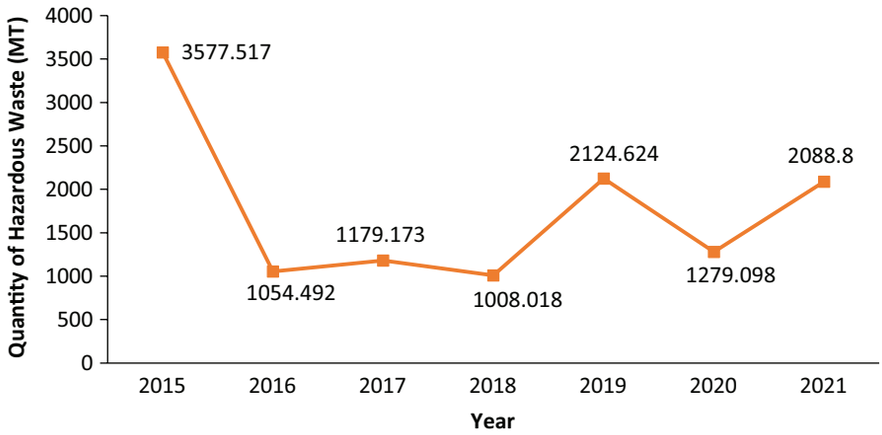

Figure 65: Year wise Quantity of Hazardous Waste generated

Source: Member Secretary CPCC, Chandigarh

The Chandigarh Pollution Control Committee (CPCC) has authorised 9 HW Recyclers to collect, transport and treat the hazardous waste produced across the UT (Chandigarh ENVIS, 2020). Additionally, the CPCC has formal agreements with the State Pollution Control Boards (SPCBs) of the states of Punjab, Haryana, and UP to utilise their TSDFs for managing its hazardous waste. As a result of such approach, Chandigarh has been successful in avoiding any contaminated of sites with the UT, which would otherwise have disastrous repercussions on environment as well as public health.

3.2 Municipal Solid Waste

As stated earlier, as per the DEP, the present estimated MSW generated in Chandigarh is 513 TPD (CPCB, 2021). Entire quantity of generated MSW is collected and sent for processing and disposal. MSW collection efficiency has always been significant, reported to be at 80% for 2016-17 reaching up to 100% in 2020-21. A snapshot of the yearly MSW generation reported in Chandigarh is tabulated in Table 89.

Table 89: Annual MSW generation over the years

Year	MSW Generated (Tonnes)
2014	135050
2015	135050
2016	160022
2017	169090
2018	157760
2019	117420
2020	171840
2021	187245

Source: Municipal Corporation of Chandigarh

For the purpose of collection of MSW, MCC has engaged 489 GPS enabled vehicles with three compartments to collect wet, dry and household hazardous waste separately. In addition, in commercial areas, colour coded bins are provided to collect wet waste (green bins), dry waste (blue bins) and household hazardous waste (black bins). The segregation levels of 90% have been achieved by the efforts of awareness programmes carried out by MCC. The bulk waste generators process wet waste by themselves and only dry waste is collected by MCC. In addition, 3 material recovery facilities have been implemented by MCC for collection and further sorting on waste.

For processing MSW, an integrated waste processing plant having a capacity of 120 TPD and trying to revive RDF processing plant. All the horticulture waste is separately composted at park sites themselves. In addition, there is one 5 TPD bio methanation plant commissioned in Industrial Area Phase I in Chandigarh to target vegetable market waste.

3.3 Biomedical waste

The total quantum of Biomedical Waste generated by Chandigarh in 2020, as published in the Annual Report of Bio-medical Waste, was reported to be 2091.085 tonnes with an average generation rate of 5729 kg/day (BWM Annual Report Chandigarh, 2020). Comprising of 876 Health Care Facilities (HCFs) in total, bedded hospitals were responsible for generating 95% of the BMW while only 4-5% originated from other sources. Annual generation of biomedical waste is provided in Table 90.

Table 90: Year-wise Annual BMW Generation

Year	BMW (Tonnes)
2019	3869
2020	4752
2021	5374

Source: Member Secretary CPCC, Chandigarh

Biomedical waste generated from the city was partially handled by the incineration plant setup at Alliance Envirocare Company Private Limited after disinfection, and remaining waste sent to the hazardous waste disposal site for final disposal as per Hazardous Wastes and Other Wastes (Management, Handling and Transboundary Movement) Rules, 2016. Furthermore, the CPCC has authorized Alliance Envirocare to operate common Bio- medical Waste Treatment Facility (BMWTF) of 7000 kg/day capacity for the collection, transportation treatment and disposal of bio-medical waste generated by the health care facilities in Chandigarh. All the health care facilities have registered themselves with Chandigarh Pollution control Committee for authorization under the Bio-medical Waste Management Rules. Ten other health care facilities (HCFs) have installed effluent treatment plants (ETPs) for liquid waste as a result of the persistent efforts of CPCC.

3.4 COVID 19 Waste

In recent times, along with 513 TPD of MSW, Chandigarh also generates around 4-6 TPD of COVID waste. Chandigarh began quantifying COVID waste as soon as the COVID epidemic began (PGIMER, 2020). COVID waste is classified into four categories in Chandigarh as per CPCB guidelines: yellow, red, blue, and white.

- Yellow bags contain used masks, head cover, shoe cover, disposable linen gowns, non-plastic or semi-plastic overall anatomical waste, soiled waste and discarded medicines,
- Red bags contain used syringes, IV sets, PPEs such as goggles, face shield, splash proof apron, plastic overall, hazmat suit, nitrile gloves and all used plastic PPEs
- Blue bags contain glass and metal waste, and
- White bags contain other wastes (CPCB, 2020).

Table 91 illustrates the different type of COVID-19 waste generated in Chandigarh in different months of 2020.

Table 91: COVID-19 Waste Generation from April 2020 to December 2020

Month	Red	Blue	Yellow	White	Total Waste (Tonnes)
Apr-20	0	0	14207	0	14207
May-20	54	0	39656	0	39710
Jun-20	2592	82	26819	0	29493
Jul-20	5251	118	40365	0	45734
Aug-20	9699	143	60948	3	70790
Sep-20	21554	697	51465	30	73716
Oct-20	14539	814	35969	0	51322
Nov-20	811	419	42579	0	43809
Dec-20	14482	265	36473	0	51220

Source: Chandigarh Pollution Control Committee

According to data provided by the CPCC, in 2020, yellow category waste accounts for 81% of total COVID waste generated since the epidemic began, red category waste amounts for 18 percent, and blue and white category waste accounts for only 1%.

3.5 Plastic waste

The status of plastic waste generation based on the estimates that it is around 7% of total MSW generated has been worked out by CPCC. The data for annual plastic waste generation is presented in Table 92 below.

Table 92: Annual Plastic Waste Generation[2]

Year	Plastic Waste Generation (TPA)
2017	12775.00
2018	11715.40
2019	11497.50
2020	13107.15

Source: (CPCB, 2021)

At present, all the plastic waste collected from households in the UT is brought to the MRF facility for further sorting and there are 7 registered plastic waste recyclers responsible for recycling plastic waste.

3.6 Electronic Waste (E-Waste)

According to CPCC's 2016 inventory, electronic waste constituted a meagre 0.75%, amounting to 1300 MT, in comparison to the entire MSW generated in Chandigarh that year (Chandigarh Pollution Control Committee, 2016). The quantity also included historical e-waste stored in the UT. Similar to the case of Hazardous Waste, the UT has no authorised dismantlers or recyclers. This has led to channelizing of E-waste to the authorised recyclers and dismantlers situated in the adjacent states with increased possibility of leakage into the informal sector. Taking matters seriously, MCC has taken the initiative and set up 4 e-waste recyclers/ dismantlers/ collection points where residents can drop off the unwanted electronics and electrical appliances. The information of the 4 authorized e-waste handlers is tabulated in Table 93 below:

Table 93: E-Waste Handling Facilities Authorized by Chandigarh Administration

S.No	Authorized Dismantler /Recycler/Collection Point	Address
1.	M/s Spreco Recycling	SCO 2901-2, 1st Floor, Cabin No. 3, Sector 22 C, Chandigarh
2.	M/s RAMKY Enviro Engineers Ltd.	Unit Punjab Waste Management Project, Village NIMBUA, PO.

2 No separate mechanism is in place to measure the quantity of plastic waste in the city the below data is based as per the study that the composition of plastic waste in Chandigarh city is 7%.

S.No	Authorized Dismantler /Recycler/Collection Point	Address
		Rampur Sanian, Tehsil. Derabassi, District. Mohali (Punjab) - 140507
3.	Ortech India Corporation	Plot No. 67-B, Industrial Area, Lodhi Majara Baddi
4.	Karo Sambhav Collection Centre	Shop Number 2, Plot Number -51, Raipur Khurd, Ambala-Chandigarh Highway, Chandigarh-160003

Source: (Chandigarh ENVIS, 2021)

This discarded e-waste is then collected and transported to the authorised facilities in the neighbouring states by one Producer Responsibility Organisation (PRO) – majorly handled by Karo Sambhav. The present e-waste generation as reported by DEP is 30.9 MT/year (District Environment Plan for U.T. Chandigarh, 2021).

3.7 Construction & Demolition (C&D) Waste

Chandigarh generates 110 MTPD of Construction & Demolition (C&D) waste. In response to the above generation, the Municipal Corporation of Chandigarh has established a Construction & Demolition Processing Facility of capacity 80 TPD in Chandigarh's Industrial Area (District Environment Plan for U.T. Chandigarh, 2021). PCC kerbs, PCC Channel, PCC Tiles, Paver Block, and other road materials are also produced at the site. The plant reduces in-house construction expenditures by up to 10%, and tipping fees and processing costs are lower than in other Indian cities. A picture of the C&D waste management facility in Chandigarh is shown in Figure 66.

Figure 66: C&D Waste Management Facility in Chandigarh

Source: TERI

As of December 2021, 30, 927 MT of C&D waste has been converted into recyclable products. These products are being sold out to local contractors by MCC or provided for being utilized by public work department. MCC has generated revenue of Rs 1, 92, 54, 437 (Municipal Corporation of Chandigarh, 2021). By manufacturing recyclable sand and aggregates within the city, this helps to reduce the carbon footprint. This increases the production of high-quality, high-value recycled sand and aggregate, which may be utilised to substitute natural resources in a variety of construction applications, such as concrete and asphalt manufacture. MCC is also taking initiatives to sensitize the citizens regarding the handling of C&D waste, its disposal, and dust mitigation measures to be followed during construction. Details of C&D waste management in Chandigarh over the past few years has been tabulated in Table 94 below:

Table 94: Annual C&D Waste handled in Chandigarh U.T.

S.No.	Year	Material Received(TPA)	Material Processed(TPA)
1	2018 (July – December)	1317.23	278.95
2	2019	11247.41	12027.19
3	2020	25121.66	18620.86

Source: Municipal Corporation of Chandigarh

4. Impact

Chandigarh has dropped 8 places, now ranked 16th in the Swachh Sarvekshan rankings for "Cities with population more than 10 lakh", which was released on November 18th, 2021 (Swachh Survekshan, MoHUA, 2021). This year, the city's overall rank was 66 out of the 4, 320 cities that were studied in various areas. Chandigarh's garbage free cities (GFC) rating was reduced from three to one star. In order to process the waste, MCC is attempting to improve the solid waste processing plant's technology, operation and maintenance. MCC's general house had terminated the contract with Jaypee and directed MCC officials to acquire the possession of the plant and its operations in March 2020 on the grounds of ineffectiveness. However, since accession, encountering technical operational difficulties has limited the functioning of the integrated waste processing facility (Centralized compost plant and RDF processing facility). Owing to the compromised efficacy of the plant, a considerable fraction of the waste is been redirected to the dumping ground unprocessed. Currently working at only around 10% of its full capacity, the challenges of processing waste in a city that produces 513 TPD of MSW have amplified.

5. Responses

5.1 Hazardous waste Management:

Presently the Hazardous waste is being directed to a collection point at the landfill site. MCC is in process of collaborating with M/s Ramky Enviro Engineers Pvt. Ltd., TSDF operator in Nibua, Punjab, to manage and process the hazardous waste. In addition to the aforementioned TSDF, CPCC has already licensed 9 Hazardous Waste recyclers and allotted the responsibility of collection, transportation and possibly treatment of hazardous waste from across the UT (Chandigarh ENVIS, 2020).

5.2 Municipal Solid Waste Management:

Waste to energy plant installed in 2008 at Dadumajra, Sec-25 west Chandigarh has capacity to process 500 TPD of waste (300 TPD to compost and 200 TPD of MSW to 60 TPD Refuse Derived Fuel (RDF). The processed RDF used for their own hot air generator and the rest is transferred to industries. Dadumajra Waste Processing Plant is not functioning in full strength and MCC has taken over it and working with the technical experts to make it functional to reduce the amount of MSW on the landfill site. At the present the compost plant is working with limited capacity of 120 TPD of MSW. In addition, a 5 TPD biomethanation plant is commissioned in Industrial Area Phase I to target vegetable market waste. The landfill site is spread over an area of 45 acres, 25 acres is capped, and out of this 8.28 acres of land is already converted into sanitary landfill facility, where non- recyclable waste is dumped every day. To avoid any incidents, the SLF is properly fenced and provided with boundary wall all around. As per the siting requirements, the SLF is 0.2 km, 8 km, 4 km, 10 km, and 8 km away from the nearest habitat, water body, state/national highway, airport, religious site, or historical landmark, respectively. Approximately 300 to 400 TPD of solid waste is placed on the landfill site, which is covered as per the provisions of MSW Rules.

For door-to-door collection and delivery of segregated waste, MCC has engaged 489 GPS- equipped segregated vehicles having partitions for wet, dry, and domestic hazardous waste. MCC has also installed a colour-coded three-bin system for collecting wet (green bin), dry (blue bin), and domestic hazardous waste (black bin) in commercial locations.

Apart from these interventions, bioremediation of legacy waste (earlier dump site) has been allotted to M/s Chandigarh Smart City Limited and around 38–40% MSW has been processed. MCC is daily monitoring the progress of work. To expedite the process, recently, two more waste processing lines have been made operational in addition to already operating three lines. Bioremediation of entire waste is expected to be completed by March 2023. Dumping of waste has stopped at the legacy waste site. Post- bioremediation of the legacy waste, 20 acres of the land will be reclaimed for alternate uses.

5.3 Biomedical Waste Management:

In addition to managing biomedical waste through CWTFs, in response to CPCB's guidelines for managing COVID waste, CPCC has set up infrastructure for the processing, treatment, and disposal of waste generated during COVID-19 waste treatment, diagnosis, and quarantine in order to combat the pandemic. The Chandigarh administration responded by establishing quarantine centres/camps, isolation wards, sample collecting centres and laboratories, and common biological waste treatment and disposal facilities, all of which are covered under the BMW Management Rules, 2016. Existing standards have been updated three times to address and incorporate actions related to the segregation of ordinary solid waste and biomedical waste.

5.4 Plastic Waste Management:

Much ahead of National Ban on Single-Use-Plastics (SUPs) in force in the country from 1st July 2022, the Chandigarh administration announced a ban on the use of SUP in the city in September 2019 itself. Plastic, Thermocol and Styrofoam items like plates, cups, party bloopers, plastic ribbons, and many such single-use plastics were outlawed under the September 2019 ban.

List of banned items include: SUP cutleries and containers, Thermocol/Styrofoam cutlery, plastic sachets, single-time use pens, plastic mineral water pouch, use of plastic/thermocol items for decoration, plastic

sticks, single-time use razors, industrial packaging, etc. An image of the banned items as communicated by Chandigarh Administration is displayed in Figure 67 below:

Figure 67: Banned SUP items in Chandigarh

Source: Chandigarh ENVIS

The notification suggest that the ban extends through stakeholder including shopkeepers, vendors, whole-sellers, or retailers, are not allowed to manufacture, store, import, sell, and transport, supply, or use polythene/plastic carry bags, according to the September 2019 notification.

In order to effectively manage the Plastic Waste, MCC has drafted "Chandigarh Plastic Waste Management Bye-Laws 2020. Chandigarh administration has also implemented SUP ban as discussed earlier (Chandigarh Plastic Waste Management Bye-Laws, Municipal Corporation Chandigarh, 2020).

In addition, the UT administration has also come out with Action Plan to manage plastic waste. For implementing the Action Plan, State Level Monitoring Committee has been constituted in compliance with the Rule No. 16(1) of the Plastic Waste Management (Amendment) Rules, 2018, responsible for effective monitoring of implementation of the Plastic Waste Management (Amendment) Rules, 2018 Rules. Special Task Force has also been constituted for preparation of Comprehensive Action Plan for mitigation of plastic pollution and phasing out of single use plastics.

5.5 E-Waste Management:

As the generation of E-waste is very low in the UT, it is collected, segregated, dismantled, recycled, treated and disposed through authorised E-waste recyclers from the other states of Punjab and Himachal Pradesh as there are no dismantlers or recyclers in Chandigarh.

5.6 Construction & Demolition Waste Management:

To manage C&D waste effectively, MCC has started a C&D waste processing unit in the year 2019. Along with that MCC has also prepared a C&D Waste Management Policy, 2021 draft. The new policy's objective is to make sure that the C&D Waste Management Rules, 2016, are implemented, and to impose fines to enforce laws, penalties, and other regulations in accordance with certain incentives to promote the reuse of recycled/re- processed waste in order to avoid mining and save the environment. It also includes waste generators' duties, processing fees, and charges paid by waste generators for construction work (C&D Waste Management Policy, Municipal Corporation Chandigarh, 2021).

6. Notable Initiatives in the city

The Municipal Corporation of Chandigarh has taken the following initiatives:

- Chandigarh Smart City Limited has allotted a project for SWM vehicle tracking and supervisory control and data acquisition to hold employees and workers accountable under technical surveillance. In this project, a control room will be established by dividing the city into 10 zones, with 10 people managing each zone on a regular basis. A mobile application will be introduced for residents to know the exact timing of the arrival of garbage lifting vehicles at their respective areas.
- Abhinav Bindra, Beijing Olympics gold medallist chosen as the Brand Ambassador of Chandigarh's Swachh Sarvekshan 2022. He stated that he is committed for bringing in behavioural change among the citizens.
- According to the new Construction & Demolition Waste Policy, the illegal dumping of C&D waste has been penalized with a penalty of Rs 5500 since December 2021.

7. Recommendations and way forward

7.1 Improving source segregation:

The segregation of municipal solid waste at the source is critical for managing waste and improving levels of recycling and scientific disposal in the city. Due to a lack of segregation, mixed waste ends up in landfills, causing adverse health consequences. As reported by CPCC, in Chandigarh, around 80% waste is received in a segregated manner (CPCC, 2020). The rest of the waste ends up littered around or end up in landfill every day. It also adds to the Municipal Corporation's workload by requiring more people for segregation at disposal sites. Source segregation level can be improved by setting up a campaign towards segregating waste, this could be linked with an effective IEC campaign with a catchy phrase to empower stakeholder to take action in this regard. The programme could be undertaken to spread awareness among general public on the issue of source segregation.

7.2 Strengthening scientific processing sites:

Since the waste processing site in Chandigarh are either not yet functional at full capacity, or require a higher waste handling capacity in order to properly treat the waste generated within Chandigarh. This gap has impacted the management of considerable amounts of waste and its scientific disposal. Despite a major portion of the waste being treated, a small portion of it is being redirected to dump yard without any treatment, causing environmental concerns. Hence, there is a requirement to operationalize processing plants (composting and RDF processing) as per the waste generation requirements to ensure scientific waste processing and disposal.

7.3 Effective Management of Plastic waste:

Even though the city of Chandigarh has banned the use of SUPs, the volume of plastic waste generated requires an upgrade in management, as well as strict penalties in the event of non-compliance, as well as informing people about the alternatives available. The Plastic Waste draft Byelaws have been notified in Chandigarh. However, their effective implementation is needed to ensure its success.

7.4 Collection and scientific disposal of E-waste:

There is a requirement for appropriate and channelized collection and management of e- waste in the city with coverage extending to all relevant waste generators. In 2014, Chandigarh Administration released Guidelines for Disposal of Obsolete/Unusable IT and Electronics Equipment which laid down specific guidelines (Chandigarh Administration, 2014). However, they should also come up with an updated policy for e-waste management, covering the entire life cycle, as its improper management is one of the major environmental concerns.

7.5 Assessment of waste management trends data compilation:

It is observed that for many solid waste streams (e-waste and MSW) especially on waste processing and disposal is consistent and not reported on regular basis. Collecting representative data and analysing it can become an important tool in long-term waste management planning and adopting strategies for reducing waste. It also allows the authorities to benchmark their performances to identify the areas in waste management where they are lagging and need to find solutions with proper planning. The compilation of waste data allows regulators to have a better understanding of the types of waste that end up in landfills, allowing them to target specific waste streams in order to minimize their environmental impact.

3

ENVIRONMENTAL PROTECTION AND RESOURCE MANAGEMENT EXPENDITURE

BACKGROUND

Environmental Protection and Resource Management Expenditure measures the efforts towards prevention, reduction and elimination of pollution and/or any other degradation of environment resulting from the production or consumption of goods and services. It covers the spending by the residents of the country such households, corporations and governmental organisations on environment protection services.

The scope of the environmental protection is defined according to the Classification of Environmental Protection Activities which distinguishes 9 different environmental domains such as; 1) protection of ambient air and climate; 2) waste water management; 3) waste management; 4) protection and remediation of soil, ground water and surface water; 5) noise and vibration abatement; 6) protection of biodiversity and landscapes; 7) protection against radiation; 8) environmental research and development; and 9) other environmental protection activities. Environmental protection is an action or activity which involves the use of labour, manufacturing techniques and practices, information networks or products where the main purpose is to collect, treat, reduce, prevent or eliminate pollutants and pollution or any other degradation of the environment resulting from the operating activity of the environment (Statistics Norway, 2014).

Resource management expenditure is defined as economic resources aimed at preservation and maintenance of the stock of natural resources and hence safeguarding depletion of resources. The expenditure can be classified according the classification of resource management activities such as; 1) management of water; 2) management of forest resources; 3) management of wild flora and fauna; 4) management of energy resources; 5) management of minerals; 6) research and development activities for resource management and other resource management activities (Statistics Norway, 2014).

The general government sector is defined as all residential institutional units which are non-market producers whose output is intended for individual and collective consumption. The main function of the governmental units is to organise or redirect the flows of money, goods and services or other assets among corporations, among households and between corporations and households and to produce goods and services to satisfy household needs to collectively meet the need of the whole society. On the other hand, non-profit institutions serving households make up an institutional sector which are mainly not financed and controlled by the government and provides goods and services to households for free or at prices that are not economically significant (Eurostat, 2021).

In Chandigarh, main departments such as administration, police, education, transport, health, rural development, engineering, electricity, sports, estate offices, industries, tourism and excise are with the Chandigarh Administration headed by Administrator, U.T whereas certain works such as water supply, storm, drainage, internal roads, sanitation, fire wing, enforcement, health were transferred to Municipal

Corporation to manage the services falling in the jurisdiction of Chandigarh Municipal Corporation. The budget allocation in Chandigarh is largest for the infrastructure sector followed by law and order, education, health, administrative, transport and social welfare in descending order.

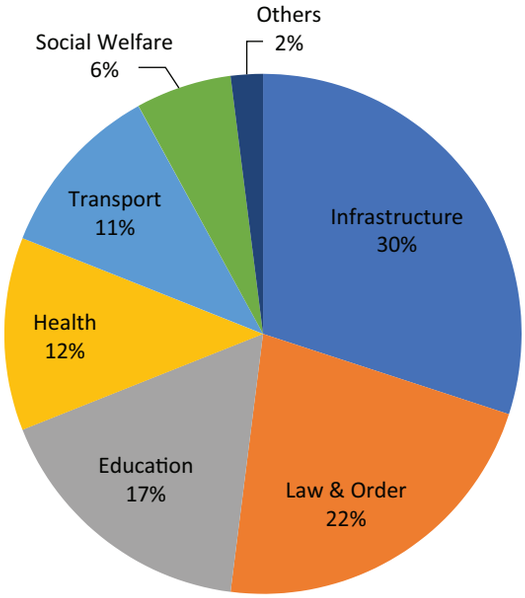

Figure 68: Budget Allocation in Chandigarh

Source: (Municipal Corporation Chandigarh, 2022)

The governmental schemes are categorised under two categories namely a) central sector schemes and b) centrally sponsored scheme based on funding and modality for implementation. The central schemes are funded completely by the central government based on the subjects mentioned in the union list. In addition, central ministries some schemes are directly implemented in the states/ UTs where the resources are not transferred to states. However, under centrally sponsored schemes there is a financial participation both by the centres and states based on the percentage contribution.

The chapter discusses expenditure incurred by Chandigarh Administration and Chandigarh Municipal Corporation undertaken by the government through its various departments by the means of schemes/ initiatives for building a resilient and sustainable city for the people of Chandigarh.

1. Municipal Chandigarh Corporation

The Municipal Chandigarh Corporation is the local governing authority of Chandigarh. There are several departments that comes under the ambit of MCC such as Public Health, Transportation, Health and Sanitation Department, Horticulture Departure amongst others. The prime responsibilities of the civic body are to ensure cleanliness and sanitation in the city, illumination of street lights, maintenance of parks and sewage disposal. The capital expenditure is the Chandigarh's spending on the infrastructure and development works whereas the revenue expenditure involves the expenses incurred salaries, wages, subsidies, loan interest etc.

The table 95 below presents the expenditure (capital and revenue) abstract for Chandigarh for year 2019 and 2020.

Table 95: Expenditure (capital and revenue) abstract for Chandigarh (Fig in lacs)

Major / Detailed Head of Account	Capital Expenditure		Revenue Expenditure	
	2019	2020	2019	2020
Public Health	1692.28	1025.68	15643.24	15429.90
Building and Roads	4027.64	2860.90	3284.12	3422.62
Horticulture and Electrical	266.90	57.91	7630.00	5479.53
Transport Section	0.00	110.27	951.25	1109.99
Total	**6429.97**	**4394.66**	**45638.16**	**47318.54**

Source: Municipal Corporation Chandigarh, 2020

The segment below presents the capital expenditure for year 2019 and 2020 in respect of public health department, buildings and roads department, horticulture and electrical department and the transport section.

Table 96: Capital Expenditure MCC (Fig in lacs)

S.No	Head of Account	2019	2020
1.	**Public Health**		
	Aug of city W/S system including Ph-V&VI, VII & VIII	1001.34	318.13
	Urban Development		
	Sewage and sewage treatment plant	302.11	317.91
	Storm water drainage	42.20	0.11
	Civic works/ Public Toilets	26.08	0.00
	N.R. buildings	0.00	0.00
	Minor Irrigation(Fountains/Water features)	38.06	0.00
	Providing Basic Amenities/Services to economically weaker sections	260.52	315.48
	Infrastructural facilities in villages under MCC	21.97	74.04
	Total	**1692.28**	**1025.68**
2.	**Building and Roads**		
	Improvement of Roads, parking places and infrastructural facilities	3154.70	1951.85
	Civic works	463.49	263.18
	Non-residential buildings	201.14	594.21
	Providing basic amenities to economically weaker sections	25.37	13.04
	Infrastructural facilities in villages under MCC	143.70	38.62
	Swachh Bharat Mission	39.24	0.00

S.No	Head of Account	2019	2020
	Residential buildings	0.00	0.00
	Motor and vehicles	0.00	0.00
	Construction of Sehaj Safai Kendra	0.00	0.00
	Construction of Shed for Sanitation Assistant/Helpers	0.00	0.00
	Total	-	**0.00**
3.	**Horticulture and Electrical**		
	Electrification	37.32	2.07
	Landscaping/Horticulture	229.58	55.84
	Total	**266.90**	**57.91**
4.	**Transport**		
	Purchase of vehicles/machineries	0.00	110.27
	Total	0.00	110.27

Source: Municipal Corporation Chandigarh, 2021

2. Public Finance

The purview of the public finance is to be considered three fold, consisting of governmental effects on a) the efficient allocation of resources; b) the distribution of income among the citizens and c) the stability of the economy.

The table 97 and 98 below presents the expenditure incurred both on revenue and capital account under various head of accounts in past 5 years.

Table 97: Capital Expenditure MCC (Rs.'000)

Head of Account	2015-16	2016-17	2017-18	2018-19	2019-20
Medical & Public Health	2844589	3292007	3663821	4201771	4453100
Water Supply & Sanitation	457607	509677	559379	626143	753700
Housing	293590	287915	312200	391699	302800
Urban Development	3302394	4387632	4402994	3430826	5733200
Soil & Water Conservation	1931	1834	3162	40	1000
Animal Husbandry	37087	40005	48061	49859	53300
Fisheries	2938	2908	3162	3204	3200
Forestry and wild life	155422	157059	212436	266154	297800
Power	7215984	7395369	7964416	8940010	9107800
New and Renewable Energy	115990	121437	124077	60166	57400

Head of Account	2015-16	2016-17	2017-18	2018-19	2019-20
Road & Bridges	10600	10744	8089	6691	7000
Road Transport	2018451	2101863	2203287	2169319	2499500
Ecology & Environment	15437	18081	17228	18519	24000
Scientific Research	13842	14842	10847	8615	11400

Table 98: Expenditure on Capital Accounts (Rs'000)

Head of Account	2015-16	2016-17	2017-18	2018-19	2019-20
Capital Outlay on Medical and Public Health	906410	694987	579088	782499	3200
Capital Outlay on Water Supply and Sanitation	27443	37000	19500	6202	321100
Capital Outlay on Housing	196752	334823	232144	305606	1929900
Capital Outlay on Urban Development	1320930	3727833	5444855	1992736	7300
Capital Outlay on forestry and wildlife	5400	734	1000	218000	0
Capital Outlay New and Renewable Energy	162728	201081	133018	265972	325300
Capital Outlay on Soil and Water Conservation	2978	6525	3000	53000	3800
Capital Outlay on Animal Husbandry	878	1999	3199	2200	3900
Capital Outlay on Other Scientific and Environmental Research	12418	2984	3600	6603	7000

Source: (The official website of Chandigarh Administration, 2020)

3. Department of Forest and Wildlife, Chandigarh Administration

The department of forest and wildlife performs multifarious activities for improving the green cover of the U.T. Chandigarh, preserving and protecting the wildlife in Sukhna Sanctuary, City Bird Sanctuary, all other parts of U.T Chandigarh and creating awareness amongst the people of Chandigarh regarding the protection of flora and fauna and thereby preserving bio-diversity of the region and upgrading the environment and quality of life.

The table 99 below projects the expenditure incurred by the department of forest as total major head for forestry and wildlife.

Table 99: Expenditure under Forestry and Wildlife

Year	Budget (Rs.)	Expenditure (Rs.)	Total (Rs.)
	Previous	Current	
2016	11, 32, 40, 426	59, 574	11, 33, 00, 000
2017	3, 56, 64, 156	36, 08, 530	3, 92, 72, 686
2018	20, 90, 92, 803	43, 43, 137	21, 34, 35, 940

Year	Budget (Rs.)	Expenditure (Rs.)	Total (Rs.)
	Previous	Current	
2019	24, 28, 97, 537	4, 50, 56, 496	28, 79, 54, 033
2020	25, 86, 45, 753	4, 98, 70, 618	30, 85, 16, 371

Source: Department of Forest Chandigarh, 2022

4. Chandigarh Smart City Corporation Limited

A Special Purpose Vehicle in the name of Chandigarh Smart City Limited was formed in 2016 for designing and execution of projects being funded by the Indian Smart Cities Mission. Chandigarh Smart City has undertaken various projects pertaining to basic infrastructure such expansion of Daddu Majra sanitary landfill site, mining of legacy waste and recovery of land at Daddu Majra dumping ground, sewage treatment facility (augmentation of existing STPs) component, SCADA for TT water, setting up of material recovery facility cum garbage transfer station, procurement of garbage hopper tippers for door to door collection of waste, GPS based vehicle tracking system for municipal solid waste vehicles and among others for comprehensive institutional, physical, social and economic infrastructure.

Table 100: Cost incurred and allocated under latest projects of Chandigarh Smart City (In crores)

Category	Name of project	Allocated Amount	Total Cost
Public Health and Waste Solid	Mining of Legacy Waste and Recovery of Land at Daddu Majra Dumping Ground	40	33.98
Management	Expansion of Daddu Majra Sanitary Landfill Site	17.85	12.41
	Procurement of 35 no.s garbage hopper for door to door collection	2.42	-
	Rehabilitation upgradation of existing sewage treatment plant at Diggain	499.39	283.67
	Rehabilitation upgradation of existing sewage treatment plant at Raipur Kalan and Raipur Kurd	159.90	123
	Rehabilitation upgradation of existing sewage treatment plant at BRD and Dhanas	125.12	74
ICT Initiatives	Provision of SCADA for Solid Waste Management for Route Management, Efficiency of Collection, Mobile Application, Daily management of solid waste	8.04	5.87

Source: (Chandigarh Smart City Corporation Limited, 2020)

5. Department of Environment, Chandigarh Administration

The key responsibility assigned to Department of Environment is to implement schemes with an objective of creating environmental education and awareness by undertaking environment awareness/action based programmes /activities in association with eco- clubs/environmental societies established in the school/colleges or any local environmental NGOs/institutes in the UT. The department of environment also conducts independent research and development in the field of environment improvement studies to have repository of data.

Under the Swachhta Action Plan 2020, Chandigarh Administration has performed various awareness campaigns/ programmes such as My Green Pledge and Action under Swachh Bharat Abhiyaan, Street Plays on Air pollution and Swachh and Green Diwali, Poster making competition etc to increase awareness and educate people of the city.

The table 101 below presents the expenditure incurred by the department of Environment, Chandigarh Administration under various campaigns/ programs schemes in last three years:

Table 101: Schemes/Programs/Initiatives by Department of Environment, Chandigarh

Year	Scheme/Program/Initiative	Expenditure Incurred
2019	Say No to Single Use plastics	Rs.1, 00, 000/-
	Ad film (on say no to single use plastics)	Rs.1, 95, 800/-
	Pictorial Guide (Ban on Single Use Plastic & Thermocol items in UT Chandigarh)	Rs.55, 450/-
	Pamphlets/Leaflets (Ban on Single Use Plastic & Thermocol items in UT Chandigarh)	Rs.1, 42, 800/-
	Rally & Street Plays on Say No to Single Use Plastic	Rs.25, 000/-
	Swachh Chandigarh-Buy Nothing Day	Rs. 50, 000/-
	Swachhta Abhiyan (cleanliness drives) and Migratory Bird Watching	Rs.1, 50, 000/-
2020	Muppet shows	Rs.55, 000/-
	My Green Pledge & Action	Rs. 1, 00, 000/-
	Street Plays on air Pollution & Swachh and Green Diwali and say no to cracker	Rs.50, 000/-
	Jingle about the ill effects of fire crackers and controlling noise and air pollution	Rs.29, 280/-
	Eco-Friendly & Clean City Green City- Diwali	Rs.60, 000/-
2021	Bicycle rally to promote the message of "Swacch Bharat Abhiyan/Clean and Green Chandigarh	Rs.50, 000/-
	Launching mobile application namely carbon watch to assess carbon footprint	Rs, 2, 43, 080/-

Source: Department of Environment, Chandigarh 2022

6. Chandigarh Housing Board

Chandigarh Housing Board (CHB) predominantly looks after the promotion of housing. The prime objective of the Housing Board is to provide reasonably priced, good quality housing for the shelter residing in the union territory of Chandigarh. Till March 2019, the Chandigarh Housing Board has constructed a total of 67565 houses of various categories. It has been estimated that about 25% of the population of Chandigarh is living in CHB houses.

The table 102 presents the working of the various housing schemes in Chandigarh.

Table 102: Working of various Housing Schemes in Chandigarh (Expenditure (Rs. In lacs)

S.No	Name of the Scheme	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
1	Middle Income Group Housing Scheme.	3864.73	1646.19	133.1	294.47	1727.56	1698.67
2	Low Income Group Housing Scheme.	146.93	332.46	48.06	-	-	5.52
3	Working of the various Housing Schemes in Chandigarh by Housing Board (House Completed). (In No.)	-	-	-	-	-	-
i)	Middle Income Group & High Group Income Housing Scheme.	1743.00	-	-	-	368.09	-
ii)	High Income Group Housing Scheme.	814.84	325.22	121.27	-	-	-
iii)	Economically Weaker Section Housing Scheme	179.91	29.62	-	-	86.43	-
iv)	Small Flat	969.00	4824.7	637.81	84.99	106.07	83.32
4	4 Common Expenses of Services to 2108 flats in Sector: 63, e.g. street lights	-	1074	166.22	37.97	100.39	31.78
5	5 Development work in small flats of 8448 Dhanas and 1696 Mauli Jagran	-	289.54	87.68	industrial	1155.54	149.04

Source: (The official website of Chandigarh Administration, 2020) (Chandigarh Housing Board, 2019)

4

EXTREME EVENT PREPAREDNESS AND DISASTER MANAGEMENT

INTRODUCTION

As defined by the United Nations Office for Disaster Risk Reduction (UNDRR) (UNDRR, 2022), *Disaster* is a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts. *Disaster damage* occurs during and immediately after the disaster. This is usually measured in physical units (e.g., square meters of housing, kilometres of roads, etc.), and describes the total or partial destruction of physical assets, the disruption of basic services and damages to sources of livelihood in the affected area. *Disaster impact* is the total effect, including negative effects (e.g., economic losses) and positive effects (e.g., economic gains), of a hazardous event or a disaster. The term includes economic, human and environmental impacts, and may include death, injuries, disease and other negative effects on human physical, mental and social well-being.

For the purpose of the scope of the Sendai Framework for Disaster Risk Reduction 2015- 2030 (para. 15), the following terms are also considered:

- Small-scale disaster: a type of disaster only affecting local communities which require assistance beyond the affected community.
- Large-scale disaster: a type of disaster affecting a society which requires national or international assistance.
- Frequent and infrequent disasters: depend on the probability of occurrence and the return period of a given hazard and its impacts. The impact of frequent disasters could be cumulative, or become chronic for a community or a society.
- A slow-onset disaster is defined as one that emerges gradually over time. Slow- onset disasters could be associated with, e.g., drought, desertification, sea-level rise, epidemic disease.
- A sudden-onset disaster is one triggered by a hazardous event that emerges quickly or unexpectedly. Sudden-onset disasters could be associated with, e.g., earthquake, volcanic eruption, flash flood, chemical explosion, critical infrastructure failure, transport accident.

Disasters can be natural or man-made. The natural disasters include earthquakes, floods, droughts, storms, fires, epidemics, landslides etc. whereas man-made disasters are industrial accidents, transport-related tragedies, and acts of terrorism. The number and scale of disasters triggered by natural hazards are increasing throughout the world. The risk and vulnerability of Chandigarh to these disasters and the management strategies have been discussed in the next sections.

2. Past incidences of natural disasters

The area of Union Territory of Chandigarh is 114 sq. km. It is vulnerable to earthquakes as it lies in seismic zone IV as per IS 1893 Part-1 (2016) because of its proximity to the Himalayan Frontal Thrust (HFT) zone. The data on occurrences of natural disasters such as cyclone, drought, earthquake, fire, flood, hail, hurricane, landslide, lightning, tornado, wildfire, and volcano has been collected by the Chandigarh Administration from 2003 to 2020. Based on the data (Table 103), Chandigarh experienced a cyclone in 2013 and nine fire incidents during the aforesaid time period. The incidents of deaths due to natural causes are presented in Table 104. As seen from the data available for the years 2017, 2018, and 2019, the highest number of deaths occurred in 2018.

Table 103: Incidences of natural disasters in Chandigarh during 2003 to 2020

Year	Disaster Type	Affected Districts	Number of Population Affected
2003	Fire	1	9
2004	Fire	1	16
2005	Fire	1	1
2006	Fire	1	18
2007	Fire	1	27
2008	Fire	1	31
2009	Fire	1	41
2010	Fire	1	16
2013	Cyclone	1	1

Source: ISBIED, 2010

Table 104: Incidences of deaths due to natural causes

S.No	Natural Event	2017	2018	2019
1	Avalanche	-	-	-
2	Lightning	-	2	2
3	Heat stroke	-	-	-
4	Flood	-	-	-
5	Cold and Exposure	1	1	-
6	Cyclone/Tornado	-	-	-
7	Starvation/Thirst	-	-	-
8	Earthquake/landslide	-	-	-
9	Epidemic	-	-	-
10	Torrential Rains	-	-	-
11	Other Natural Causes	-	45	-
12	Total	1	48	2

Source: Statistical Abstract 2020

3. Risk and Vulnerability Analysis

Risk and Vulnerability Analysis (RVA) is an essential tool for any disaster management plan. In the Chandigarh Disaster Management Plan – (CDMP 2031) (Chandigarh Master Plan 2031, 2022), a conscious effort has been made to include a preliminary RVA which will help identify people, property and resources that are at risk of damage, injury or loss during disasters. Such information would aid in prioritizing the precautionary measures.

The key natural and man-made hazards that have been identified include earthquake, terrorist attack, fire, chemical spillage, flood, accidents, and road blockade. Based on the hazard analysis, the areas which are prone or vulnerable to disaster have been mapped in Figure 69 and described in Table 105.

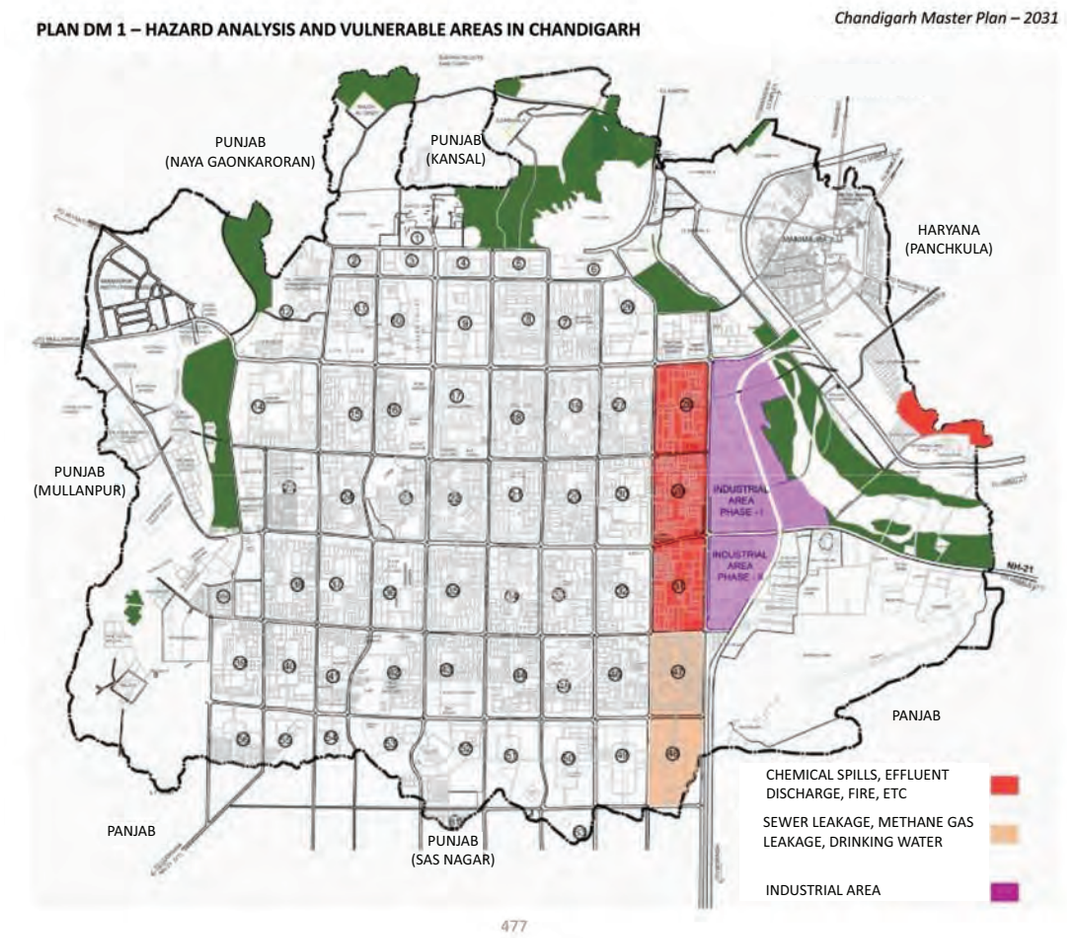

Figure 69: Areas vulnerable to disasters

Source: Chandigarh Master Plan 2031

Table 105: Potential areas that are prone to disasters

S.No.	Industrial Location	Nature of Hazard	Vulnerable Areas
1	Industrial Area – Phase –I	Chemical spills, effluent discharge, fire, etc.	Sector 28, 29, Sukhna Choe, Reserved Forest
2	Industrial Area – Phase -II	Chemical spills, effluent discharge, fire, etc.	Sector 31, Karsan Rehabilitation Colony

S.No.	Industrial Location	Nature of Hazard	Vulnerable Areas
3	Industrial Area – Phase -III	Chemical spills, effluent discharge, fire, etc.	Mauli Jagran rehabilitation colony
4	Sewage Treatment Plant	Sewage leakage, methane gas leakage, drinking water pollution etc.	Sector 47 & 48, Karsan rehabilitation colony

Source: *Chandigarh Master Plan 2031*

3.1 Earthquakes

The seismicity in Chandigarh region is due to movements along several faults, thrusts as well as lineaments. The Himalayan Frontal Thrust, the Main boundary Thrust, the Krol, the Giri, Jutogh and Nahan thrusts lie in this region. Besides that, there are scores of smaller faults, like the Kaurik Fault which triggered the 1975 earthquake. The Himalayan earthquakes have their epicentres very close to any of the terrain bounding thrusts i.e. Main Central Thrust (MCT), Main Boundary Thrust (MBT) or Himalayan Frontal Thrust (HFT). Due to its location it weathers dozens of mild earthquakes every year. Large earthquakes have occurred in all parts of Himachal Pradesh, the biggest being the Kangra Earthquake of 1905. There were two more big quakes, but they were not nearly as powerful as the 1905 jolt. The first was in 1906, a 6.4 near Kullu and the second was a 6.8 in Lahual-Kinnaur Spiti in 1975 along the Indo- China Border. The area is also vulnerable to possible future large earthquakes in the Central Himalayas. Number of important structures and monuments of this moderately populated city could be prone to damage due to an earthquake of considerable magnitude. The seismic hazard studies in the recent past also indicate Chandigarh in the high hazard zone as shown in Figure 70 (Mittal, Dharmaraju, & Deviel, 2008). According to GSHAP (Global Seismic Hazard Assessment Program) also, these areas would expect to have maximum peak ground acceleration (PGA) of 0.08g to 0.32g. The seismic effects in this zone vary from site to site depending on the geological, geomorphological and geotechnical conditions (Bhatia, Kumar, & Gupta, 1999).

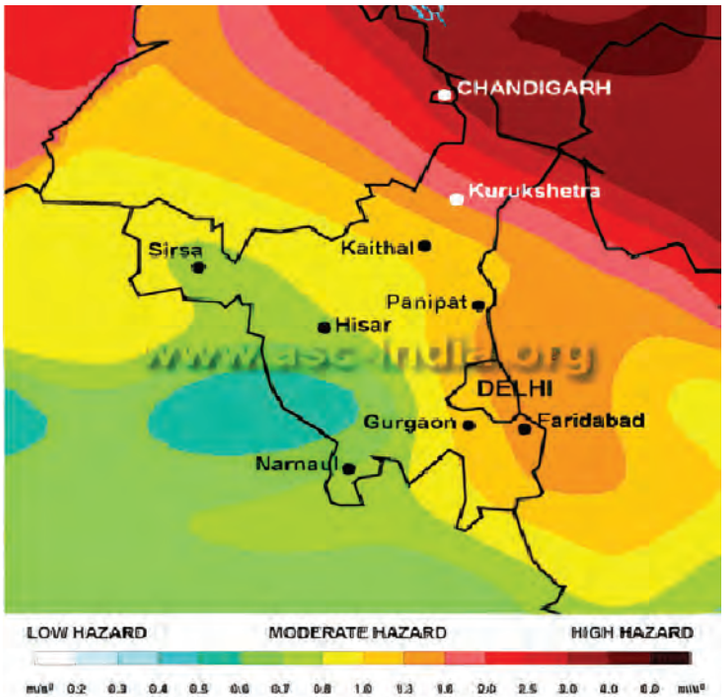

Figure 70: Seismic hazard of Chandigarh

Source: (Mittal, Dharmaraju, & Deviel, 2008)

Using the earthquake data distributed over 32 years (1974 to 2005), a study was done (Mittal, Dharmaraju, & Deviel, 2008) to compute the mean return periods and probability of occurrence of earthquakes. Based on these computations, the predicted yearly numbers and return period for Chandigarh region are shown in Table 106.

Table 106: Predicted yearly numbers and return period for Chandigarh region

Magnitude (M)	Yearly expected number of earthquake (Nm)	Mean return period (Tm)
4.0	3.754	0.266 years
4.5	1.564	0.639 years
5.0	0.651	1.534 years
5.5	0.271	3.684 years
6.0	0.113	8.844 years
6.5	0.047	21.232 years
7.0	0.019	50.970 years

Source: Mittal, Dharmaraju, & Deviel, 2008

Further, the possible seismic hazards in Chandigarh were evaluated by probabilistic seismic hazard analysis (PSHA), wave amplification analysis and liquefaction potential assessment by Puri and Jain (2018). The results show that the region can experience strong ground motions due to earthquakes in Himalayan thrust system. The expected PGA with 10% probability of exceedance is 0.28g. The average wave amplification factor for the analysed sites was observed as 1.3. It was found that many areas in the city are prone to earthquake induced liquefaction (Table 107). The results of this study can be used for upcoming design and construction works in the city (Jain & Puri, 2018).

Table 107: Liquefaction potential index (LPI) for various sites in Chandigarh city

Sites	Borehole Depth (m)	PGA Soil (g)	LPI	Severity
Village Sarangpur	9	0.242	5.0	Moderate
Village Mauli Jagram	6	0.241	20.16	Major
Village Manimajra	9	0.248	25.48	Major
Village Maloya	10	0.218	5.58	Moderate
Village Kaimbwala	9	0.235	35.45	Major
Sector 9	15	0.244	20.61	Major
Sector 10	12	0.246	0	None
Sector 11	9	0.247	18.78	Major
Sector 15	20	0.238	22.52	Major
Sector 17	12	0.238	4.52	Minor
Sector 18	9	0.238	17.19	Major

Sites	Borehole Depth (m)	PGA Soil (g)	LPI	Severity
Sector 24	9	0.230	39.94	Major
Sector 28	9	0.237	26.09	Major
Sector 31	15	0.225	6.26	Moderate
Sector 32	9	0.228	2.78	Minor
Sector 33	21.5	0.225	46.83	Major
Sector 35	13	0.225	5.33	Moderate
Sector 37	7.4	0.224	9.2	Moderate
Sector 38	16	0.226	10.5	Moderate
Sector 39	9	0.221	34.17	Major
Sector 42D	9	0.221	47.26	Major
Sector 43	9	0.222	23.64	Major
Sector 45	9	0.220	38.25	Major
Sector 46	9	0.222	4.02	Minor
Sector 47	9	0.218	3.92	Minor
Sector 48	25	0.213	14.45	Moderate
Sector 50B	9	0.216	27.15	Major
Sector 52	20	0.215	27.21	Major
Sector 54A	9	0.215	20.28	Major
Sector 56	13.4	0.215	7.7	Moderate
Village Dhanas	15	0.235	27.17	Major

Source: Jain & Puri, 2018

3.2 Water logging as likely impact of climate change

The change in precipitation patterns in the region include an increased intensity of heavy and very heavy rainfall events that will be concentrated within short time spans. Such instances generate very heavy runoff rates that cause water logging and flood like conditions in low-lying regions (SAPCC, 2017). The elevation of the UT ranges from 304- 365 metres above sea level, with an average elevation of about 321 MSL. The low-lying areas in the UT are largely concentrated in the southern part with many of them getting flooded during periods of heavy rainfall (Chandigarh Administration, 2022).The repeated occurrence of water logging in the low-lying areas has also resulted in an increase in the soil salinity of those areas. While the UT has 100% coverage of the city with storm water drainage, the capacity of these was designed for 12 mm/hour, exceeding which results in situations. While a major reason is that of inadequate capacity of the existing drainage network, another factor is the overflowing of the shallow aquifers in the region that are untapped due to issues in their quality. Such aspects need to be taken into consideration while addressing this issue (SAPCC, 2017).

Water logging can adversely affect the quality of both surface and groundwater in the region. The city's storm water drainage system is not sufficient to carry the increased load of run off that has been witnessed recently. This results in the drains overflowing and thereby causing sewage water to mix with rainfall run off making the water polluted. Many surface water bodies such as ponds, tanks, etc. also get polluted if the run-off water along with sewage flows into them.

The issue of water logging has been seen very frequently in low lying areas that are now new residential areas such as Zirakpur, Mullanpur, Manimajra and Mohali. Out of these, the areas of Mullanpur and Manimajra fall under the administrative boundaries of the Chandigarh Administration.

3.3 Heat waves as likely impact of climate change

The climate projections for the region show an increase in the average annual maximum and minimum temperatures as well as in the minimum temperatures during winters. The resultant rise in overall temperatures in the UT can lead to increased instances of heat wave like conditions. The informal labour in the UT is quite high as about 93% of the total casual workers lack a written job contract. This implies a large part of the population being exposed to higher temperatures while working in outdoor conditions. The population of the UT exposed to heat wave like conditions would contribute to increasing the vulnerability of the population significantly (SAPCC, 2017).

4. Response to Disaster

The National Disaster Management Authority (NDMA) is the apex body Disaster Management in India. Setting up of NDMA and the creation of an enabling environment for institutional mechanisms at the State and District levels is mandated by the Disaster Management Act, 2005. NDMA is mandated to lay down the policies, plans and guidelines for Disaster Management. India envisions the development of an ethos of Prevention, Mitigation, Preparedness and Response (NDMA, 2022).

4.1 State Disaster Management Authority

State Disaster Management Authority for Chandigarh has been formed under the Chairmanship of the Adviser to the Administrator, U.T. to evaluate the disaster preparedness for different type of calamities. This Authority is the pioneer Committee in the U.T. to take stock of the situation, monitor routine preparedness and to suggest improvement in the response mechanism. This has been done to ensure coordinated mitigation, preparedness and response measures whenever disaster strikes. The State Disaster Management Authority comprises of officials as listed in Table 108 (Chandigarh Disaster Management Authority, 2018).

Table 108: Disaster Management Authority

S.No.	Functionaries	Designation
1	Advisor to the Administrator, UT, Chandigarh	Chairman
2	Home Secretary, Chandigarh Administration	Member
3	Finance Secretary, Chandigarh Administration	Member
4	Commissioner, Municipal Corporation, Chandigarh	Member
5	Secretary, Social Welfare, UT, Chandigarh	Member

S.No.	Functionaries	Designation
6	Inspector General of Police, UT Chandigarh	Member
7	Deputy Commissioner, UT Chandigarh	Member Secretary

Source: Chandigarh Disaster Management Authority, 2018

4.2 District Disaster Management Committee

District Disaster Management Committee is the high-powered committee at district level to look after disaster management and emergency response. This high-powered committee is chaired by the Deputy Commissioner with all policy makers from the District/ Nodal Officer of each line department/ ADC/ SDMs and nodal officers from various organizations as its members. ADC is the convener of District Disaster Management Committee (DDMC).

4.3 Disaster Management Plan

The Disaster Management Plan (DMP) (Chandigarh Administration, 2018) has been prepared for its operationalisation by various departments and agencies of the Chandigarh Administration and other Non- Governmental Agencies expected to participate in disaster management. This plan provides for institutional arrangements, roles and responsibilities of the various agencies, interlinks in disaster management and the scope of their activities. An elaborate inventory of resources has also been formalized.

The purpose of this plan is to evolve a system to:

- Organize Working groups including constituting Warden Services in the city;
- Formation of Disaster Management Cell and City Disaster Management Force;
- Assess the status of existing resources and facilities available with the various departments and agencies involved in disaster management in the UT;
- Assess their adequacies in dealing with a disaster;
- Identify the requirements for institutional strengthening, technological support, upgradation of information systems and data management for improving the quality of administrative response to disasters at the state level;
- Make the UT DMP an effective response mechanism as well as a policy and planning tool.

This DMP details out the profile for Chandigarh in terms of topography, geology, weather, natural and man-made infrastructures. It includes the disaster management set-up, standard operating procedures, trigger mechanisms, and emergency support functions. It also describes the short-term and long-term response plan along with the action plan for the relevant department that are expected to provide services in the event of a disaster. Moreover, detail mitigation plans have been incorporated for terror attack, nuclear disaster, chemical spills, biological disaster, floods, earthquake, heat wave, and fire.

It also provides for uniformity in approach and clear perception of the various issues at hand, thus avoiding undue complications. At the same time, the plan provides for the coordination of different agencies from the field level to the central government. The objective is to provide a quick and effective response in emergency situations. Although, effective disaster specific plans have been previously prepared by different departments/agencies, there is a growing awareness of the need for a multi-disaster action

plan in order to tackle multi-faceted effects of disaster. This essentially concentrates on the institutional setup and information flow, providing hazard specific responses along with the roles of primary agencies involved. Such an approach allows flexibility in response at the local level, while still under the direct supervision and control of the state or regions.

While the action plan assumes an element of preparedness on part of the administrative authorities, it also calls for substantial involvement of the NGOs and private initiatives. Community participation is one of the most effective inputs for the management of disasters. Training of the community and key social functionaries thus become essential elements for the successful execution of a disaster management action plan.

5. Recommendations

- Implementation support and enforcement of existing disaster management plan is necessary. Sensitization and skill development of practitioners and decision makers is an absolute necessity for successful implementation of the plan.
- Strengthening of existing Emergency Support Functions, Disaster Management Teams, Quick Response Teams, and Field Response. Refresher trainings for all such teams at regular intervals of time and exercise of Mock Drills should be done. Regularly organizing continuous awareness/ sensitization programmes for the stakeholders and the general public should be facilitated.
- Earthquake resistant construction of buildings should be strictly implemented. Enforcement of building codes and bye-laws should be mandatory. For existing buildings retrofitting or seismic strengthening is the only solution to make it disaster resistant. Subject experts from academia, researchers, and practitioners should be involved.
- It is pertinent to dovetail climate resilience into the existing disaster management plan.
- In order to address the recurring issue of water logging in the UT it is important that crucial assessments are carried out at the administrative sector level to understand the spatial coverage of the issue. In this regard, flood hazard maps or flood zone mapping are important assessments that need to be undertaken. Water logging assessments require assessment of different water indexes like Normalised

Differences Water Index (NDWI), Normalised Differences Vegetative Index (NDVI), Normalised differences Moisture Index (NDMI) in addition to an assessment of ground water tables across the region. Water logging vulnerability and spatial risk mapping or flood area modelling need to be done so that strategies may be used for planning and mitigation efforts to reduce future water logging. These assessments will provide a clear picture of vulnerability of the UT to the issue of water logging and will consequently assist decision makers and policy planners in working towards the development of a climate resilient city of Chandigarh.

- With increasing incidences of flash floods and waterlogging situation in the UT, it becomes necessary to equip the UT with flood early warning system for better management of situations with havoc rains resulting in disaster like situations. The flood early warning systems will help the disaster management to forecast whenever the flood like incidences would be predicted. It will help in issuing warning when a flood is eminent or already occurring. With effective governance arrangements, a flood warning system would help in recognition of risk and put across a good monitoring and evaluation system. Based on these the danger pond on the citizens and infrastructure of the UT can be scaled to very low impact.

5

ENVIRONMENT INFORMATION AND AWARENESS

INTRODUCTION

Environmental agencies are mandated to protect the environment from natural and anthropogenic stresses. More recently awareness generation and capacity building on addressing environmental issues by key stakeholders has become essential in tackling environmental degradation. This is because pollution sources are now not only limited to production of goods and services but also stem from over consumption. It is imperative to have public awareness on environmental issues, sustainable practices, and move towards pro-environmental behavior change including responsible consumption. Environmental awareness helps complement existing legal and economic instruments and SDGs developed to safeguard the environment and promote sustainable development.

The Ministry of Environment, Forest, and Climate Change (MoEFCC) in 1983-84 launched a programme on environment education, awareness and training (EEAT) to (i) Promote environmental awareness among all sections of society, (ii) Spread environment education, and (iii) Mobilize students' participation for environment conservation (MoEFCC, 2020). Environment information, education, awareness comes under the Department of Environment (DoE), Chandigarh. The department implements schemes and programmes under MoEFCC with the aim to create environment education and awareness with the help of environmental societies, Eco-Clubs, and NGOs. The DoE has constituted committees for generating environmental awareness, which include:

- The monitoring committee for implementation of National Green Corps (NGC) Programme in U.T. Chandigarh.
- The steering committee for bringing out Status of Environment Report for Chandigarh.
- The committee for the evaluation of Best Eco-Club in Chandigarh
- The committee for the evaluation of Best Green Teacher, NGO and Herbal Garden

To tackle environmental issues the Chandigarh administration has seen it as imperative have systematic awareness campaigns and has therefore recently created a working group on strategic knowledge for climate change.

This chapter on **Environment, Information, and Awareness** outlines the work done by the DoE and other committees such as the Chandigarh Pollution Control Committee (CPCC) and the municipality to provide information on environment and related issues, sensitize the public with the aim of generating awareness, and shift towards sustainable consumption, disposal, and related practices.

1. Environmental education

The Chandigarh administration is active in its information and awareness generation with respect to environmental issues of pollution, waste management rules, and action plans. In addition to the research study/reports, posters/brochures/booklets on environment education and awareness, publications,

reports, and knowledge sharing materials have also been released by the department of environment and made available to NGOs, government departments, Eco-Clubs, and educational institutions and include (Department of Environment, 2022):

1. State of Environment Report (SoER) Chandigarh, 2018

The Environment Information System (ENVIS Hub) of the Department of Environment, Chandigarh (U.T.), periodically takes up the task of bringing out the SoER to highlight major environmental concerns, trends and significant remedial actions needed to be undertaken in the UT, related to five important environmental issues including land use pattern, air quality, water, waste management and energy.

2. Towards a Cleaner & Greener Chandigarh

The Green Chandigarh Action Plan prepared by the department of Forest and Wildlife, Chandigarh, is an annual report that attempts to address the greening requirements of the urban community in the city. It includes various efforts made by the Department of Forest and Wildlife towards a cleaner and greener Chandigarh.

3. Book on Trees of Chandigarh

A book titled *Tree Treasure of Chandigarh* by Prof RK Kohli, SAS Nagar, Vikas Kahol, Dr Navdeep Kahol, and Prof HP Singh compiled diverse avenue trees of the city was published by the UT forest and wildlife department in 2021. The book released by the UT administrator and Punjab governor VP Singh Badnore, profiles a number of old and majestic heritage trees creating awareness and attraction towards the preservation of trees in the city.

4. Booklets

The Department of Environment, Chandigarh administration has published various booklets for generating awareness and educating the general public on various issues on biodiversity protection, waste and sustainable mobility. Some of these include Comprehensive Mobility Plan for Chandigarh Urban Complex, Chandigarh Development Plan, Booklet on Sukhna Wild Life Sanctuary at a Glance, Handbook on Environment, Booklet on Central Ground Water Board, Booklet on Heritage Trees of Chandigarh, Booklet on Lantana exotic weed, Booklet on Herbs for Everyone, National Mission for a Green India, Single Use Plastic and Thermocol Ban in Chandigarh - A Pictorial Guidebook (Oct, 2019).

5. Quarterly Newsletter of ENVIS Centre.

The below publications are available in the Department of Environment, Chandigarh Administration for reference.

Figure 71: Quarterly Newsletter of ENVIS Centre

Source: Department of Environment, 2019; Department of Environment, 2020

National Green Crops (NGC): Eco-Clubs programme

The DoE helps execute the National Green Crops (NGC) programme under the EEAT programme. The Eco-Clubs carry out activities/awareness programmes including rallies, marches, human chains, seminars, debates, lectures, popular talks on environmental issues, tree plantation, campus cleaning, solid waste management, water, sanitation, and hygiene (WASH) issues, rainwater harvesting, including vermin composting, etc. to spread the message of Eco-friendly/awakened Society.

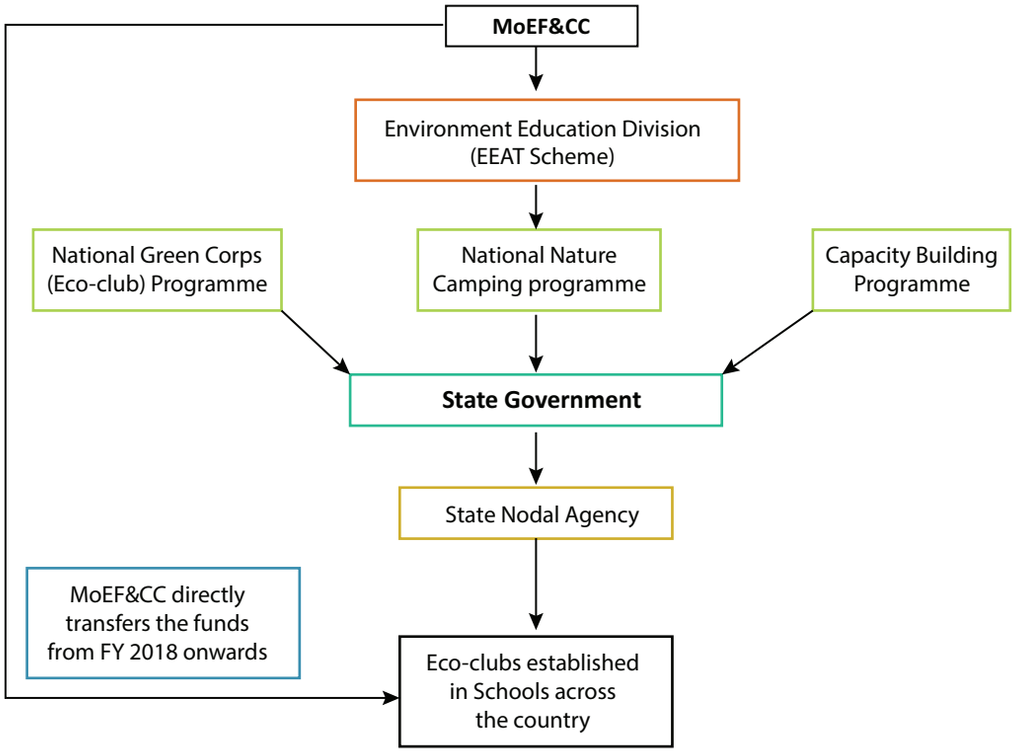

Figure 72: Organizational Structure Eco-Clubs nation-wide.

Source: MoEFCC, 2020

Almost, all middle, high, and senior secondary schools in the government and private sector are covered under the NGC programme and approximately 15, 000 students in Chandigarh are part of the Eco-Clubs.

The DoE provides the clubs with technical/financial assistance and resource material. The planning and organization of activities/programmes/events is done by the Eco-Clubs. The department also:

- Distributes and provides facilities - equipment/publications/books/ teaching- learning aids/films
- Supports camps/tours/excursion financially for creating environmental awareness amongst the students/teachers
- Conducts regular tours of the school children (Eco-clubs) to the wilderness areas like Botanical Garden, Sukhna Wildlife Sanctuary etc., thrice a week.
- Collects and disseminates information among Eco-Clubs/Environment societies by developing information brochures and books.

Under the NGC, the department has established 152 Eco-Clubs in Govt./Govt. recognized/private schools kendriya/navodaya vidyalayas in Chandigarh. The full list of Eco Clubs can be accessed here: https: //chandigarhenvis.gov.in/departmentsdeptt-of- environmentenvironment-education-awareness-training/list-of-eco-clubs

The Eco-Clubs are ranked in their performance and the best Eco-Clubs for 2020-21 are given below:

Table 109: Top performing Environment Societies (Colleges) for 2020-21 in U.T. Chandigarh

	Primary/Middle Schools	Higher/Sr. Sec. Schools	Colleges
1st	Bhartiya Vidya Bhavans Bhavan Vidyalaya Junior, Sector- 33, Chandigarh.	Govt. Girls Model Sr. Sec. School, Sector 18-C, Chandigarh	Post Graduate Govt. College for Girls, Sector 42, Chandigarh
2nd	Kids 'B' Kids School, Sector 42, Chandigarh	Carmel Convnet School Sector 9-B, Chandigarh	Sri Guru Gobind Singh College, Sector 26, Chandigarh
3rd	Govt. Model Middle School, 33-B, Chandigarh	DAV Model School, Sector 15-A, Chandigarh	Mehr Chand Mahajan D.A.V for Women, Sector 36-A Chandigarh
4th		Govt. model High School, Sector 22-C, Chandigarh	
5th		Sacred Heart Senior Secondary School, Sector 26, Chandigarh	

Source: Department of Environment, Chandigarh Administration 2021

a. Organize conferences and Activities

The Children and Young Environmentalist Conference on Environment Protection (CoEP 2020) (City Air News, 2020)

This conference was organized by DoE, Punjab University, and Department of Community Medicine and School of Public Health (PGIMER), Ankur School, and Central Pollution Control Committee (CPCC),

MoEFCC northern region, and Health care without harm & lung care foundation in Chandigarh. The objective was to engage scientists, students, and children on sustainable society on the theme of World Environment Day. Chandigarh administration conducts plantation drives each year, as part of World Environment Day celebrations at Nagar Van where saplings of Banyan tree, Neem, etc. are planted. The plantation drives witness enthusiastic participation of students from schools in Chandigarh and the general public. Other activities during the celebrations are as below.

b. Activities as part of World Environment Day

Table 110: Activities carried out by Department of Environment, UT of Chandigarh during World Environment Day

S.No	Activity	Year	References
1	• Inter-school Poster making, repurposed art contest and poetry contests (virtual mode) with the support of teachers an Yuvsatta, an NGO • Best out of waste- Create anything from something • Create a Garden @ Your own home • Vertical garden from waste material • Online Green Quiz Competition	2020	(Chandigarh Administration, 2022)
2	• Inter-school Photography Contest at Sukhna Wildlife Sanctuary • Inter-school Declamation and Photography Contest on the theme of 'Protect our Species'	2019	
3	• Best Eco-Club Award of UT Chandigarh presented to St. Joseph's Sr. Sec. School, Chandigarh • Herbal plant distribution drive to students to promote the theme of green Chandigarh • Cloth made Jholas were distributed to people present there to discourage use of poly-ethylene/plastic bags • Short play contest on the theme of 'Polyethylene Bags Free Chandigarh' was conducted. • Inter-school poster making/slogan writing contests were held • Quiz sessions on the theme of Environment, Forests & Renewable Energy.	2018	(Chandigarh Administration, 2021)

c. Other activities conducted by Chandigarh Administration

Table 111: Environmental education and information generation activities in U.T. Chandigarh

S.No.	Activities	Year	References
1	**Vrikshabhandan celebrations** • Citizens, Chandigarh residents tie Rakhi bands to the trees at Sukhna Lake and Botanical Garden, Sarangpur. • Pledge to conserve the nature • Lucky draw followed by prize distribution **Wildlife week** • Sensitization and raising awareness for protection and conservation of wildlife, nature and natural resources. • Launch of Jungle Book, a quarterly newsletter of the Department of Forest & Wildlife. **Grow your own herbs and food campaign** • Training programme by Medicinal Plants Board, Chandigarh for Eco Club teachers at Botanical Garden, Sarangpur in collaboration with Yuvsatta, an NGO. **Short film competition** • Short film competition on wildlife conservation for students from different eco-club schools of Chandigarh **Eco-Development Program** • Community participation in protecting forests by making social fencing • Pressure cookers were distributed to families of Khuda-Ali-Sher and Kaimbwala village to motivate them towards energy efficient cooking and lessening of direct dependency on fuel wood. **World Forestry Day** • Plantation programme organised by the Forest Department at Botanical Garden, Sarangpur. **Short Mobile Video contests** • Medicinal Plant Board, UT Chandigarh in association owth Yuvsatta- NGO organized a Short Mobile Video Contest on "Medicinal & Aromatic Plants of Chandigarh.". **Partnership Initiative Programme (PIP)** • Launched with the motive to generate awareness about the activities to be undertaken by the departments and seek participation of the public. • Under PIP, 102 NGOs have been registered with the Forest Department, Chandigarh for the tree plantation drive.	2020	(Chandigarh Administration, 2022)

S.No.	Activities	Year	References
2	**Water Conservation Fortnight** • Department of Environment, UT of Chandigarh organized a 'Water Conservation Fortnight' in various schools to reduce unnecessary waterusage through sensitization. • Students presented a colorful dance schowcasing plight of bird. • Students performed a street play on 'Say No to Water Wastage' • Green Quiz • School students took a pledge to conserve water **Green Pledge** • Week-long event for the public at Sukhna Lake by taking a pledge and tying a green ribbon of commitment for the protection of Mother nature organized by the Department of Forest and Wildlife, Chandigarh. **Halloween 2019- The Harrows of Plastic** • Halloween rally was organized on the theme of 'The Harrows of Plastic', jointly by the Department of Public Relations, Environment Department and Government College of Arts as part of the #PlasticKaTimeUp Campaign to sensitize people with the implications of SUPs on environment. **Wildlife Week** • Shram Daan Diwas was organized on theme of "Let's Pledge Today to Make Chandigarh Plastic Free". • Signature Campaign organized by Department of Forest & Wildlife, Chandigarh at Sukhna Lake wherein public signed and took pledge to protect wildlife. • Exhibition on birds of Chandigarh organized by the Department of Forest & Wildlife in collaboration with Chandigarh Birds Club at Sukhna lake, wherein awareness generation on the role of birds was highlighted. • Exhibition on Chandigarh Butterflies at Nature Interpretation Centre, Chandigarh, wherein the Department in collaboration with Eco Clubs organizes visits of school students to sensitize and educate them on the rich diversity and importance of butterflies in the ecosystem • Launch of Sukhna Mitra in which habitants of village Kaimbwala participated to understand the importance of wetland with special emphasis on Sukhna Lake	2019-20	(Chandigarh Administration, 2022)

S.No.	Activities	Year	References
	• Art Exhibition to bring people together for saving the environment and wildlife on the theme of "Living in harmony with Nature" organized by the Department of Forest & Wildlife, Chandigarh in collaboration with Yuvsatta- NGO, Art Dialogo Asia and the eco-club of Carmel Convent School, Chandigarh. • Wildlife rescue proramme to sensitize the villagers of Dhanas & Sarangpur about various aspects of wildlife and its conservation. Modern techniques and equipments such as Net Gun, Tranquilizing Gun, Snake Catcher etc. used by the forest staff was also demonstrated. Necessary knowledge was imparted to villagers to tackle wildlife in emergency situations. • Department of Forest & Wildlife, Chandigarh organized a short film competition on the theme of 'Air pollution'. **Vanmahotsav and Paudh Mela** • Tree plantation drive to inculcate the need for growing trees and preserving them, among the general public • Paudh Mela, near Sukhna Lake Club was organised, where the general public collected saplings. **Eco Club Day** • Plantation of saplings by teachers and students in school premises to sensitise the students to generation awareness for protection and conservation of flora & fauna. **Van Mahotsav Celebrations in Schools** • Plantation of herbal plants like Giloe, Elaichi, Aloe Vera, Aparajita etc. by the Department of Forest & Wildlife along with Yuvsatta- NGO, Earth Day Network India and Srijan Eco Club of CL Aggarwal DAV Model School, Chandigarh **Herbal Day** • Celebration of Herbal Day to sensitize the masses especially school children to generate awareness about the medicinal values of various plants available in nature.		

S.No.	Activities	Year	References
3	**Vanmahotsav and Paudh Mela** • Tree plantation drive to inculcate the need for growing trees and preserving them, among the general public • Paudh Mela, near Sukhna Lake Club was organised, where the saplings were distributed free of cost. **Eco Club** • Eco clubs training programme for teachers of 149 schools organised by Department of Environment and Yusvatta, an NGO **Celebration of World Ozone Day** • Department of Environment and Forests, Chandigarh in collaboration with Youth Innovation Society, celebrated World Ozone Day by organising an inter-school painting and slogan writing competition and quiz competition. **Wildlife Week 2018** • Department of Forests & Wildlife organised a 'Walk for Wildlife' covering a distance of 9.5km. • Walkathon on the theme 'Walk for Wildlife' was organised at Sukhna Lake, in collaboration with Yuvsatta, Chandigarh • Drawing/painting competition, photography exhibition etc. trekking to wilderness to raise the awareness amongst all the stakeholders to join hands together for conservation of wild flora and fauna for posterity. **Welcoming Migratory Birds** • Department of Forests & Wildlife, in collaboration with Yuvsatta, Chandigarh launched a fortnight long 'Migratory Bird Watching Fest' • Regular bird watchers like Kulbhushan Kanwar sensitised kids about migratory birds. **Chandigarh says goodbye polybags campaign** • Department of Forests & Wildlife, in collaboration with Yuvsatta, Chandigarh and with participation of Chandigarh Traders Association organised a 'Chandigarh says goodbye polybags' campaign • 'Poly-Raja', a street play was staged by volunteers of Yuvsatta **Nature Camps at City Forest for Biodiversity Walks** • Department of Environment, Chandigarh in collaboration with Yuvsatta, Chandigarh organised biodiversity walks at City Forest, Chandigarh to sensitise students.	2018-19	(Chandigarh Administration, 2021)

S.No.	Activities	Year	References
	• Kubhushan Kanwar, environmentalist, who was single- handedly discovered and photographed over 100 species of butterflied of Chandigarh explained to young students about how butterflies play an important role in the ecosystem **Training Programme** • A training programme on the theme of 'Water and Wetlands Conservation' for teachers in charge of Eco Club was organised under the Environment Education Awareness and Training Scheme, of Ministry of Environment & Forests and Department of Environment, Chandigarh. **Nature Bird Walk** • A monthly nature bird walk was started from the month of August, 2018 in the Bird Park area in association with Chandigarh Bird Club, in Nagar Van behind Sukhna Lake to raise awareness about thedifferent species of birds amongst the general public.		

2. Environmental training and capacity building

The DoE as part of its EEAT programme supports capacity building activities to impart skills to students (schools and colleges) and teachers of Eco-club on themes including:

- Bio-diversity conservation
- Waste Management and concept of 4Rs – Reduce, Reuse, Recycle & Recover
- 17 Sustainable Development Goals
- Climate Change related issues with focus on Adaptation and Mitigation
- Control of pollution
- Any other related theme
- In addition to Eco Clubs, Environment Societies have been formed in various Colleges/Educational institutions. The NGOs/Societies registered under Societies Act are part of the EEAT programme implemented by DoE, Chandigarh.

3. Energy conservation (EC), energy efficiency (EE), and communication

The State Designated Agency (SDA) (Chandigarh Administration, 2022) is responsible for coordinating, regulating, and enforcing provisions of the Energy Conservation Act 2001 including implementing the annual action plan formulated by the Bureau of Energy Efficiency (BEE), New Delhi. In addition to implementing such activities the SDA is responsible for planning workshops on EC & EE, publicity on social and print media, and knowledge materials as outputs in journals/ souvenirs, etc., awareness raising campaigns involving elected representatives, school children, and local population.

To further public awareness, the SDA provides financial assistance to government schools to establish energy clubs and organize energy conservation activities like painting, slogan writing, quiz competition. Over 30 Schools have established energy and ECO clubs and are organizing energy conservation activities.

4. Citizen engagement and charter

Citizen engagement is environmental awareness generation, promotion of sustainable practices, and associated pro-environmental behavior change. The citizen's charter in Chandigarh is a joint effort by the ministry to improve environmental information and awareness generation. Citizen's charter is created (The official website of Chandigarh Administration, 2022):

- To instill a spirit of conservation of natural resources;
- To follow rules and regulations under the ministry towards protection of the environment;
- To disseminate information to public on sustainable development and improved habits;
- To provide suggestions to streamline functioning of existing institution, promote accountability and responsibility;
- To adopt "Environmental ethics" in the community.

The citizen's charter is created to improve public services by making citizen participation part of the decision-making process (The official website of Chandigarh Administration, 2022). This is a consultative process involving expertise from different areas that aid in reflecting concerns and ideas of all sections of society and allow for comprehensive and transparent government decisions.

5. National network and regional cooperation

National level network with interstate and regional collaboration is required to share resources and best practices on environment programmes, materials, and publications.

a. The Environment Information System (ENVIS) Hub

The DoE, Chandigarh administration is in charge of the ENVIS Hub to make data accessible electronically. The ENVIS hub is covered under the MoEFCC scheme. A MoU between DOE, Chandigarh and MoEFCC was signed to develop the ENVIS hub, Chandigarh for electronic transfers of status of environment and related information to the public. The ENVIS Hub can be accessed through the website developed www.chandigarhenvis.gov.in which allows for wider dissemination of information on environmental status and information for the UT.

The ENVIS HUB is a web-enabled repository of comprehensive environmental information with collection, collation, storage, retrieval and dissemination through a network of ENVIS hubs. The stakeholders operating and administering the platform include government bodies Environment/ Forest Departments of State Governments/ UT Administrations, environment related governmental and non-governmental organizations (NGOs) and institutes. The following are the features of ENVIS hub:

It is a decentralized system with a nation-wide network of distributed subject- specific Hubs/RPs ensuring integration of national and state-wide efforts in environmental information collection and dissemination;

The MoEFCC is the focal point for the ENVIS network with ENVIS Hubs located in different organizations/ establishments nationally, covering topics related to pollution control, toxic chemicals, central and offshore ecology, environmentally sound and appropriate technology, bio-degradation of wastes, and environment management, etc.

The ENVIS Hub assigned to develop, maintain, and update information including quantitative and qualitative information such a GIS maps, analytical reports, consolidated data on issues related to state and local levels regularly.

6. Financing Environment Information Awareness

The DOE provides financial assistance to Eco-Clubs/Environment Society established in Schools/ Colleges/Educational institutions/NGOs for Seminar/Training on theme of environment are organized in association with public representatives viz. NGOs etc.

The DOE, Chandigarh administration has allocated budget for various activities under the theme of Ecology & Environment. The table below provides the budget expenditure on various activities:

Table 112: Budget expenditure (2020-21) as allocate by Department of Environment, Chandigarh

	Head/Item of the budget	Budget Expenditure in lacs (2020-21)
1	Direction & Administration	95.27
2	Protection & Conservation of Resources	10.00
3	Institution Support & Public Participation	3.00
4	Environment Education	6.00
5	Research and Development	Nill
6	Assistance to Chandigarh Pollution Control Committee	60.00
7	**Total Ecology & Environment**	**174.27**

Source: Department of Environment, Chandigarh Administration, 2021

In addition to the aforementioned budget allocation the Ministry of Housing and Urban Affairs (MoHUA) also as part of the Swachh Bhart Mission (SBM) allocated 0.85 crores from 2015-20 under solid waste management related IEC and awareness generation activities[2].

2 Stakeholder consultation with Chandigarh Administration from (26-28th October 2021)

6

TRANSFORMATIVE PATHWAYS AND SUSTAINABLE DEVELOPMENT GOALS

BACKGROUND

The Sustainable Development Goals (SDGs) 2030 Agenda, adopted by the United Nations General Assembly in 2015, aimed to take forward the success of the Millennium Development Goals worldwide. The goals provide a shared blueprint for achieving a better and sustainable future for all. It comprises of about 17 goals and its associated 169 targets offering a comprehensive list of global goals which integrate all development's social, economic, and environmental dimensions. Although, SDGs are not legally binding but they have provided de-facto international obligations to re-orient domestic spending and priorities of the countries till 2030. Being a signatory to United Nations (UN), India is committed to implementing SDGs based on its specific nationally defined indicators responding to the nation's needs and priorities. NITI Aayog was assigned to develop national indicators, oversee the implementation by ministries, and coordinate with the states to achieve development targets enshrined in the SDGs. Under the federal set-up, the States and Union Territories are the key movers on the SDGs action plan and play a critical role in the localization of SDGs, with the Central Government playing an enabling role.

Chandigarh is a well-planned and well-maintained city with high standards of civic amenities. It is emerging as a regional hub in health, infrastructure, education, information technology, and industry. Chandigarh was ranked first in the Human Development Index (HDI), quality of life and e-readiness (The official website of the Chandigarh Administration, 2022). Chandigarh administration took several initiatives to provide essential services to the poor, increase manufacturing competitiveness, develop human resources, improve governance, develop infrastructure and protect the environment. One of the important initiatives undertaken by the Chandigarh Administration is the democratic decentralization under the guidance of NITI Aayog in the shape of indicators within SDGs and under various schemes such as Swachh Bharat Mission (SBM), Smart City, infrastructure development, digital transactions etc.

The Planning and Evaluation Organisation under Finance Department, Chandigarh Administration is the nodal agency implementing SDGs in the region. The implementing departments of SDGs are working directly under the Chairpersonship of Adviser to the Administrator. The monitoring of SDGs in Chandigarh UT is being done through UT Indicator Framework derived through the National Indicator Framework (NIF) developed by the Ministry of Statistics and Programme (MOSPI), the Government of India (Finance Department, 2022). The UT emerged as a front runner in various development sectors for sustainable development goals.

Sustainable Development Goals and Performance of Chandigarh

In 2018, NITI Aayog, in partnership with UN India office, developed the SDG Index Baseline Report and a dashboard spanning 13 out of 17 SDGs (excluding goals 12, 13, 14 and 17) for States and U.Ts. Chandigarh stands at the first position amongst the UT and States in the 'front runner' category with an overall score of 79 out of 100 as per the third edition of SDG India Index 3.0, 2020-21 (Niti Aayog, 2021).

It can be observed from Figure 73 below that the Chandigarh's status is much higher in comparison with the Indian average status in almost every Goal except Goal 9 (Industry, Innovation and Infrastructure) and Goal 16 (Peace, Justice and Strong Institutions). Although, initiatives have been taken by Chandigarh UT towards the fulfilment of Goal 9 & Goal 16. Under Goal 9 initiatives include upgrading of healthcare systems, development of new medical education system, conversion of bitumen roads to RCC roads and usage of plastic waste in roads, setting up plants for manufacturing of Solar PV cells, coming up with phase II & III of Rajiv Gandhi Chandigarh Technology Park, coming up of new state of the art education city, upgradation of Punjab Engineering College to IIT Status, setting up of IIM Institute and branch of National Institute of Design in Chandigarh, development of botanical gardens, undertook 3 lakes work, tertiary water treatment plant underway etc. Chandigarh also came up with peace city campaigns in collaboration with Yuvasatta, an NGO based in Chandigarh UT itself. The NGO with support from tricity schools and education department of Chandigarh administration started creating peace clubs in schools under this they involved all the teachers and students towards building of new and responsible young Indians.

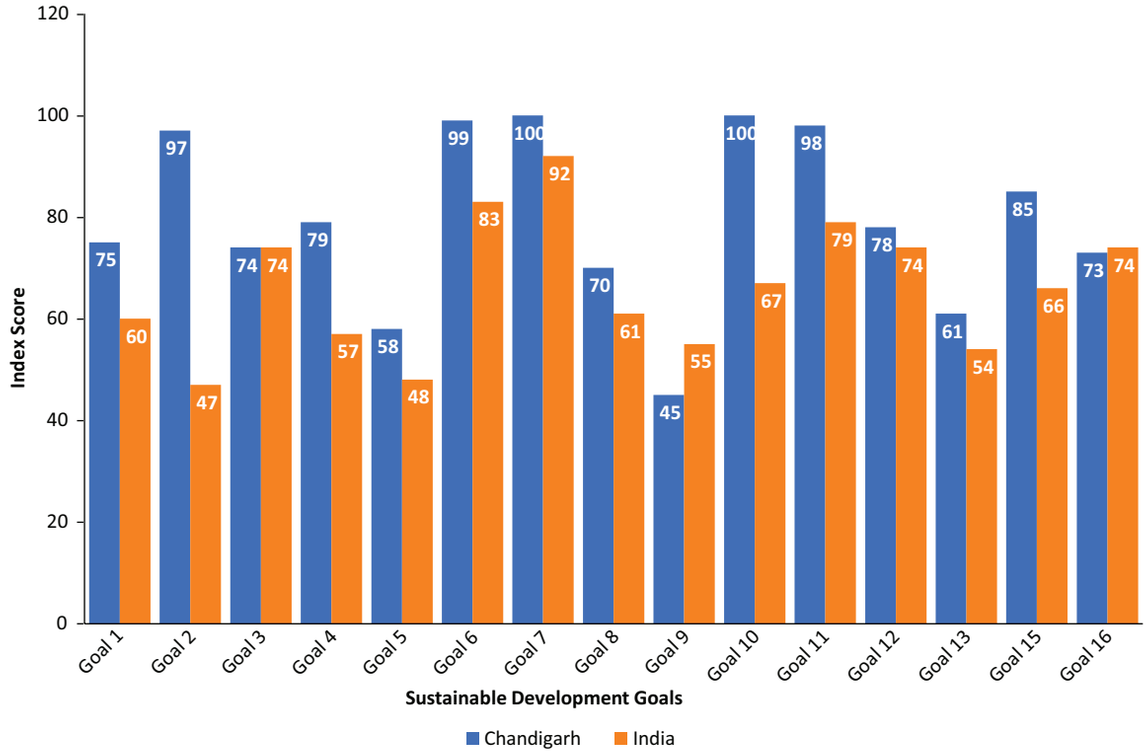

Figure 73: Goal Wise SDG Index of Chandigarh and India

Source: (NITI Aayog, 2021)

The performance of Chandigarh for all SDGs is tabulated in Table 113 below:

Table 113: Goal wise performance of Chandigarh UT on Sustainable Development Goals

Category	SDG Goals		Score	Ranking of Chandigarh in 2020
Achiever (100)	Goal 7	Affordable and Clean Energy	100	1
	Goal 10	Reduced Inequality	100	1
Front Runner (65-99)	Goal 1	No Poverty	75	3
	Goal 2	Zero Hunger	97	1
	Goal 3	Good Health and Well being	74	4
	Goal 4	Quality Education	79	1
	Goal 6	Clean Water and Sanitation	99	2
	Goal 8	Decent Work and Economic Growth	70	1
	Goal 11	Sustainable Cities and Communities	98	1
	Goal 12	Sustainable Consumption &Production	78	3
	Goal 15	Life on Land	85	1
	Goal 16	Peace, Justice and Strong Institutions	73	6
Performer (50-64)	Goal 5	Gender Equality	58	3
	Goal 13	Climate Action	61	5
Aspirant (0-49)	Goal 9	Industry, Innovation and Infrastructure	45	5

Source: NITI Aayog, 2021

Figure 74 below displays the overall performance of Chandigarh UT for 2019-20 and 2020-21

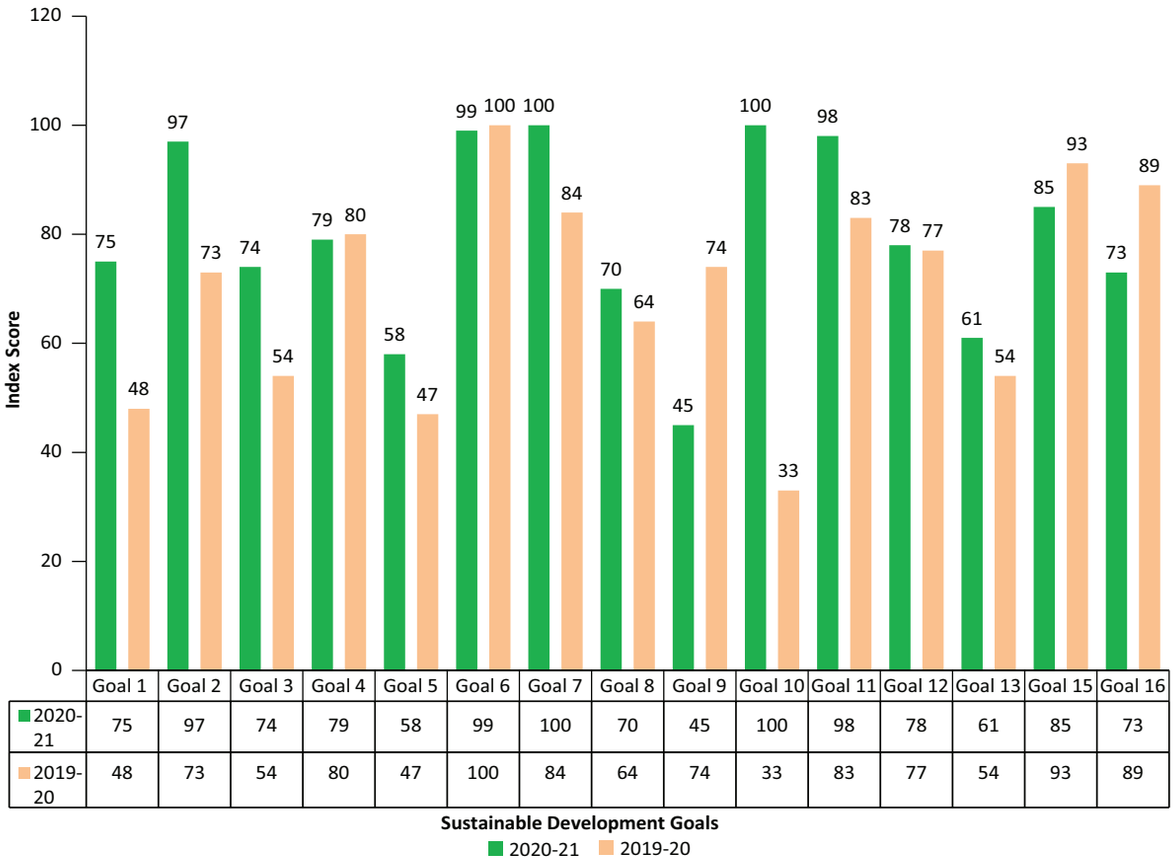

Figure 74: Goal Wise SDG Index for Chandigarh 2019-2020

Source: NITI Aayog, 2021

Highlights – Performance of Chandigarh for 2020

- Chandigarh UT stands in the **Achiever category** for SDG 7 and SDG 10 with a total score of 100 out of 100, highlighting that the Chandigarh UT efforts to provide affordable and clean energy and ensure equal opportunities for its citizens, promoting social, economic and political inclusion for all. Chandigarh has shown a remarkable improvement in its performance for Goal 7 and Goal 10 compared to 2019 through initiatives like LED distribution, Aadhaar enrolment etc.
- Chandigarh stands **Front Runner** for SDGs 1, 2, 3, 4, 6, 11, 12, 15 and 16, which ensures the welfare and well-being of the people and portrays potential to improve targets through its ongoing initiatives such as fortification of food, direct benefit transfer program through Aadhaar, ensuring good health under central government schemes etc. However, compared to the 2019, Chandigarh's performance dipped marginally for the Goals 4, 6, 15 and 16.
- For Goals 5 and 13, Chandigarh's status improved marginally compared to 2019 and stands in the **Performer category**. However, with the current ongoing initiatives of the Chandigarh Administration, such as effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life for women (Goal 5) and actions related to climate change (Goal 13) will improve its stand in the coming years.

- SDG 9 witnessed the maximum decrease from previous years, making it the only Goal in which Chandigarh stands in the **Aspirant category**. The administration continues to strive hard toward improving the infrastructure and management of its city, and the ratings in this Goal are also expected to increase.

Chandigarh's progress to targets and national indicators for SDGs related to key environmental areas

SDG 6: Ensure availability and sustainable management of water and sanitation for all

Water resources are critical for agriculture and industrial use; therefore, protecting and restoring water-related ecosystems is essential. Goal 6 aims towards improving the water quality by reducing pollution, substantially increasing water efficiency across all the sectors, and strengthening the participation of all local communities in improving water and sanitation management. Some of the initiatives taken by the Government of India include National Rural Drinking Water Programme, National Water Quality Sub-Mission, Namami Gange, and Swachh Bharat Mission – Gramin.

Aligning with the Government of India's thrust to improve availability and management of water and sanitation, Chandigarh UT has achieved targets of 100% in the construction of toilet facilities and achieving open defecation free status. Chandigarh sectoral grid has a well-designed system of piped water supply and sewage disposal system justifying the high ratings (The official webiste of the Chandigarh Administration, 2021).

To measure Chandigarh's performance, 8 indicators have been identified of the total SDGs targets.

Table 114: Targets under Goal 6

	Targets
Target 6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all
Target 6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
Target 6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing the release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
Target 6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
Target 6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes