DRAFT

DISTRICT ENVIRONMENTAL PLAN

(As per the Hon'ble National Green Tribunal (NGT) vide order O.A. no. 360/2018 dated 26.09.2019)

BAGESHWAR

G.B. Pant National Institute of Himalayan Environment (GBPNIHE), Kosi-Katarmal, Almora Uttarakhand

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PREFACE

Hon'ble National Green Tribunal (NGT) vide order, dated 26/09/2019 in O.A. No. 360 of 2018 filed by Shree Nath Sharma Vs. Union of India and Others directed that Central Pollution Control Board (CPCB) shall facilitate the District Magistrates in preparation of the District Environmental Plan by placing a model plan on its website. This model plan may be adopted as per local requirements by all Districts under the supervision of the District Magistrate. The said order also directs that the Department of Environment in respective States should collect district plans to prepare State Environment Plan, which shall be monitored by respective Chief Secretaries of the State by 15/12/2019. Based on State Environmental Plans, CPCB and Ministry of Environment, Forest & Climate Change (MoEF&CC) shall prepare a National Environmental Plan, under the supervision of Secretary, MoEF&CC and Chairman, CPCB.

There are diverse environmental issues that address our key responsibilities to the community and its surrounding environment. As a set of the target, fourteen areas by Hon'ble NGT and one more- plastic waste by Govt of Uttarakhand were included under the district plan. These 14 areas were regarding compliance to rules for solid waste including legacy waste, bio-medical waste, construction & demolition waste, hazardous waste, E-waste, polluter stretches, non-attainment cities, industrial clusters, the status of sewage treatment plants (STPs) and re-use of treated water, the status of common effluent treatment plants (CETPs) /effluent treatment plants (ETPs), ground water extraction /contamination and re-charge, air pollution including noise pollution, illegal sand mining, and rejuvenation of water bodies. In addition, plastic waste was also assessed based on consultative workshops with the State Government including SPCB.

Implementation of the environment plan based on fundamental indicators will do noticeably more to ensure that these objectives are achieved and our compliance obligations are met. It will also allow environmental opportunities associated with our activities to be further explored and undertaken. The environmental plan describes how action might impact the natural environment in which it occurs and set out clear commitments on how those impacts will be avoided, minimized, and managed so that they are environmentally acceptable. We hope this document will act as an easy reference for various stakeholders interested in the progression of sustainable development planning for the Bageshwar district. Moreover, it will help develop a comprehensive understanding of the environmental planning process, which has gone into the development of the area over the period. Finally, it briefly touches upon the imminent need for bringing in a mountain perspective in developmental planning for the district.

Date: October 18, 2021,

Principal Investigator, Co-Principal Investigators & Project staff

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

AMRUT	-Atal Mission for Rejuvenation &Urban Transformation
APL	-Above Poverty Line
AR	-Assessment Report
As	-Arsenic
BMWMIS	-Biomedical Waste Management Information System
BPL	-Below Poverty Line
C	-Carbon
C&D waste	-Construction & Demolition waste
CACMP	-Catchment Area Conservation Programme
CAGR	-Compound Annual Growth Rate
CAMPA	-Compensatory Afforestation Fund Management and Planning Authority
CBMWTF	-Common Bio-Medical Waste Treatment Facility
Cd	-Cadmium
CD	-Check Dam
CEMS	-Continuous Emission Monitoring System
CETP	-Common Effluent Treatment Plant
CFL	-Compact Fluorescent Lamps
CGWB	-Central Ground Water Board
CH_4	-Methane
CK	-Chal Khal
CO	-Carbon monoxide
CO_2	-Carbon dioxide
CPCB	-Central Pollution Control Board
CPHEEO	-Central Public Health and Environmental Engineering Organisation,
Cr	-Chromium
CSCs	-Community Sanitary Complex
CT	-Contour Trench
Cu	-Copper
DDT	-Di-chloro diphenyltrichloroethane
DPR	-District Project Report
DPRO	-District Panchayati Raj officer
EEE	-Electronics & Electrical Equipment
EEMI	-Electricals & Electronics Manufacturing in India

ENVIS	-Environmental Information System
ETPs	-Effluent Treatment Plants
E-Waste	-Electronic Waste
F	-Fluoride
FPZ	-Flood plain zones
FSI	-Forest Survey of India
FSSM	-Faecal Sludge & Septage Management System
GBPNIHE	-G.B. Pant National Institute of Himalayan Environment
GIS	-Geographical Information System
GPS	-Global Positioning System
HCFs	-Health Care Facilities
HFL	-Highest Flood level
ICIMOD	-International Centre for Integrated Mountain Development
ICT	-Information & Communication Technology
IEC	-Information, Education & Communication
IHHLs	-Individual Household Latrines
IPC	-Inter-Personal Communication
IPCC	-Intergovernmental Panel on Climate Change
IRAP	-Integrated Rural Area Programme
ISO	-International Organization for Standardization
ISWM	-Integrated Solid Waste Management
IWRM	-Integrated Water Resources Management
MBBR	-Moving Bed Biofilm Reactor
MDWS	-Ministry of Drinking Water & Sanitation
MMT	-Million Metric Tons
MoEF&CC	-Ministry of Environment, Forest & Climate Change
MoF	-Ministry of Finance
MoUHA	-Ministry of Urban & Housing Development
MPCC	-Medical Pollution Control Committee
MRF	-Material Recovery Facility
MSMEs	-Micro, Small & Medium Enterprises
MSW	-Municipal Solid Waste
MTPD	-Metric Ton Per Day
NA	-Data Not Available

NA	-Not Applicable
NAAQS	-National Ambient Air Quality Standards
NACP	-National Clean Air Program
NASA	-National Aeronautics & Space Administration
NCEPC	-National Committee on Environment Planning & Co-ordination
NGOs	-Non-Governmental Organizations
NGT	-National Green Tribunal
NH	-National Highway
NITI	-National Institution for Transforming India
NP	-Nagar Panchayat
NPP	-Nagar Palika Parishad
NTFPs	-Non-Timber Forest Products
ODF	-Open Defecation Free
OSS	-On-Site Sanitation
PAT	-Perform, Achieve & Trade
PCC	-Pollution Control Committee
PHCs	-Primary Health Centre
PM	-Particulate Matter
PT	-Percolation Tank
PWD	-Public Works Department
QPD	-Quintal Per Day
RBMs	-Riverbed Minerals
ROHS	-Restriction of Hazardous Substances
RSM	-Rural Sanitary Marts
RTRWH	-Rooftop Rain Water Harvesting
SBM-G	-Swachh Bharat Mission Gramin
SDGs	-Sustainable Developmental Goals
SIDCUL	-State Industrial Development Corporation of Uttarakhand Limited
SLWM	-Solid & Liquid Waste Management
SPCB	-State Pollution Control Board
SSMG	-Sustainable Sand Management Guidelines
STP	-Sewage Treatment Plant
TPD	-Ton Per Day
TSDF	-Treatment Storage & Disposal Facilities

UKPCB	-Uttarakhand Pollution Control Board
ULBs	-Urban Local Bodies
UNDP	-United Nations Development Programme
UREDA	-Uttarakhand Renewable Energy Development Agency
WHO	-World Health Organization
ZED	-Zero Effect Zero Defect
ZLD	-Zero Liquid Discharge
µg	-Microgram

EXECUTIVE SUMMARY

Bageshwar district is witnessing a rise in levels of urbanization, a rising quantity of waste, wastewater and a lack of sustainable public transport. Moreover, increased tourism has brought with it several environmental and urban planning related challenges for the district. While the causal mechanisms of environmental and climate change are numerous and complex, economic growth and population growth are the factors that can be highlighted to explain the increasing stress imposed by human interference on the natural environment.

To analyse the current environmental status and to furnish a comprehensive plan to mitigate the environmental deterioration, GBPNIHE was assigned the task to prepare a district Environment plan. Detailed deliberations were carried out to devise the action plan focusing on explicit thematic areas which include:

- ***Waste Management Operations:*** At present, proper collection and disposal of solid waste *(both dry and wet)* is practised in the urban centres of the district. However, there is no established mechanism for waste collection in rural areas. There is a very unique decentralised mechanism is adopted for wet waste management by both the urban local bodies.
- Waste segregation at the source is a major issue in all the urban local bodies of the district. Moreover, the waste recovery and disposal facilities are not robust. Due to improper segregation of municipal solid waste, domestic hazardous and E-waste are also dumped in the landfill sites causing environmental hazards.
- ***Biomedical Waste Management:*** Currently no healthcare facility in the district has linkage with any Common biomedical waste treatment facility. The deep burial method is adopted in all health care facilities for the disposal of biomedical waste.
- So the district authority must consider linking the health care facilities of the district with the nearby common biomedical waste treatment facility.
- ***Construction and demolition waste management:*** Rapid urbanisation and development of road infrastructure in the district have led to an increase in the generation of construction and demolition waste. Indiscriminate disposal of road construction and debris from landslides have endangered downhill slopes and polluted rivers. Still, the district lacks a mechanism for the proper handling of this waste. Bylaws must be framed to have a common set of guidelines for the management of C&D waste.

- ***Wastewater Management:*** At present, there is no sewage treatment plant in any of the towns of the district. Conventional on-site sanitation method of septic tank+soak pit is mostly used everywhere in the district.
- So there is an urgent need to implement the FSSM (Fecal Sludge and Septage Management) policy of the central government to improve sanitation in the district. As this is both financially and topographically suitable for the district.
- The district has no operational industrial effluent treatment plant as liquid waste generating industrial units are not established in the district so far
- ***Air and Noise Pollution:*** Compared to a couple of decades ago, particulate pollution is no longer a feature of Indo-Gangetic plains alone. Events of massive forest fires are increasing and the numbers of vehicles are also soaring. Thus there is a need for continuous monitoring of air quality and noise levels in the district to come up with a mitigating strategy.
- ***Surface and Groundwater Management:*** As the global temperatures are rising and weather patterns are changing drastically, the water sources in the Himalayan region are severely affected. As the district is dependent on glacier-fed water bodies and groundwater sources for its water needs, hence proper watershed and spring shed management needs to be done for sustainable management of water sources.
- ***Mining activity:*** As the district is well known for the mining of minerals like Soapstone and Magnesite so it becomes important to have proper surveillance of mining activities and it becomes also necessary to have a check on the ambient environment near mining areas. So requirement modern surveillance system is there.

The execution of this management plan will require the integration and cooperation of the people, private and public stakeholders of Bageshwar. This plan aims at reducing the risk on the human health and environment with a target of sustainable development.

INTRODUCTION

The link between environmental degradation, economical scarcity, and poverty is straightforward. The world's poor are significantly prone to natural disasters pertaining to the fact that in many cases their livelihoods are directly dependent on natural resources (Eriksson, et al., 2019). Human welfare is closely associated with the health of the environment. Around the world, 24 per cent of deaths can be traced back to avoidable environmental factors (WHO, 2018). People are in dire need of clean air to breathe, fresh water to drink and places to live that are free of toxic substances and hazards. The 2030 agenda for Sustainable Development goals and its 17 SDGs adopted by world leaders defines a blueprint for future development trajectory to all nations with a focus on poverty eradication, environmental sustainability, peace and harmony (Anonymous, 2018; WHO, 2018; Azash, & Thirupalu, 2017). Recently released report, "Climate Change: 2021: The Physical Science Basis" as a part of IPCC's *(Intergovernmental Panel on Climate Change)* Sixth Assessment Report *(AR6)* has raised a crucial red flag that global temperatures have already risen by about 1.1ºC from pre-industrial times and warns that the 1.5ºC threshold is likely to be breached before 2040 *(the stated objective of 2015 Paris Agreement, the international architecture to fight climate change, is to limit the temperature increase to within 2 ºC from pre-industrial times)* (IPCC, 2021). In India, the report says that waves and humid heat stress will be more intense and frequent in the 21st century. Changes in monsoon precipitation are also expected, with both annual and summer monsoon precipitation projected to increase (Krishnan, et al., 2020). To shed some light on the Himalayan context, the area is one of the most fragile mountainous regions of the world; hence it is very much susceptible to changes in Environment and Ecology (Krishnan, et al., 2020). These mountains are the Water towers of Asia, as they are the origin of the major rivers in the Indian sub-continent. But for the past two decades, the area has become a global hotspot of Environment degradation and the indirect impact has been seen in the glaciological aspect of these mountains (Eriksson, et al., 2019). Over a billion people worldwide and over 500 million in South Asia are reliant on the healthy aspect of this Himalayan Ecosystem. In India, it directly serves a national interest because of an imperishable ecosystem developed by them, which helps in realizing sustainable development in the Indo–Gangetic plains. A prerequisite for such sustainability is ecological audit in areas, which at once would apprise about the present environmental issues and a strategy to meet the targets for the future (Sandhu & Sandhu, 2015). Uttarakhand being a crucial chunk of the Himalayan regime is utmostly vulnerable to Environment mediated risks. About three fourth of the state's population is rural, hence their livelihoods are almost totally dependent on natural resources (Raj 2015) The traditional customs of the local

people of Uttarakhand, which tend to be sustainable and in harmony with the natural ecosystem are often overlooked as every time reckless development of roads, infrastructure, and environmental degradation takes precedence over the traditional ecological knowledge. The recent data on Sustainable Goal Indices released by NITI Aayog shows that the state is one of the top gainers with an increase in the overall index by 8 points. However, a lot is needed to be done in the indicators related to Climate Action *(SDG, 13)* (Chopra, 2014). The tragedy of ecological governance in most parts is that it remains trapped in Environment - Development Binary. In contrast, the people of Uttarkhand had in past shown with movements such as the Chipko Andolan (Sarkar, 2018), which sowed the germ of an idea of human well-being sensitive to forests, mountains, and water bodies.

The art of cultivating a balance between economic development and sustainable development is known to many but is implemented by few. We need to devise a strategy to break this trade-off so that a mutually beneficial situation is achieved for the Environment and Society (Messerli, et al., 2019). Environment plan is a prerequisite to understanding how the Social, Political and Economic factors are affecting the environment considering development. Environment planning begin in India in the early 1970s after the Human Environment Conference at Stockholm held by the United Nations which led to the formation of NCEPC *(National Committee on Environment Planning and Co-ordination)* (Natcom, 2012). Subsequently, the Ministry of Environment and Forest was formed in the mid-1980s by the Government of India. Realizing that the conservation of nature and its sustainability is a basic requirement for sustaining healthy life on the globe, the key purpose of this plan is to implement and devise programs intended to conserve and protect the environment (UNDP, 2015; Gaur, 2008).

FUNDAMENTAL PRINCIPLES OF ENVIRONMENT PROTECTION

(Judgments of the Hon'ble Supreme Court of India)

Sustainable Development

The Hon'ble Supreme Court has recognized the principle of sustainable development as a basis for balancing ecological imperatives with development goals. In rural litigation and Entitlement Kendra, Dehradun vs the State of U.P., the Hon'ble Supreme Court was hearing litigation for the problem of the mining activities in the limestone quarries in the Dehradun-Mussoorie area (Azash, & (No, 2014; Thirupalu, 2017). This was the first case of its kind in the country involving issues relating to the environment and ecological balance and brought into sharp focus the conflict between development and conservation. In this case, the Hon'ble Supreme Court emphasized the need for reconciling development and conservation in the larger interest of the country (No, 2014;

Sahu, 2014). Furthermore, it was realized that the necessary condition for achieving sustainable development is ecological security, economic efficiency and social equity (Rajaram, 2005).

Precautionary Principle

The emergence of the precautionary principle marked a shift in the international environmental jurisprudence – a shift from the assimilative capacity principle to the precautionary principle. It is a principle that ensures that a substance or activity posing threat to the environment is prevented from adversely affecting it, even if there is no conclusive scientific proof lining that particular substance or activity to the environment damage (Kriebel, et. al., 2001). In Vellore Citizens Welfare Forum vs Union of India, it was alleged that the untreated effluent being discharged by tanneries in Tamil Nadu was entering into the river, agricultural fields and was significantly polluting the water. Justice Kuldip Singh (Known to be Green Judge) observed that "even otherwise once these principles are accepted as a part of the Customary International law, there would not be difficulty in accepting them as part of domestic law (Venkat, 2012). It is an almost accepted proposition of municipal law, that the rule of customary international law, which are not contrary to the municipal law shall be deemed to be incorporated in the domestic law and shall also be followed by the Courts of laws of the country". As per this special principle, the burden is on the person wanting to change the status quo to show that the actions proposed will not have any adverse effect, the presumption operating in favour of environmental protection (Singh, 2000).

Polluter Pays Principle

Polluter Pays Principle has become a popular slogan in recent times. "If you make a mess, it's your duty to clean it up". It should be mentioned that in environmental law, this principle doesn't refer to" Fault". Instead, it favours a curative approach that is concerned with repairing ecological damage (Kriebel, et. al., 2001). The Supreme Court held that as per the Polluter Pays principle "once the activity carried on is hazardous or inherently dangerous, the person carrying out such activity is liable to make good the loss caused to any other person by this activity irrespective of the fact whether he took reasonable care while carrying on his activity. The rule is premised on the very nature of the activity carried on". While applying the principle of polluter pays, the Hon'ble Supreme Court later expressed the view that compensation to be awarded must have some correlation not only with the magnitude and capacity of the enterprise but also the harm caused by it (Kriebel, et. al., 2001).

Public Trust Doctrine

The public trust doctrine primarily rests on the principle that certain resources like air, sea waters and forests have such great importance to the people as a whole that it would be wholly unjustified to make them a subject of private ownership (Paul, 2014). The said resources being a gift of nature, they should be made freely available to everyone irrespective of the social status. This doctrine came up for consideration in the M.C. Mehta vs Kamal Nath (No, 2014). A rather unusual situation had arisen in this case. The flow of river Beas was deliberately diverted because it used to flood Span Motels in the Kullu-Manali valley in which a prominent politician's family had a direct interest. Though the Hon'ble Supreme Court did not specifically refer to the Doctrine of Public Trust directly, in many cases they have given effect to this doctrine implicitly (Azash, & Thirupalu, 2017). Traditionally the Doctrine of Public Trust was applied only for the protection of access to the common for public benefit, but now the Doctrine is being applied even to prevent over-exploitation of the environment (Azash & Thirupalu, 2017).

Public Liability Insurance

The Public Liability Insurance Act 1991 has been enacted to provide immediate relief to the victims of accidents that might occur while handling hazardous substances. The owner who has control over the handling of hazardous substances is required under the act to pay specified amounts to the victims as interim relief based on "No-Fault" liability. The expression 'Handling' is defined widely to include manufacture, trade and transport of hazardous substances. Accidents because of war or radioactivity are excluded from the scope of the Act (Azash, & Thirupalu, 2017). The principle of absolute Liability was propounded in the case of MC Mehta vs Union of India with the primary question regarding the extent to which industries engaged in hazardous and inherently dangerous industries can be held liable. This Principle was further reaffirmed in the Indian Council for Enviro Legal Action vs Union of India in which it was held that industries will be liable to the harm caused to villages due to the pollution caused to the soil and underground water and hence are bound to take remedial measure to improve the situation (Azash, & Thirupalu, 2017).

ENVIRONMENT MANAGEMENT SYSTEM (ISO 14001:2015)

An Environment management system helps organizations identify, manage, monitor, and holistically control their environmental issues. ISO 14001 is an internationally agreed standard that sets out the requirements for an environmental management system (Da, 2015). It helps organizations improve their environmental performance through more efficient use of resources and reduction of waste. Other ISO standards that look at different types of management systems

such as ISO 9001 for quality management and ISO 45001 for occupational health and safety, all use a High-level structure; this means that ISO 14001 can be integrated easily into existing ISO management systems. ISO 14001 includes the need for continual improvement of an organizations systems and approaches to environmental concerns (Da, 2015). It is suitable for organizations of all types and sizes, be they private not-for-profit or governmental. It requires an organisation to consider all environmental issues relevant to the operations such as air pollution, water and sewage issues, waste management, soil contamination, climate change mitigation, resource use and efficiency (Ferronato & Torretta, 2019).

The art of cultivating a balance between Economic development and Sustainable development is known to many but is implemented by few (Messerli, et al. 2019). We need to devise a strategy to break this trade-off so that a mutually beneficial situation is achieved for the Environment and Society (Kroll, et al., 2019). Environment plan is a prerequisite to understanding how the Social, Political and Economic factors are affecting the Environment considering Development. Environment Planning begin in India in the early 1970s after the Human Environment Conference at Stockholm held by the United Nations which led to the formation of the National Committee on Environment Planning and Co-ordination (NCEPC) (Vinuesa et al., 2020). Subsequently, the Ministry of Environment and Forest was formed in the mid-1980s by the Government of India. Realizing that the Conservation of nature and its sustainability is a basic requirement for sustaining healthy life on the globe, the key purpose of this plan is to implement and devise programs intended to conserve and protect the Environment (MoEF&CC, 2021).

DISTRICT PROFILE

The district of Bageshwar was carved out of Almora district in 1997 lies in the Kumaon region of Uttarakhand. It is surrounded by the district of Pithoragarh in the east, the district of Chamoli in the west, the mighty Himalayas in the north and the district of Almora in the south. The district is well connected with the other districts of Uttarakhand by a network of all-weather metalled roads. The major national highways passing through the district are NH 309A and the newly notified NH 109K.

Bageshwar is known as the “Adobe of Gods” gets its name from the ancient temple of Lord Shiva (Bagnath Temple) set in the heart of the town. Bageshwar has a rich Katyuri heritage and ancient

culture still evident in the valley region of the district. Kumaunis revered the Bagnath temple since ancient times. The temple became famous politically due to the 1921 movement against ‘‘Kuli Begar”. From ancient times, every year on the occasion of Makar Sankranti ‘Uttraiyini Fair’ is organised here and traders from remote places came here to sell their goods.

Kausani, a hill station situated in the district is famous for its tea gardens and scenic 300 km. wide panoramic view of the great Himalayan peaks. During the pre-independence era when Gandhi Ji visited this place, he was so much amazed by the beauty of this place and called it *“Switzerland of India”.* The woollen workmanship of this region is also widely recognized in the country and abroad.

Table 1. District at a Glance

Geographical Location	
Latitude	29º42’N -30^{0}18’N
Longitude	79^{0}28’E -80^{0}90’E
Geographical Area	2246 km^2
The average elevation of district headquarters	934 m
Population Data (2011 census)	
Overall Population	259898
Male Population	124326
Female Population	135572
Population density	116
Population growth rate	15.63%
Literacy rate	80.01%
Male literacy	92.33%
Female literacy	69.03%
Sex Ratio (2011 census)	1090
Administrative Setup	
Tehsils	06
Blocks	03
Nyay Panchayats	35
Village Panchayats	407
Total census villages	923
Municipal councils	01
Nagar panchayats	01

Source: District census handbook 2011; & District statistical report 2018-19

Topography

Bageshwar district comprises mainly two physiographic regions, first one is the Central Himalayan region (north of the main central thrust), and the other is the Lesser Himalayan region

(south of the main central thrust). The general slope is towards the south. The elevation varies from 3000m to 6861m in the northern part of the district whereas in the southern valleys it is as low as 800m to 900m at some places. Many rivers originate from the northern region makes their way to the southern region of the district. The rivers, along with their tributaries and sub tributaries, provide the district with numerous valleys which play an important role in separating the mountain masses from one another and in discharging the surplus moisture of the surrounding tracks. Based on geology, soils, topography, climate and natural vegetation the district is divided into three sub-micro regions.

Table 2. Important geographical features of the District

Region	Location	Geographical Features
Great Himalayan region/ Central Himalayan region	The extreme north part of the district	Permanently covered under snow and almost inhabited. The average elevation is above 4000 m.
Pindar Basin	Between the great Himalayan region and the Saryu basin	Narrow and deep river valleys. Average elevation ranges from 2000 to 4000m.
Saryu Basin	The southern part of the district	Ridges and valleys with gentle slopes make the region suitable for agriculture. The slope varies from 800 to 2400 m.

Source: District survey report for minerals 2016

Climate

The climate of the Bageshwar district is sub-tropical to sub-humid type except for the northern part where the cold temperate climatic conditions prevail and the temperature goes down to -6^0 C, the northern part of the district experiences sub-zero temperatures throughout the year whether the southern part is comparatively warm and humid, temperature generally goes above 30^0C in the southern valleys. Severe winter is the main climatic feature of the district. The maximum rainfall occurs in the monsoon season that occurs between July to September.

Rainfall

The district receives an average rainfall of about 1220.74 millimetres, which predominantly occurs in the rainy season pertaining to the fact that the 80% of the annual rainfall happens from June to September. July and August are usually the wettest months which accounts for about 70 to 80 per cent of the annual rainfall. Winter precipitation is associated with the passage of Western disturbances which causes snowfall over higher elevations and rainfall over valleys.

Drainage

Drainage in the region is mainly controlled by Pindar, Saryu (or Sarju), Gomati and their tributaries (locally called Gad, Gadhera and Nadi.) The Central and North-Central parts of the district are drained by the Saryu River. Gomati River drains the western and southeastern parts whereas the Pindar River drains the northern part. These rivers are primarily fed by snowmelt with a relatively smaller contribution from groundwater. However, during the lean period, the rivers are fed by groundwater occurring as base flow. The following table indicates the main rivers and their tributaries in the district.

Table 3. Major River Systems in the Bageshwar District

Major river Systems	Origin	Tributaries
Pindar river system	Pindari Glacier	Saurgad, kaphnigad, Bauragad, sundardhungagad
Saryu river system	Sarmul, 15 km. south of Nanda Kot Mountain	Gomati, Bhrapadigad, Jalaurgad, Bhaurgad, Alaknandi, Saniyangad, Panar, Eastern Ramganga

Source: District survey report for minerals 2016

Forests

The District is rich in forest cover having a variety of flora and Fauna. The vegetation varies from small grass to gigantic tree species like Sal (*Shorea robusta*), Sain (*Sehima nervosa*) and Siris (*Albizia lebbeck*) etc. Forest cover varies as per the height and altitude in the area. The highest spot lies in the Dhakuri forest block (3213 m) in the Kapkot range and the lowest spot is Bageshwar itself (884 m) at the confluence of the Saryu-Gomti rivers. The District area extends from the lesser Himalayas to the Greater Himalayan range. The main species of the forest are Chir Pine (*Pinus roxgueghaii*), Burash (*Rhododendron arborium*) Khaphal (*Myrica esculenta*) and Oak (*Qurecus glauca*) etc. The area has a good diversity of medicinal herbs. The propagation of these plants has good potential in the area. Some measures of marketing i.e. buy-back mechanism may be adopted so that growers can take good advantage of their crops. The soils are mostly granite and sandy loam in nature, also quite deep and fertile. These soils are suitable for agriculture in lower regions and pH ranges from 5.5 to 6.5.

Table 4. Forest cover of Bageshwar District

Particular	Geographical Area	Very Dense Forest	Mod. Dense Forest	Open Forest	Total	Change wrt 2017 assessment
Forest Area of Bageshwar (Km^2)	2,241	162.39	761.61	338.69	1,262.69	1.69

Sources: FSI Report 2019

Flora and Fauna

Flora

The magnificent Himalaya is well recognized for its bio-physical diversity and socio-cultural heritage, unique physical and ethnic diversity, traditional systems and an ample quantity of indigenous knowledge or tribal wisdom. Plants provide food and other life-supporting commodities and are very important for the survival of human beings and other organisms, besides they protect our environment. Tropical forests are the major reservoir of plant diversity. Those forests inhabit a large number of trees, shrubs, herbs, climbers, faunal wealth and a wealth of non-timber forest products including medicinal and wild edible plants and maintain nature. Some plants in the Bageshwar district are Giloe (*Tinospora sinensis*), Pine (*Pinus roxgueghaii*), Burash (*Rhododendron arborium*), Khaphal (*Myrica esculenta*), Samel (*Bombax ceiba*), Timur (*Zanthoxylum armatum*), andSiris (*Albizzia chinensi*) etc.

Fauna

Bageshwar district, located in Kumaon Himalayas of Uttarakhand. The high altitudes (Pindari and Sunderdhunga valleys) of the district support a diverse and unique assemblage of wild flora and fauna. These valleys are situated in the heart of the Kumaon hills and are located in the southern part of Nanda Devi Biosphere Reserve. Leopard (*Panthera pardus*), Asiatic Black bear (*Ursusthi betanus*), Indian peafowl (*Pava cristatus*), Grey Francolin (*Francolinus pondicerianus*), Black Drongo (*Dicrurus macrocercus*), Spotted Dove (*Streptopelia chinensis*), possessing plumage of magnificent design and colours.

Culture and Tradition

Bageshwar is famous for its thriving Kumauni culture. The functions and festivals celebrated here are not only an expression of the religious, social and cultural urges of the people but have also sustained the folk culture and have been the centre for the economic activities of the people. Every year on the occasion of Makar Sankranti, the Uttarayni fair is organized on the banks of Saryu and Gomati. It is the biggest cultural festival in the Kumaon region and has been the hub of trade between India and Tibet.

Mineral Resources

Bageshwar is quite known for its mineral resources and mineral processing industry. The district has reserves of minerals such as Magnesite and Soapstone. There are 42 mining industries spread throughout the district. Out of which 41 are Soapstone mining industries and all are owned by

private companies. There is a magnesite processing unit in the district known as “Almora Magnesite Factory” and is owned by the public sector.

Major Environmental Concerns In Bageshwar

Bageshwar is a fully mountainous district and the lives of the people here are intermingled with the local environment. The livelihood of the major portion of the population is dependent on natural resources so this proximity has created many challenges when it comes to dealing with environmental issues. The district Bageshwer is rich in water resources but ill management of the resources has aggravated the crisis. The discharge in the major rivers like Saryu and Gomati is decreasing due to many reasons such as massive forest fires in the recent decade causing depletion of the groundwater table and use of dynamites for the road construction which has disrupted fissures and led to drying of springs. Climate change has a profound impact all over the globe and the district is also not untouched by this. Due to climate change, the Himalayas are warming at a faster rate causing uncommon weather patterns in the district which is affecting the livelihood of the local community. So it is need of the hour to take preventive measures to mitigate the risks of climate change in the local community. Construction of roads, resorts and other infrastructure in a haphazard manner led to severe damage to the environment. An increase in landslides in recent years is one of the major impacts that are visible to all. Unplanned development in the towns of Bageshwar, Garur and Kapkoat has created many problems such as improper drainage and waste management facilities and frequent traffic jams etc. An increase in the demand for construction material also causes the problem of illegal sand mining in the region.

DATA AND IMPACT ANALYSIS

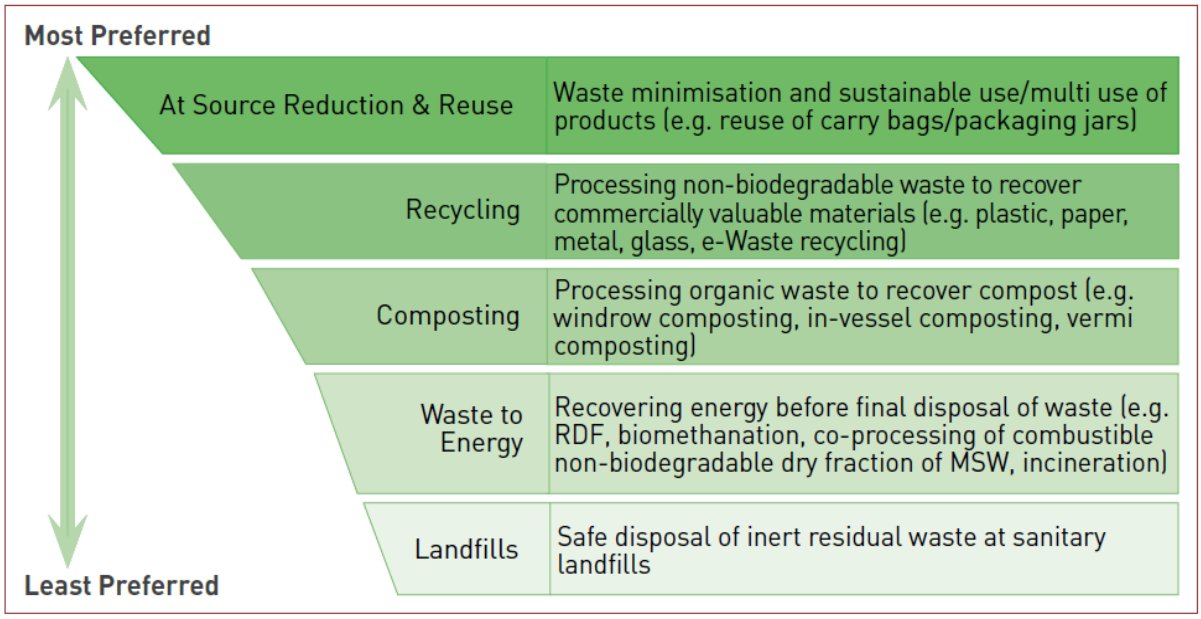
SOLID WASTE MANAGEMENT

Ministry of Environment, Forest and Climate Change (MoEF&CC) defines Municipal Solid Waste (MSW) as commercial and residential waste generated from a municipal area in either solid or semi-solid form excluding hazardous waste (Industrial), but including treated bio-medical waste. Predominantly, about 0.17 kg of MSW is generated per capita per day in small towns compared to about 0.67 kg per capita per day in cities. More than 70% of waste in India is considered to be dumped in an unsatisfactory manner (Sharma and Jain, 2019).

Integrated Solid Waste Management (ISWM)

It is based on the waste management hierarchy, with an aim to reduce the amount of waste being disposed while maximizing resource recovery and efficiency. Based on this waste management

hierarchy, an assessment of local needs and conditions should lead to the selection of an appropriate mix of process and technologies.



(Source: MoHUA, 2016)

Fig: 1. **Integrated Solid Waste Management (ISWM)**

Solid Waste Management in Bageshwar District

Waste management is still in its early stage in most of the ULBs of Bageshwar district. Total solid waste generation is varying according to population density and urbanization in each ULB (Table 5). Waste management operations are carried out in each district which includes segregation at source, door to door collection, sweeping, waste transport, waste disposal etc. (Table 6) for which infrastructure has been developed pertaining to financial conditions (Table 7). Based on composition of waste, different methods are adopted for waste recovery, recycling etc. Some of the ULBs are making third party interventions to achieve effective waste disposal (Table 8).

Table 5. Inventory of Total Solid Waste Generation

Name of Urban Local Body	Population *(2011)*	Number of Wards	Solid waste generation *(MTPD)*			
			Dry	Wet	C&D and others (*Unsegregated waste*)	Total
Nagar Palika Parishad Bageshwar	25045	11	4	3.50	Not estimated	7.50
Nagar Panchayat Kapkot	5365	7	1.5	0.5	Not estimated	2.00
Nagar Panchayat Garur	*Nagar Panchayat Garur is a newly formed urban local body and is yet to start its waste management operations. So the quantity of daily waste generated is not estimated so far.*					

Table 6. Waste Management Operations

Waste Management Operations	Outcome	
Segregation at source	***ULB***	***Source Segregation (%)***
	Nagar Palika Parishad Bageshwar	**90**
	Nagar Panchayat Kapkot	**80**
Door to Door Collection	Both the ULBs in the district have 100% coverage for door to door collection.	
Sweeping	Both the ULBs in the district are accomplishing 100% sweeping by manual method.	
Segregated waste Transport	***ULB***	***Segregated waste Transport***
	Nagar Palika Parishad Bageshwar	Partial
	Nagar Panchayat Kapkot	Partial
Material Recovery Facility (MRF) operation	• Both the ULBs of the district have not installed material recovery facilities. • Final segregation is done manually at some temporary sites in both the ULBs.	
Involvement of Non-Governmental Organizations (NGOs)/ private agencies	Both the ULBs handle their waste management by themselves.	
Authorization and issuance of Identity cards to waste pickers/Sanitation workers	***ULB***	***Numbers***
	Nagar Palika Parishad Bageshwar	28
	Nagar Panchayat Kapkot	14
Linkage With Treatment Storage and Disposal Facilities (TSDF)/Bio-Medical Waste Treatment Facility (CBMWTF)	As the amount of Sanitary and domestic hazardous waste is very less so none of the ULB has linkage with such treatment facilities.	

Table 7. Present Infrastructure for Waste Management Operations

	Inventory of Infrastructure Involved in Waste Management Operation

Name of ULB	Waste collection trolleys	Mini collection trucks/tractors/ others	Composting units/ On-site composting facilities	Material Recovery Facility (Available/Not Available)	Landfills (open dumping/Trenching Ground/sanitary landfills)	Remarks
Nagar Palika Parishad Bageshwar	40	06	300	Not Available	Trenching Ground	DPR of 3.20 Cr. has been approved for revamping waste management operations in the ULB under which procurement of various types of machinery and construction of a Material recovery facility and sanitary landfill is proposed.
Nagar Panchayat Kapkot	11	02	40	Not Available	Open dumping	A DPR of 76 lakhs has been approved for upgrading the waste management operations under which procurement of machinery and construction of material recovery facility is proposed.

Table 8. Methods of Treatment, Disposal and Recovery

Name of ULB	Wet waste management *(Centralised or on-site composting)*	Dry Waste Management *(waste to Energy/Recycling/incineration/ open Dumping in Trenching ground/ sanitary landfill)*	Remediation of the old dump site
Nagar Palika Parishad Bageshwar	• Wet waste management in the ULB is very commendable. • As decentralised composting is done by 300 families, this help to reduce the transportation charges of the Nagar Palika Parishad.	• Dry waste is after collection is segregated into different categories. • Recyclable waste is sold after compaction and residual (inert) waste is dumped in the trenching ground.	Around 200 MT legacy waste is dumped in the ULB, for the remediation of this waste the Nagar Palika Board has applied for necessary approvals.

Nagar Panchayat Kapkot	• Similar to NPP Bageshwar, Nagar Panchayat Kapkot is also managing its wet waste in the best way possible. • Decentralised composting is done by 70 families of the ULBs.	• Recyclable dry waste after collection is sent to Bageshwar for recycling. • Non-recyclable waste is dumped in the dumping yard of the ULB.	There is not any old dump site in the ULB.

Gap identification and Proposed policies for effective waste management in Bageshwar district

Improper segregation of waste at source and open dumping are some of the common gaps identified in each ULB of Bageshwar district (Table 9). However, some policies have been proposed by each ULB to refurbish their waste management operations, which includes technological interventions as well. (Table 10).

Table 9. Gap Identification

Name of ULB	Observed Shortcomings	Remarks
Nagar Palika Parishad Bageshwar	Partial Source segregation of waste	Source segregation is done in all the 11 wards of the ULB, Nagar Palika Parishad is trying to achieve 100% source segregation as soon as possible.
	Partially segregated waste transport	As source segregation is partial in the ULB so completely segregated waste transport is not possible as of now.
	Non-availability of any waste recovery facility	DPR has been approved for improving waste management operations in the ULB.
	No linkage with authorised waste recyclers	ULB sells their waste to local Rag pickers who are not authorised so far.
	Minimal involvement of NGO/private firm for waste management operations.	Some women self-help groups are assisting the Nagar Palika in Waste collection but more such kind of involvement is desired from other such organisations also.
Nagar Panchayat Kapkot	Partial Source segregation of waste	NPP has achieved 80% source segregation so far and aiming for a target of 100% segregation at source.
	Partially segregated waste transport	As source segregation is partial in the U.L.B. so complete segregated waste transport is not possible as of now
	Non-involvement of NGO/private firm for waste management operations.	As of now no NGO or Private firm is serving the ULB in its waste management operations.
	Non-availability of any waste recovery facility	DPR has been approved for improving waste management operations in the ULB.
	No linkage with authorised waste recyclers	U.L.B. sells their waste to local Rag pickers who are not authorised so far.

**There is a gap identified in the waste management operations of all the ULBs of the district as no U.L.B. has established linkage with Treatment Storage and Disposal Facility (TSDF) and Common Biomedical Waste Treatment Facility (CBMWTF) for the disposal of domestic hazardous waste and municipal sanitary waste respectively.*

Table 10. Proposed Policies and Budget Requirements Put Forward by Different Stakeholders in the District

ULB	Stakeholders Responsible	Proposed Policy	Current status and Budget requirement
Nagar Palika Parishad Bageshwar	Nagar Palika	Revamping Solid waste management	• Currently, the ULB is performing very well in wet waste management but the problem is with the management of dry waste as there is no material recovery facility in the ULB so proper segregation of dry waste into different categories is not possible due to this. • To solve this issue DPR of 3.20 Cr. has been approved and some of the instalments are allocated to the ULB, with this allocation procurement of required machinery, and construction of material recovery facility and sanitary landfill is proposed. • ULB has granted the ODF (*Open defecation free)* status and application of ODF+ is under process.
Nagar Panchayat Kapkot	Nagar Panchayat	Revamping Solid waste management	• Similar to Bageshwar, Kapkokot is efficiently managing its wet waste but much improvement is desired in the management of dry waste. • Although to solve this issue DPR of 76 lakhs has been approved for the ULB. Under this allocation procurement of machinery and construction of required infrastructure is proposed. • Apart from this ULB is declared as bin free city in the year 2020 and has been granted ODF + status recently, the further application of ODF++ is under process.

Vegetation suitable for rehabilitation of dumping sites

Besides having aesthetic value, vegetation (natural or planted) on a landfill site has an important role to play in soil formation, removal of contaminants and erosion control (Sadowsky, 1999). Moreover, vegetation may also be used in leachate treatment. Sometimes, vegetation over landfill sites may show signs of damage due to presence of landfill gas *(LFG)* in the root zone. In view of reconstruction of a suitable medium for landfill, afforestation, plantation, or re-vegetation might provide a capping that is deep and as favourable as to root growth to achieve desired plants' performance in getting over these degradations. In this context, locally available species could be hardened and resistant in reclaiming the waste dump problem.

Table 11. Suggested vegetation for reclaiming landfill sites in the district Almora

Botanical Name	Local and English Name	Life form	Assimilating capacity	Altitude (m)	References
Quercus leucotrichophora A. Camus	Banj oak	Tree	Microbial biodegradation, binding, holding soils, and/or decreased leaching	1200-2400	Meenakshy et al, 1981
Bauhinia variegata L.	Kachnar	Tree	Absorbs Zn, Hg, As, Pb, Cu and Cd from wastewater	1250-1800	Das, 1981
Bauhinia acuminata L	Kachnar	Tree	conversion of Hg to volatile chemical from groundwater	1150-1500	Chaphekar, et al., 1980
Adina cordifolia (Roxb.) Hook. f. ex Brandis	Haldu	Tree	conversion of Se and Hg to volatile chemical from groundwater	Upto-1500	Prajapati, 2012
Berberis aristata DC.	Kingore	Shrub	Metals, radionuclides, hydrophobic organics	1350-2000	Das, 1981
Berberis asiatica Roxb. ex DC.	Kilmora	Shrub	Adsorb' all the dissolved gases	1650-2400	Das, 1981
Cynodon dactylon (L.) Persoon	Dubla, Doob	Herb	Absorbs Arsenic and Fluoride from wastewater	700-2500	Chaphekar, et al., 1980
Azolla pinnata R. Br.	Azolla	Herb	Control the Hg, and Cd from wastewater also known as bio-fertilizer	400-2200	Rai, 2008

Projected population and waste generation in Bageshwar district

Forecasting waste quantities in the future is as difficult as it is in predicting changes in waste composition. Storage methods, salvaging activities, exposure to the weather, handling methods and decomposition, all have their effects on changes in waste density. As a general rule, the lower the level of economic development, the greater the change between generation and disposal.

Census population data for the years 2001 and 2011 has been taken for population forecast. Decadal population and subsequent waste forecast *(For the years 2031& 2041)* has been done based on the following presumptions:

- The arithmetic increase method has been used for the decadal population forecast, hence the rate of change of population with time is assumed to be constant.
- 1.5% yearly growth in per capita waste generation has been taken keeping in mind the changing waste paradigm and floating population *(MOF,2009).*
- While forecasting predicted waste has been mentioned in a suitable range to provide flexibility in deciding waste management operations.

- The analysis includes population and waste generation estimations only for Urban local bodies and does not include areas under peri-urban and rural areas.

Table 12. Estimated Waste Generation

ULB	Projected Population			Projected Waste Generation (MTPD)		
	2021	2031	2041	2021	2031	2041
Bageshwar	31179	37313	43447	7.5	10.32	13.59
Kapkot	5786	6207	6628	2	2.47	2.98
Garur	5474	5946	6418	2	2.50	3.05

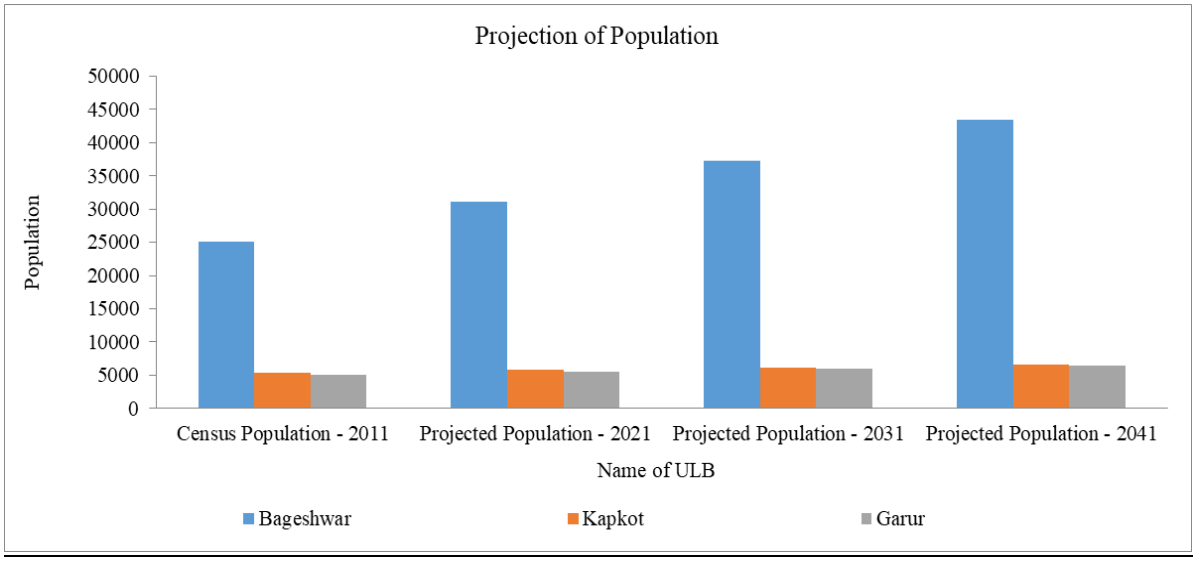


Fig: 2. **Graphical Representation of Projected Population**

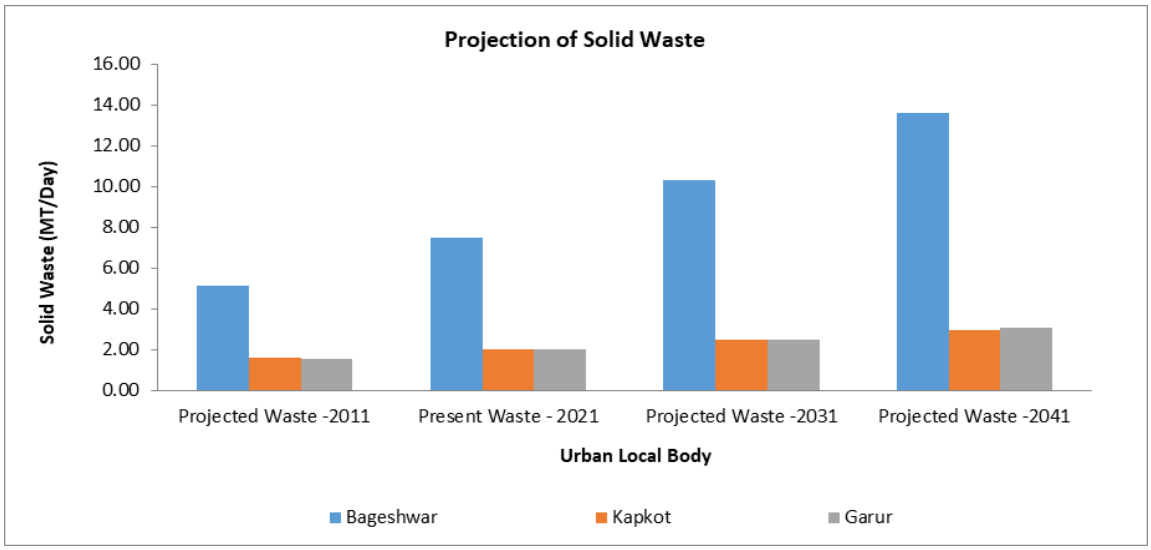


Fig: 3. Graphical Representation of Projected Solid Waste Generation

Inferences from the Forecasted Data

- Although Garur is a newly formed urban local body but the kind of growth trends it is showing, there is an urgent need is there to start the waste management operations as soon as possible.
- Among all the urban centres Bageshwar is expected to showcase unprecedented population growth so the district administration and the Nagar Palika board needs to develop their resources considering such growth trends.

Rural Solid Waste Management

The domestic waste generated in rural households of India is increasingly becoming an issue of serious concern. As reported by MDWS *(Ministry of Drinking Water and Sanitation)* about 0.3 to 0.4 million metric tonnes of solid waste is generated in rural India every day. Intending to achieve ODF plus status and to improve cleanliness, hygiene and the general quality of life in rural areas, the aspect of Solid and Liquid Waste Management(SLWM) assumes greater significance. Most of the solid waste generated in rural areas can be reused after generation because the generation rate of rural areas is much less as compared to urban areas.

Current standpoint about Rural Waste Management in India

- According to 2011 census, 68.84% of total population in India lives in rural areas which generates almost 0.3-0.4 million metric tonnes of waste per day.
- Due to lack of commercial development, Rural solid waste only contains Domestic waste (92.4%)as a major contributor to the total waste generated.
- Rural community produces comparatively more bio-degradable waste (63.5%) compared to non-bio-degradable waste (36%).
- About 78% of the rural population use open dumping as storage and collection of solid waste.

BIOMEDICAL WASTE MANAGEMENT

According to the latest biomedical waste management rules (published in 2016 and amended in 2019), Biomedical waste is defined as any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals. WHO fact sheet reported that from the total of waste generated by health care activities, 20% is hazardous. All the biomedical waste generated is very essential to be properly collected, Segregated, Stored, Transported, Treated and disposed of safely to prevent the spread of infectious diseases. The health system of Uttarakhand constitutes a large network of health care facilities based on a three-tier system. Due to its typical physiographical disposition and changing density of population in decadal growths, the Biomedical waste

management needs of the state of Uttarakhand has shown wide variations among its 13 districts. The following diagram shows the complete process of handling and disposal of biomedical waste.

Source: CPCB (Central Pollution Control Board)

Fig: 4. **Segregation of Biomedical Waste as per BMW rules,2016**

Importance of Biomedical Waste Management in the Wake Of Pandemic

As the whole world is facing a dearth of the pandemic, this has led to increasing in the generation of biomedical waste manifolds. A similar trend is also observed in our country as from 2019 to 2021, the daily biomedical waste generation increased from 619 MTPD to 800 MTPD *(CPCB,2021)* in the country and from 3.8 MTPD to 6.26 MTPD *(ENVIS,2020)* in the state. In the district itself, the daily biomedical waste generation increased by four times during the peak of the pandemic. In the present times, biomedical waste is generated not only from the health care facilities but also from the quarantine centres, residential areas where patients are in home isolation. Bio-medical waste is ought to be segregated from the municipal solid waste generated in the households during this time and thus has to be properly disposed to set aside the risk of infection to the workers handling the municipal waste.

Biomedical waste management in Bageshwar district

Sufficient government and private healthcare facilities are available in Bageshwar district, which consists of bedded and non-bedded hospitals, veterinary hospitals, pathology labs, clinics etc. The district relies on the conventional method of deep burial for disposal of biomedical waste. (Table 13)

Table 13. Inventory of current healthcare infrastructure for Bio-medical waste Management

S. No.	Parameter	Outcome	
1.	Health-care facilities in the district	***Facility***	***Numbers***
		Bedded HCFs	42
		Non-bedded HCFs	108
		Total	**150**
2.	Miscellaneous Health care Facilities in the District	***Facility***	***Numbers***
		AYUSH wings & Hospitals	24
		Veterinary Hospitals	12
		Other Medical Facilities (Leprosy, Tuberculosis, Infectious diseases)	7
3.	Number of health care facilities authorised by SPCB/PCC	All the 150 major health care facilities and other miscellaneous facilities of the district are authorised by the state pollution control board (SPCB).	
4.	Method of treatment used for the treatment of biomedical waste in the district	• Method of deep burial is used (after disinfection with sodium hypochlorite) for the treatment of biomedical waste in the district. • Liquid waste is discharged after proper disinfection with either bleaching powder and sodium hypochlorite.	
5.	Linkage with (CBMWTF) Common Bio-medical Waste Treatment Facility	No Healthcare facilities of the district have linkage with the Common Bio-medical Waste Treatment Facility.	

Table 14. Current Status of Biomedical Waste Management

S. No.	Action areas	Outcomes
1.	Authorisation of health care facilities by SPCB	All the 150 major health care facilities and other miscellaneous healthcare facilities of the district are authorised by the state pollution control board.
2.	Adequacy of facilities to treat biomedical waste	• At present no incineration facility is available in the district for the treatment of biomedical waste. • Biomedical waste is disposed of in deep burial pits after proper disinfection.
3.	Segregation of BMW as per guidelines of BMW rules, 2016	All the healthcare facilities of the district properly segregate their biomedical waste into separate colour-coded bins as per biomedical waste medical waste management rules 2016.
4.	Tracking of biomedical waste (Implementation of bar code system for tracking)	There is no facility available in the district for the bar code tracking of biomedical waste.
5.	District level monitoring committee	Established under the chairmanship of the District Magistrate.

CONSTRUCTION & DEMOLITION WASTE MANAGEMENT

Construction and Demolition waste is produced in the construction, remodelling, repair and demolition of residential/commercial buildings and other structures and pavements. It is a basic thumb rule that 40% of the total C&D waste originates from renovation work, 50% from demolition work and 10% from new construction work. C&D waste mainly consists of Concrete, Bricks, Timber, and Sanitary ware, Glass, Steel, and Plastic etc.

Implementation of 3R Principle in C&D Waste Management

The concept of 3R which refers to reduce, reuse, and recycle particularly in the context of production and consumption is well known today. It is something like using recyclable materials more than actual practice, reusing raw materials if possible and reducing the use of resources and energy. These can be applied to the entire life cycles of products and services – starting from design and extraction of raw materials to transport, manufacture, use, dismantling and disposal. The quantity of waste generated in the construction industry is quite large and much of this waste can be predicted and avoided. Hence it is evident that the application of the 3R principle will help reduce the C&D waste in the construction industry.

The present State of Affairs

- The volume of construction waste generated worldwide every year will nearly double to 2.2 billion tons by 2025, according to a report by Transparency Market Research.
- The country generates 150 Million Tonne/Year of C&D waste but the official recycling capacity is a meagre of 6500 tonnes/day or just about 1%*(as per the building material promotion council).*

Table 15. Thumb Rule for Estimation of C&D Waste Generation for India

Range	Type of construction
40-60 kg/m^2	New construction
40-50 kg/m^2	Building repair
300-500 kg/m^2	Demolition of building

Resent Infrastructure Within the State

- Currently, no treatent facility is available in the state for processing the C&D waste.
- In hilly districts, ample dumping zones are not established due to which waste is dumped at the river banks.
- As the management of C&D waste is not done in the state, so it is not possible to assess the total amount of waste generated.

Table 16. Current Status Related to C&D Waste Generation

S. No.	Action Areas	Outcomes/Remarks
1.	Quantity of C&D waste generated *(KGPD)*	Not estimated as no collection initiated. However, the quantity is assumed to be minimal.
2.	Collection of C&D waste	None of the ULBs has initiated the collection of C&D waste in the district.
3.	Establishment of Deposition points/Dumping Zones	• No dumping zones are established as of now by either of the ULBs. • However, dumping zones are established within the district by the other construction agencies such as PWD (*Public Works Department*) and RWD (*Rural Works Department*).
4.	Establishment of Linkage with any C&D waste recycling facility	There is no C&D waste treatment facility in the district. Moreover; none of the ULBs has linkage with any other common C&D waste treatment facility outside the district.

Table 17. Gap Identification

S. No.	Observed shortcoming	Outcome/Remarks
1.	Quantification of C&D waste.	As the collection of C&D waste is not initiated hence quantification of C&D waste generated in the district is not possible.
2.	Establishment of collection centre /Deposition points/Dumping Zones.	• Both of the ULBs has not established dedicated deposition points for C&D waste, as mostly the C&D waste generated in the district is excavated earth which is reused in filling the excavation. • However, sometimes dumping of the excavated material on the river banks is an issue.
3.	Implementation of by-laws for C&D waste management.	Due to lack of awareness regarding C&D waste management, it is not properly segregated, and as of now the process of implementing by-laws for the C&D waste management is not initiated by either of the ULBs within the district.
4.	Lack of strategies for C&D waste management.	Due to a lack of strategies for C&D waste management, dumping of C&D waste is done along the banks of rivers openly at many places in the district which is hampering the river profile.

C & D Waste Management in Rural Areas

In the rural areas of the district, construction work is very limited there0foreminimal amount of C&D waste is generated which mainly consists of the soil excavated from the foundation trenches and stones from the hill slopes. This excavated soil is reused in filling the plinth and trenches or many times used in filling the low-lying area. Stones obtained from the hill slopes are used in masonry work. There is an issue of improper dumping of muck on the river banks during the construction of roads which needs to be addressed.

HAZARDOUS WASTE MANAGEMENT

Hazardous Waste is any waste which because of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment whether alone or in contact with other wastes or substances. Tabulation of Hazardous waste generating units and quantification of wastes generated in India is done by the respective State Pollution control boards (SPCBs). Hazardous industrial wastes in India can be categorized broadly into two categories:

- Hazardous wastes are generated from various industries in India.
- Hazardous industrial wastes are transported to India from western Countries for re-processing and recycling.

The present State of Affairs

- The collection, transfer, processing, treatment and disposal of hazardous waste is governed by Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- According to CPCB Report 2019-20. In India, there are 69,308 hazardous waste generating units having authorized annual capacity to generate about 39.46 Million MT of hazardous waste. However, during 2019-20, about 8.78 Million MT of hazardous waste has been generated as per the annual returns submitted by such units.

Table 18. Hazardous Waste generation in India

Type of hazardous waste	Quantity/Year (MMT)	Percentage of Total waste
Land-fillable	2.13	24.29
Incinerable	0.40	4.52
Recyclable	2.07	23.59
Utilizable	4.18	47.6

Table 19. Inventory of Hazardous Waste in the District

<table>
<tr><th>S. No.</th><th>Parameter</th><th>Present status</th></tr>
<tr><td>1.</td><td>Quantity of Hazardous waste generated in the district (in MT/Annum)</td><td>
<table>
<tr><th>Incinerable</th><th>Landfillable</th><th>Recyclable/ Reusable</th><th>Total</th></tr>
<tr><td>NA</td><td>NA</td><td>0 .34</td><td>0 .34</td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>Number of Hazardous waste generating industries in the district</td><td>06</td></tr>
</table>

Table 20.Current Status Related to Hazardous Waste Management

S. No.	Action Areas	Outcome and Remarks
1.	No. of captive / common TSDF *(Treatment storage and disposal facilities)* in the district.	• Currently, there is no captive or common treatment storage and disposal facility (TSDF) in the district for the treatment of hazardous waste. • The hazardous waste generated in the district is sent to TSDFs available outside the district.
2.	Linkage with common TSDF	**(02)** *(Bharat Oil & Waste Management Ltd., Roorkee, Uttarakhand)* *(K. Nandini Refineries, Pilibhit)*
3.	Display board of Hazardous waste generation in front of gates of respective industries	As per the State Pollution Control Board, all the six hazardous waste generating industries in the district have installed a display board in front of their gates.
4.	Number of ULBs linked with common TSDFs	No ULB in the district is linked with common TSDFs for the treatment of domestic hazardous waste.
5.	Contaminated sites/probably contaminated sites within the district	As per the state pollution control board, there are no contaminated sites identified within the district.
6.	Regulation of industries & facilities generating Hazardous waste	Industries generating hazardous waste are strictly regulated by the state pollution control board.

ELECTRONIC WASTE MANAGEMENT

The Discarded and end-of-life electronics products ranging from computers, equipment used in Information and Communication Technology(ICT), home appliances, audio and video products and all of their peripherals are known as Electronic waste(E-waste). The ill-effects of e-waste could be on soil through leaching of hazardous contents from landfills; in water due to recycling process *(if not carried out properly),* through inhalation of gases during recycling, contact of the skin of the workers with hazardous substances and contact during acid treatment used in the recovery process.

The government of India has notified E-Waste Management Rules 2016, which are expanded to manufacturer, dealer, re-furbisher and Producer Responsibility Organization (PRO) of components, consumables, spares and parts of Electronics and Electrical Equipment (EEE) in addition to equipment as listed in Schedule I appended with the rules. Moreover, Compact Fluorescent Lamps (CFL) and other mercury-containing lamps are also brought under the provisions of these Rules**.**

Table 21. Bifurcation of E-Waste Based on Electronic Appliances

Types of Waste	Percentage Contribution
Computer devices	70%
Telecom sector	12%
Medical equipment	7%
Electric equipment	8%
Others	3%

Worldwide Scenario

- Electronics and Electrical Equipment (EEE) are manufactured and disposed of worldwide. In 2016, 44.7 Million Metric Tons (MMT) of e-waste was generated worldwide *(equivalent to 6.1kg/inhabitant).* Following the current growth rate of rising e-waste, it is estimated that by 2021, quantity has already risen to 52.2 Million Metric Tons or 6.8 kg/inhabitant.
- Out of the total e-waste produced in 2016, only 20% *(8.9 MT)* is documented to be collected properly and recycled, while there is no record of the remaining e-waste. The quantity of e-waste generated worldwide is expected to grow at a rate of 3.15% (CAGR).

Indian Scenario

- In 2016, India generated 2 Million Metric Tons (MMT) of E-waste. The transported e-waste in India from developed countries has further complicated the management of e-waste.

- India discarded approximately 1.85 million tonnes (MT) of e-waste in 2016 which is about 12% of the global e-waste production.
- India has emerged as the fifth largest Electronic waste producer in the world. City-wise, Mumbai tops the list in producing electronic waste, followed by New Delhi, Bangalore and Chennai.
- The government offices, public and private sector companies generate nearly 75% of e-waste; with the contribution of individual households only being 16%.

Table 22. Current Standpoints Regarding E-Waste Generation and Collection

S. No.	Parameter	Outcome & Remarks
1.	Quantity of E-waste generated per annum *(As per State pollution control board)*	**Uttarakhand** — *16260 MT* **Bageshwar** — *Not Estimated*
2.	Toll-free number in the district for the citizens to deposit E-waste.	The facility of a toll-free number to deposit E-waste is not initiated in the district.
3.	Collection centre established by ULBs in the district.	At present, there is no collection centre established by either the ULBs or the district administration.
4.	The number of authorized E-waste Recyclers/dismantlers in the state.	**(05)** • *Attero Recycling Pvt. Ltd. Raipur, Bhagwanpur* • *Bharat Oil & Waste Management, Mukhimpur, Laksar* • *Resource E-Waste Solution Pvt. Ltd. Bahadrabad* • *Scarto Metal Recycle Plant, Mewar Khurd, Roorkee* • *Anmol Paryavaran Sarakshan Samiti, Daulatpur Budhwa Shahid, Banjarewala*
5.	Linkage with any E-waste recycling facility	No ULBs in the district has established linkage with authorised E-waste recycling facility.
6.	Control over illegal trading or processing of E-waste in the district.	Controlled

Table 23. Gap Identification

S. No.	Observed Shortcomings	Remarks
1.	Establishment of collection centres & Toll-free number	• An ample amount of E-waste is lying idle in the government offices of the district which cannot be sent for recycling as there is no facility in the district to deposit E-waste. • As there is no facility of Toll-free number to deposit E-waste in the district so all the E-waste generated from the residential areas is mixed with municipal solid waste and thus not treated properly.
2.	Segregation of E-waste by ULBs	As the quantity of E-waste generated is very less so there is no mechanism in the ULBs for segregation.

3.	Linkage of ULBs with authorised recyclers/ Dismantlers	Yet to establish any linkage

WASTEWATER MANAGEMENT AND SEWAGE TREATMENT PLANT

Domestic sewage is the type of wastewater that is produced by a community of people and is characterized by the volume of flow, physical condition, chemical and toxic constitute and its bacteriologic status. Around 80% of water supply flows back into the ecosystem as wastewater, this can be a critical environmental and health hazard if not treated properly.

Currently, India can treat approximately 37% of its wastewater, or 22,963 million litres per day (MLD), against a daily sewage generation of approximately 61,754 MLD according to the 2015 report of the Central Pollution Control Board. Moreover, most sewage treatment plants do not function at maximum capacity and do not conform to the standards prescribed.

Piped sewerage system connects only 31.7 per cent of the total urban households with individual household latrines. More than half of the urban population in the State relies on On-Site Sanitation (OSS) systems such as septic tanks *(53.1 per cent)* for the collection of faecal sludge and wastewater. Further, some individual households in the state discharge the waste from their toilets directly into open drains.

Table 24. Current Scenario Related to STPs in Uttarakhand

Number of STPs Installed in Uttarakhand	71
Total Sewage Generation	627 MLD
Installed Capacity	448.18MLD
Operational Treatment Capacity	345 MLD
Actual Utilization	187 MLD*(42% of installed capacity, 54% of Operational capacity)*
80 % of the state's total sewage treatment plant capacity caters to Dehradun, Rishikesh and Haridwar (Plain areas).	

(Source: ENVIS Centre on Hygiene, sanitation, sewage treatment systems and technology)

Current Scenario Related to STPs in the District

Table 25. Inventory of Sewage Management

Name Of Ulb	Population	Quantity of sewage generated (MLD)
Nagar Palika Parishad Bageshwar	25045	Not Estimated
Nagar Panchayat Kapkot	5365	Not Estimated

Currently, no sewage treatment facility is operational in the Bageshwar district. It relies on the conventional on-site sanitation (OSS) system of septic tank + soak pit for sewage treatment. The

urban centres of the district have seen rapid expansion over the years. However, the infrastructure development related to sewage management being capital intensive and involving complex engineering takes considerable time that often cannot match the pace of urbanisation.

Due to the lack of sewerage treatment facilities in the district the on-site sanitation facilities of the district are overstressed also with the rapid urbanisation of the urban centres there are many constraints especially the shortage of land for the construction of individual on-site sanitation (OSS) facilities. So the construction of sanitation facilities especially for the urban centres of the district becomes necessary.

Several initiatives have been taken by the Government of India to achieve decent sanitation in the urban areas of the country. These initiatives may be broadly classified into

(i) Programmatic initiatives

(ii) Policy initiatives

Table 26. Major initiatives by the Government of India

Major categories	Major Initiatives	Objectives
Programmatic initiatives	Swachh Bharat Mission – Urban (SBM-U)	To provide access to sanitary toilet facilities to the entire urban population and to eradicate the problem of Open Defecation from the country
	Atal Mission for Rejuvenation and Urban Transformation (AMRUT)	Creation of basic urban infrastructure including sewerage and septage management in 500 cities/towns in the country
Policy initiatives	National Urban Sanitation Programme (NUSP), 2008	To transform Urban India into community-driven, totally sanitized, healthy and liveable cities and towns." The specific goals include awareness generation and behaviour change; open defecation free cities; and integrated city-wide sanitation.
	Manual on Sewerage and Sewage Treatment Systems, 2013:	Separate chapters have been allocated for decentralized sewerage systems and onsite sanitation, wherein, the different methods of decentralized sewerage and onsite sanitation systems are discussed in detail.
	National Policy on Faecal Sludge and Septage Management (FSSM), 2017	To set the context, priorities, and direction for, and to facilitate, nationwide implementation of FSSM services in all ULBs such that safe and sustainable sanitation becomes a reality for all
	Standard Operating Procedure (SOP) for Cleaning of Sewers and Septic Tanks, 2018	The set of procedures to be followed while cleaning the sewers and septic tanks its cleaning frequency and the use of personal protective & cleaning equipment are discussed in detail

On-Site Sanitation (OSS) vs. Underground Sewerage system

Wherever a sewerage system is available within 30m from the proposed individual household, community or public toilets only the superstructure (i.e. toilets) may be constructed under SBM and connected to the existing sewerage system. No construction of treatment units such as twin pits, septic tank, bio-digester or bio- tank shall be allowed.

But in case no such sewerage network is available then On-site sanitation is the only option left. In this system sewage is collected, treated and/or disposed off at, or near the point of generation, without the use of an underground sewerage system. OSS systems are sanitation facilities provided for the use of individual households, community and the floating population There are a number of situations when an underground sewerage system may not be feasible or desirable. For example, for smaller cities where construction of sewerage infrastructure may be expensive, or those cities that are in hilly areas or in undulating terrain where it may not be practical to construct a sewer network, or even in many cities that have grown organically and where not all households are connected to the existing sewerage network.

Table 27. Proposed Policies and Budget Requirements Put Forward by Different Stakeholders in the District

Name of ULB	Type of Septage Management	Stakeholders Responsible	Proposed policy
Bageshwar	Both On-site and Off-site Management.	Government of Uttarakhand	On-site Septage management (FSSM) is being planned by the respective committee, details of which have been sent for approval.

Liquid Waste Management in Rural Areas

Since the water supply for domestic purposes in rural areas has improved considerably over the years, the quantity of wastewater that is disposed of has also increased. Hence effective wastewater management systems need to be introduced in the rural areas to mitigate the problem of contamination in the majority of rural areas, untreated wastewater is discharged directly into the local surroundings and water bodies. This leads to contamination of surface as well as sub-surface water, having negative effects on the environment and human health.

Current standpoint about Rural Waste Water Management in India

- With Population growth and rapid industrialization, wastewater management has become a serious issue. Rural India with old or no infrastructure has reached a tipping point.
- India has the highest number of people who don't have access to clean drinking water. Even abundance of water in certain places do not guarantee access to safe, reliable, drinking water.
- United Nations Sustainable Development goal 6 focuses on access to clean water and sanitation for all. The goal of the initiative is to sensitize communities to the advantages of hygiene and sanitation.

Table 28.Policies Undertaken for Waste Water Management in Rural India

Current Policy	Sponsoring agency	Remarks
Construction and Usage of IHHLs *(Individual Household Latrines)*	Under SBM-G *(Swachh Bharat Mission- Gramin)*	There are various models of toilets available based on safe sanitation technologies like Twin pit, Septic tank, Bio toilets etc.
Availability of Sanitation Material through Rural Sanitary marts (RSM), Self-help groups (SHGs)	Under SBM-G*(Swachh Bharat Mission- Gramin)*	To provide material, services and guidance needed for constructing different types of latrines and other sanitary facilities for a clean environment,
Community Sanitary Complex (CSCs)	Under SBM-G *(Swachh Bharat Mission- Gramin)*	Such complexes comprise an appropriate number of toilet seats, bathing cubicles etc.*(Only where there is a lack of space in the village for the construction of household toilets.)*
Financial Assistance	Under SBM-G *(Swachh Bharat Mission- Gramin)*	Up to Rs.12000 is provided to BPL *(below poverty line*) households and identified APL *(Above poverty line)* households for the construction of one unit of IHHL. It is not the cost of the toilet but an incentive amount.
Mensural Health Management	Under SBM-G *(Swachh Bharat Mission-Gramin)*	It is aimed at making the behavioural change in the woman and adolescent girls using a clean menstrual management material to absorb or collect blood that can be changed in privacy as often as necessary for the duration of the menstruation period and having access to facilities to dispose of used menstrual management materials.

GROUNDWATER EXTRACTION/CONTAMINATION AND RE-CHARGE

Groundwater is found underground in the cracks and spaces in soil, sand and rock. Over 70% of the earth's surface is covered in water but of that water, just 1% is readily available for human use, out of which,99% is stored beneath our feet as groundwater *(The Groundwater Foundation, 2021).*

Groundwater extraction:

Over 80-85% of our country population depends on groundwater for drinking water. Groundwater is also one of our most important sources of water for irrigation. Due to overuse and leverage of high amount of groundwater water table decreasing with a rapid rate and it will very harmful for the mankind

Groundwater contamination

Groundwater contamination occurs when man-made products (such as gasoline, oil, road salts and chemicals) get into the groundwater and makes it unsafe and unfit for any kind of use for humans and as well as other animals *(The Groundwater Foundation, 2021*). Unfortunately, groundwater is susceptible to pollutants. Hazardous materials from the land surface can move through the soil and end up in the groundwater. For example, pesticides and fertilizers can find their way into groundwater supplies over time. Also, groundwater is contaminated by untreated waste from septic tanks and toxic chemicals from underground storage tanks and leaky landfills.

Groundwater Recharge

Groundwater recharge is a hydrologic process when water (rain, snow-melt etc.) moves downward from surface to groundwater. Most groundwater is recharged naturally but due to the high amount of groundwater extraction, the water table is falling day by day. Saving groundwater is very important for mankind as it is the major source of drinking water and agricultural irrigation water (The Groundwater Foundation, 2021). A comparison of depth to the water level of August 2019 with the decadal mean of august (2009-2018) indicates that there is a decline of more than 4m in the groundwater level in the state of Uttarakhand(CGWB,2019-20). Therefore, some artificial methods (Rainwater harvesting, Injection wells) are applied nowadays to save groundwater.

Table 29.Water Resources in the District

S. No.	Parameters	Outcome		
		Name	***Origin***	***Major Tributaries***
1.	Rivers/Streams	Saryu river	Sarmool (near Nanda Kot Mountain)	*Pungar, Lahur*

	in the District	Gomti river	Angyari Mahadev (Chamoli)	*Garur Ganga*
		Pindar river	Pindari Glacier	*Kaphni gad, sundardhunga gad*
2.	Nalas/drains meeting rivers	170 (As per the records of Forest Department Bageshwar)		
3.	Lakes and ponds	***Forest Range***	***Lake/Pond***	***Perennial/Seasonal***
		Bageshwar	Bagnigad Tal	
		Baijnath	Baijnath Lake (Artificial) Sarla Tal Sup Tal	Perennial
		Garkhet	Bali Bubu Tal	
		Kapkot	Sukunda Tal	
		Glacier	Dhakuri/Sankar Tal	
4.	The total estimated quantity of sewage generated in both the ULBs of the district (MLD)	5.16		

Table 30. Pollution Control in Water Resources

S. No.	**Parameter**	**Current Status**		
1.	Open Defecation in River/Nala/Khad	Fully controlled		
2.	Dumping of solid waste on River Banks	Fully controlled		
3.	Control Measures for idol immersion	Measures taken		
4.	Disposal of Untreated Sewage in Rivers	Nil		
5.	Monitoring of Action Plans for rejuvenation of rivers	Monitored		
6.	Encroachment near flood plains	No measures have been taken to control encroachment near flood plains.		
7.	Protection of flood plains	Guide banks are constructed on the banks of the rivers mainly in the urban areas other than that also the plantation has been done at some places to protect the river banks.		
8.	Availability of water quality data	The following table represents the recent sampling data provided by the district administration:		
		Characteristics	***River***	
			Saryu (Feb 2021)	***Gomti (Jan 2021)***
		pH (Hydrogen ion concentration)	7.79	7.89
		Biochemical oxygen demand (BOD) (mg/l)	1.0	1.0
		Dissolved oxygen (DO) (mg/l)	7.0	7.0

		Total coliforms / 100 ml	Nil	Nil

Table 31. Information on Groundwater in District

S. No.	Parameter	Current Status
1.	Estimated numbers of bore-wells/Hand pumps	60
2.	Groundwater polluted area in the district	No such area in the district is identified so far.
3.	Adequacy of Groundwater Availability	Not Estimated
4.	Disposal of Untreated Sewage in Rivers	Nowhere in the district, the untreated sewage is discharged directly into the rivers.
5.	Access to surface water and groundwater quality data at DM office	Not available

Current Standpoint Regarding Water Resources Management in Bageshwar

Present state of affairs

Common water sources used for water supply schemes over the district are:

- *Deep Tube-well,*
- *Khadins / Nadins/ Tankas/ Ponds / Wells/ Ooranis,*
- *Infiltration well,*
- *Rivers*
- *Rivulet / Naula / Gadhera,*
- *Springs*
- *Treated Surface Water,*
- *Streams*

- Rivulet / Naula / Gadhera (79.5%) followed by Springs (8%) and Streams (6%) are noted to be highly tapped for water schemes in Bageshwar
- Awareness activities are organized quarterly to bring awareness amongst people about the declining standards of water quality as well as overexploitation of Naulas and Dharas.
- No information is currently available on the annual change of ground water level in the district.

Source- Technical report: Water at a glance, Uttarakhand (An Assessment of water scarcity), GBPNIHE

Artificial Recharge of Groundwater

The geographical area of the district is divided into units like high relief glaciated areas, Structural hills, Denudational hills, dissected fans, River terraces and flood plains. The major part of the hilly area has a slope of more than 20%. the slope of this magnitude makes the area unsuitable for groundwater development due to low groundwater potential. In this region, the groundwater mainly manifests in the form of springs and occurs under unconfined conditions and the water table follows the topography.

Table 32. Artificial Recharge of Groundwater

District	Area (km^2)	Area identified for AR (Artificial recharge) (km^2)	Volume of unsaturated zone (MCM)	Available sub-surface space for AR (MCM)	Water required for artificial recharge (MCM)	Surplus available for recharge (MCM)
Bageshwar	2302	424	848	127	169	1061

The major part of the district is hilly with localized small valleys through which the entire runoff passes. The major part of the rainfall is lost as surface runoff. Apart from this the small rivers, nallas also act as carriers for base flow & spring water. Despite good rainfall, there is an acute shortage of water, especially during the summer. The state government is working for rainwater harvesting in the state under many projects to solve this issue.

Table 33. Artificial Recharge and RTRWH Structure constructed in Uttarakhand under catchment area conservation Program (CACMP)

District Name	Number of structures					Total cost (in lakhs)					Total cost (in lakhs)
	CD	CK	RTRWH	PT	CT	CD	CK	RTRWH	PT	CT	
Bageshwar	12	62	88	0	0	1.2	1.86	30.8	0	0	33.86

CT-Contour Trench, CK- Chal Khal, RTRWH- Rooftop Rain Water Harvesting, CD- Check Dam, PT- Percolation Tank, NA- Data not Available

Table 34. Artificial recharge and cost Estimate in Uttarakhand

District Name	Structures proposed					Unit cost Estimate (in lakhs)					Total cost (in lakhs)					Total cost (in lakhs)
	RTRWH	CD	PT	CK	CT	RTRWH	CD	PT	CK	CT	RTRWH	CD	PT	CK	CT	
Bageshwar	350	350	30	75	150	0.5	0.3	0.07	0.15	0.015	175	105	2.1	11.25	2.25	295.6

CT-Contour Trench, CK- Chal Khal, RTRWH- Rooftop Rain Water Harvesting, CD- Check Dam, PT- Percolation Tank, NA- Data not Available

AIR AND NOISE POLLUTION MANAGEMENT

Air Pollution Management

The ambient air that is the atmospheric air in its natural form consists of nearly 99.9% of Nitrogen, Oxygen, Water vapours, Carbon dioxide, and some other gases like helium, argon, methane, argon, etc. surrounds the earth and form its atmosphere. Any undesirable change in the composition of ambient air is called air pollution. The undesirable substances can be in solid, liquid, and gaseous forms and when present in sufficient concentration for a sufficient time under certain conditions can endanger human health and the welfare of plants and animals. According to the State of Global Air report 2020, Air pollution has now become the biggest health risk in India. Most of the cities in our country (the majority of them are from the region of Indo-Gangetic plains) are facing the problem of air pollution which has led to an increase in cases of breathing discomfort and other related diseases. To tackle the problem of air pollution in our cities, the Government of India has taken many steps, one of them being the National Clean Air Program (NCAP) 2019. Under this programme, 122 cities in the country are identified as non-attainment cities which includes three cities from Uttarakhand *(Dehradun, Rishikesh and Kashipur)*. These are the cities that have fallen short of the National Ambient Air Quality Standards (NAAQS) for over five years. The goal of the national Clean Air Program(NCAP) is to meet the prescribed annual average ambient air quality standards at all locations in the country in a stipulated timeframe. The tentative national level target of 20% to 30% reduction of PM2.5 and PM10 concentration by 2024 is proposed under the NCAP taking 2017 as the base year for the comparison of concentration (Table 35).

Table 35. national ambient air quality standards in India.

Pollutant	**Time-weighted average**	**Concentration in Ambient Air**	
		Industrial, Residential, Rural and Other Areas	Ecologically Sensitive Area (notified by Central (Government)
Sulphur Dioxide (SO_2), µg/m^3	Annual* 24 hours**	50 80	20 80
Nitrogen Dioxide (NO_2), µg/m^3	Annual* 24 hours**	40 80	30 80
Particulate Matter (size less than 10 µm) or PM_{10} µg/m^3	Annual* 24 hours**	60 100	60 100
Particulate Matter (size less than 2.5 µm) or $PM_{2.5}$ µg/m^3	Annual* 24 hours**	40 60	40 60
Ozone (O_3) µg/m^3	8 hours* 1 hour**	100 180	100 180

Lead (Pb) µg/m	Annual* 24 hours**	0.50 1.0	0.50 1.0
Carbon Monoxide (CO) mg/m^3	8 hours* 1 hour**	02 04	02 04
Ammonia (NH_3) µg/m^3	Annual* 24 hours**	100 400	100 400
Benzene (C_6H_6) µg/m3	Annual*	5	5
Benzo (a) Pyrene (BaP)-particulate phase only, ng/m^3	Annual*	1	1
Arsenic(As), ng/m^3	Annual*	6	6
Nickel (Ni), ng/m^3	Annual*	20	20

Source: National Ambient Air Quality Standards, Central Pollution Control Board Notification in the Gazette of India, Extraordinary, New Delhi, 18th November 2009.

** Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.*

*** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time, they may exceed the limits but not on two consecutive days of monitoring.*

Current Standpoint Regarding Air Pollution in the District

As the monitoring of ambient air quality is not yet started in the district so the present condition regarding the air quality is very difficult to ascertain. With the increase in the number of forest fire events and the number of vehicles in the district, the problem of air pollution is gradually increasing which needs to be addressed.

Table 36. Air Quality Monitoring and Data Accessibility

Action Area	Outcomes
Number of automatic air quality monitoring stations in the district	Yet to be installed
Number of manual air quality monitoring stations in the district	Yet to be installed
Availability of air quality monitoring data	Ample readings are not taken to provide necessary information about prevalent air quality standards.

Table 37. Identification of Sources of Air Pollution

Action area	Outcomes
Number of non-attainment cities in the district	No city in the district is classified as a non-attainment city according to the national clean air program *(NCAP).*
Prominent sources of air pollution in the district	Unprecedented forest fires and vehicular pollution are major reasons for Air pollution in the district.

Table 38.Control Measures for Industrial / Non-Industrial Air Pollution

Action Areas	Outcomes
Identification of Prominent air polluting sources	• Forest fires are the prominent source identified. • The increasing number of vehicles and mining operations on a large scale is also the point of concern in the district.
Control of industrial air pollution	• There are many mining sites in the district which could be a possible source of air pollution. However, no complaint is registered by the State Pollution Control Board for violation of norms by any of the mining sites. • However continuous monitoring of these mining sites is required.
Control of non-industrial air pollution	
(a) Control open burning of waste	As almost 100% door to door collection is done in both the U.L.Bs in the districts so practices of open burning of waste are not observed there but in the rural areas and other semi-urban areas where there are no provisions of waste collection as of now, waste burning is usually practised.
(b) Control of forest fires	• The Forest department has established fire crew stations and deployed fire watchers across the district to have a check over incidents of forest fires. • IEC (Information, Education & Communication) activities are organised periodically at the village level.
(c) Control of vehicular pollution	• 06 PUC centres are available in the Bageshwar district. • Total 80 Challans have been done in this financial year on violating pollution norms. • District administration is promoting E-Rickshaws for public transportation in Bageshwar town. • The transportation department is organising periodic awareness campaigns along with schools and taxi unions.
District level action plan for air pollution	At present, no such action plan has been prepared.
Awareness of air Quality	There is the mindset in the district that air pollution is not an issue in the hilly region so local citizens are not aware of the problem of increasing levels of air pollutants in the district especially in the urban centres of the district.
Development of Air pollution complaint redressal system	Not Initiated

Table 39. Gap Identification

Serial No.	Area of Concern	Remarks
1.	Forest Fires	• Lack of staff • Multiple departments are involved to resolve the issue, hence a lack of coordination and responsibility-sharing has been observed. • Sloping terrain makes it difficult for fire tenders to reach high altitudinal areas. • Abrupt migration from villages and change in living habits has exaggerated the situation. • Lack of inspection in forest areas under Van panchayat and Civil Forest.
2.	Lack of monitoring	Currently, no ambient air monitoring stations are installed in the district to have a check on the air pollution level around the widespread mining sites and to monitor the effect of the increasing number of vehicles on the ambient air quality.

Noise Pollution Management

Regular exposure to elevated sound levels may lead to adverse effects in humans or other living organisms. According to WHO sound levels less than 70 dB are not damaging to living organisms and exposure to noise levels beyond 85 dB constantly for more than 8 hrs. may be hazardous and leads to loss of hearing. Although noise pollution is a big issue in the district proper monitoring is required to maintain noise levels within the desirable limits. The following table represents the permissible noise level standards in India

Table 40. Noise Pollution Management in India

Area code	Category of area/zone	Limits in dB(A) L_{eq}^{*}	
		Day Time	Night Time
A	Industrial Zones	75	70
B	Commercial Zones	65	55
C	Residential Zones	55	45
D	Silence Zones	50	40

Source- Noise Pollution (Regulation and Control) Rules, 2000

Note: -

1. Daytime shall mean from 6.00 a.m. to 10.00 p.m.
2. Nighttime shall mean from 10.00 p.m. to 6.00 a.m.
3. A silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

* dB(A) L_{eq} denotes the time-weighted average of the level of sound in decibels on scale 'A' which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB(A) L_{eq}, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

L_{eq}: It is an energy mean of the noise level over a specified period.

Table 41. Current Status Related to Noise Pollution Management

S. No.	Parameter	Current Status
1.	Number of noise level measuring devices available with various agencies in the district	At present no noise level monitoring device is installed in the district.
2.	Number of complaints received by state pollution control board related to noise pollution in last 1 year	Nor the District administration neither the state pollution control board received any such complaint in the last 1 year.
3.	Implementation of ambient noise standards in residential and silent zones.	The local police are responsible for the implementation of the ambient noise level standards.
4.	Silent Zones in the district	No place in the district is declared a silent zone.
5.	Setting up of Sign Boards	Signboards are installed around hospitals, schools and along the highways by the concerned authorities.

ILLEGAL SAND MINING

Sand being an important economic resource and the second most used mineral after water is one of the main ingredients of concrete and mortar. Besides its economic importance, it also constitutes an important abiotic component in the aquatic ecosystem like rivers. As our country has seen robust growth in the infrastructure sector in the recent decade the demand for sand increased by manifolds. Further with the announcement of the national infrastructure pipeline project, the demand for sand is going to increase exponentially soon. In recent years, Uttarakhand has also seen an increase in riverbed mining operations. With the establishment of the stone crusher industry especially in the southern Terai and Bhabar region of the state, the scale and intensity of RBM (Riverbed Minerals) excavation have further increased in the past few decades. Uncontrolled and illegal mining of river bed minerals like sand has led to the loss of revenue to the state, degradation of aquatic and riparian habitat *(through large changes in the channel morphology)* and geology of adjoining groundwater systems.

Guidelines to Monitor Sand Mining in India

The Mines and Minerals (Development and Regulation) Act, 1957 has empowered state governments to make rules to prevent illegal mining, transportation and storage of minerals. However, still, large numbers of illegal mining cases are registered in the country and some cases; many of the officers even lost their lives while executing their duties to curb illegal mining. Ministry of Environment, Forests and Climate Change (MoEFCC) put forward the sustainable sand management guidelines (SSMG) 2016, which focus on the management of sand mining in India, but there is a need to revamp the existing system for effective enforcement of regulatory provisions and their monitoring. Recently, in 2020, a new set of guidelines have been put forward by the Ministry of Environment, Forests and Climate Change (MoEFCC) in 2020, which focuses on the effective monitoring of sand mining (from the identification of sand mineral sources to its dispatch and end-use by consumers and the general public) and uniform protocol for the whole country. Also, states are advised to conduct river audits and monitoring of mining activities with night vision drones and other modern surveillance equipment.

Table 42. Current Standpoints Regarding Mining Activities in the district Prevalent Mining Activities

Parameter	**Outcome**			
Total Area of District (km^2)	2302			
Area Covered under Mining (km^2)	9.8			
Type of Mining Activity	***Mining activity***	***Legal\Illegal***	***Area under mining (km^2)***	***Revenue***
	Soapstone	Legal	9.8 km^2	6,50,963 (*In the financial year 2020-21*)
	Magnesite	Legal	9.8 km^2	
	Sand	So far no sites are allocated in the district for sand mining. However, some cases of illegal mining have been observed on a very small scale for which penalties have been charged as per the rules.		
Total no of Mining sites in the district	***Type of Mineral***		***Mining sites***	
	Soapstone		52	
	Magnesite		01	
Number of sites where permission for mining is given to the district authority by the environmental ministry	103			
Number of mining sites operational in the present	53			
Action against illegal mining activities in the district (*in the financial year 2020-21*)	Amount received from the penalties charged for illegal mining		Amount received from the penalties charged for illegal storage & transportation of minerals	
	9,72,183		8,89,540	

Table 43. Compliance with Environmental Standards

Parameter	**Outcome**
Mining areas meeting Environmental Clearance Conditions	53
Mining areas meeting consent conditions of UKPCB	53
Mining operations were suspended for violations of environmental norms	Nil
Pollutions related complaints against Mining operations in past one year	Nil

REJUVENATION OF WATER BODIES

Most of India's major water resources *(underground waterways, lakes, rivers and reservoirs)* have to depend on monsoon rains to replenish/recover them. Nearly 600 million Indians faced high to extreme water stress and about 2 lakh people died every year due to inadequate access to safe water. The NITI Aayog in 2018 released the results of a study warning that India is facing its "worst water crisis" in history and that demand for potable water will outstrip supply by 2030 if concrete steps are not taken. If matters are to continue, there will be a 6% loss in the country's GDP by 2050. The high amount of water extraction and mismanagement of water resources are causing drought and sudden floods in several parts of our country. Rejuvenation of water bodies also plays a vital role to improve the water quality and storage of surface runoff water. For these reasons, we just need to store, manage and rejuvenate the existing water bodies. We can use several government policies/Schemes like Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Atal Bhujal Mission etc. to restore and rejuvenate the water bodies. The Water Stress Index 2019 by London-based Verisk Maplecroft ranks India as the 46th highest risk country *(Verisk Maplecroft 2019)*. India is also 13th on the Aqueduct's Water Risk Atlas and listed as one of the world's ***"extremely water-stressed countries"*** *(World Resources Institute 2019)*

Table 44. Present Scenario in the District

Parameter	**Outcome**	
Details of water bodies in the district	***Water Body***	***Number***
	Major Rivers	02
	Rivulets/Nalas/Gadheras	170
	Ponds and Lakes	07
	Springs	73
Techniques used in the district for rejuvenated of water bodies	To rejuvenate water bodies following works are done under various schemes such as MNREGA • *Construction of recharge pits* • *Construction of Infiltration trenches* • *Construction of chal-khals* • *Plantation drives*	
Plant Species used for rejuvenation of water bodies	• *Banj (Quercus leucotrichophora)* • *Bhimal (Grewia optiva)* • *Utis (Alnus nepalensis)* • *Burans (Rhododendron arboretum)*	
Local action plan for rejuvenation of water bodies	Traditional water bodies are undergoing restoration within the district under MNREGA with the construction of various water harvesting structures such as Chal- Khals, Check Dams, Ponds and periodic plantation drives.	

Garur Ganga Rejuvenation Project: Rejuvenating a Dying Himalayan River

Garur Ganga flows through the Garur town of the Bageshwar district. The river is well known for its religious importance along with the medicinal benefits of its water. But due to continuous negligence and reckless development in its catchment, it is on the verge of turning into a seasonal rivulet from an evergreen river. The flow of the river was reduced significantly over the years.

Garur Ganga Overview	
Origin:	*Garur Sila*
Length:	*12.68 km.*
Catchment Area:	*82.93 km^2*
Confluence:	*Gomti River (At Baijnath Temple near Garur Town)*

After addressing this issue the district administration took the initiative to rejuvenate this river. Under this initiative, a 12 member committee Garur Ganga Rejuvenation Committee (GGRC) was constituted in 2019 under the Chairmanship of the District Magistrate. Chief Development Officer (CDO) was appointed as the coordinator of the project.

Terms of References of Garur Ganga Rejuvenation Committee (GGRC):

- *To develop recharge zone wise micro-plans with physical and financial implications.*
- *To make arrangements of the funds from different sources for implementation of Garur Ganga River Rejuvenation biological and mechanical treatment measures.*
- *To review quarterly the activities executed under the project*
- *To make constant efforts to sustain the activities of the project*.

Using the Digital Elevation Model, the following nine surface recharge zones were delineated.

- *Dharapani Dhar Recarge Zone*
- *Saukala Khatta Recarge Zone*
- *Jariya Bagar Dhar Recarge Zone*
- *Amoli Recarge Zone*
- *Dumalot Recarge Zone*
- *Kamalekh Recarge Zone*
- *Pinglakot Recarge Zone*
- *Kausani Recharge Zone*
- *Darana Recarge Zone*

At every recharge zone, two district-level officers are appointed as nodal officers.

Table 45. Estimated expenditure incurred in the project

Financial Year	*Estimated Expenditure (in lakhs)*
2019-20	237.56
2020-21	180.35
2021-22	86.82
2022-23	28.80
2023-24	20.18
Total	553.72

Table 46. Works executed in the year 2019-20 under the project

S.No	**Work**	**Quantity**	**Unit**
1.	Advance Soil Works	53	Hectares
2.	Plantation	53	Hectares
3.	Number of saplings planted	58300	Numbers
4.	Infiltration Trenches	0.08	Lakhs
5.	Napier grass plantation	2	Hectares
6.	Infiltration holes	0.05	Lakhs
	Due to the unavailability of funds rejuvenation works are not executed on a large scale although the district administration carried out the above works after managing the finances from the other sources.		

Table 47. Works executed in the year 2020-21 under the project

S.No.	**Work**	**Quantity**	**Unit**	**Expenditure**
1.	Infiltration Holes	279000	Numbers	279000
2.	Contour Trenches	75077	Numbers	2745548
3.	Pine Check dams	298	Numbers	894000
4.	Dry Stone Check dams	137	Numbers	2740000
5.	Pucca Dams	2	Numbers	1000000
6.	Chal- Khal	72	Numbers	1800000
7.	Maintenance Works	53	Hectares	541452
8.	**Total**	**10000000**		
Many other works such as plantation works also done under this project in 2020-21 by the forest department.				

As the project is in its initial stages so it will take some time to appear the results on the ground but for that, it is also necessary that all the work is done on time and required funds are also issued timely.

PLASTIC WASTE MANAGEMENT

Plastic waste is defined as the accumulation of plastic objects (e.g. Plastic bottles, bags etc.) in the environment that adversely affects wildlife and Humans. The ongoing pandemic has caused rapid growth in the generation of Plastic waste for the medical, packaging and other services *(like PPE kit, gloves, face shield, packaged food etc.).* Its broad range of applications is in packaging films, wrapping materials, shopping and garbage bags, fluid containers, clothing, toys, household and industrial products, and building materials.

Plastic products have become an integral part of our daily life pertaining to the fact that its production has crossed 150 million tons per year globally *(CPCB, 2013).* India generates 15 million tons of plastic waste every year but only one-fourth of this is recycled due to the lack of a functioning solid waste management system. This leads to a burden on the landfills and poor socio-economic conditions of the waste pickers, mostly women *(UNDP, 2018-2024).*

It is a fact that plastics will never degrade and remain on the landscape for several years. Recycled plastics are more harmful to the environment than virgin products due to the mixing of colour, additives, stabilizers, flame retardants etc.

Table 48.Plastic Waste Management Inventory of Plastic Waste Generation

Name of Urban Local Body	Population (2011 census)	Number of Wards	Estimated Quantity of Plastic Waste Generated (MT/Day)
Nagar Palika Parishad Bageshwar	25045	11	0.55
Nagar Panchayat Kapkot	5365	07	0.50

Table 49.Current Standpoints Regarding Plastic Waste Management Plastic Waste Management Operations

Waste Management Operations	Outcome	
Door to Door Collection	Almost all the ULBs have 100% door to door collection in the district.	
Door to Door Collection	***ULB***	***Segregation***
	Nagar Palika Parishad Bageshwar	Partial
	Nagar Panchayat Kapkot	Partial
Material Recovery Facility (MRF) operation	None of the ULBs has installed a material recovery facility.	
Linkage with Public Relation Officers(PROs) of producers	No ULB in the district has linkage with Public Relations Officers (PROs) of producers.	
Involvement Of NGOs (Non-Governmental Organizations)/ private agencies	No NGO or Private firm is assisting either of the ULBs in their waste management operations.	
Authorization and issuance of Identity cards to Waste Pickers/Sanitation workers	***ULB***	***Numbers***
	Nagar Palika Parishad Bageshwar	28

	Nagar Panchayat Kapkot	14

Table 50. Present Infrastructure for Plastic Waste Management Operations

Name of ULB	Inventory Of Infrastructure Available For Plastic Waste Management Operation				
	Plastic Waste collection centres	**Plastic Compactors and its Capacity**	**Linkage with Plastic waste Recyclers**	**Material Recovery Facility (Available/Not Available)**	**Remarks**
Nagar Palika Parishad Bageshwar	18 (Secondary bins)	01 (Can compact up to 40 kg waste at a time.)	Recycled waste is sold to the authorised local rag pickers.	Not Available	DPR is approved and some budget is allocated to establish a material recovery facility in the ULB.
Nagar Panchayat Kapkot	Plastic waste is collected from households and commercial institutions by Nagar Panchayat and no separate collection centres are established yet.	Not Available	NA	Not Available	DPR is approved for the procurement of compactor and establish material recovery facility.

Projected Population and Plastic Waste Generation in Bageshwar District

Plastic waste in India has surged over the past 50 years and is expected to double again over the next 20 years. The growth rate of the Indian plastic industry is one of the highest in the world. Forecasting waste quantities in the future is as difficult as it is in predicting changes in waste composition. As a general rule, the lower the level of economic development, the greater the change between generation and disposal.

Census population data for the years 2001 and 2011 has been taken for population forecast. Decadal population and subsequent waste forecast *(For the years 2031&2041)* has been done based on the following presumptions:

- The arithmetic increase method has been used for the decadal population forecast, hence the rate of change of population with time is assumed to be constant.
- The per capita consumption of plastic waste has been taken as 11kg/annum. *(Centre for Science and Environment,2019).*
- It is considered that 70% of total plastic waste consumption is discarded as waste. *(CPCB,2013)*
- 16 % yearly growth in per capita plastic waste consumption has been taken keeping in mind the changing waste paradigm and floating population. *(Centre for Science and Environment,2019)*
- While forecasting predicted waste has been mentioned in a suitable range to provide flexibility in deciding waste management operations.
- The analysis includes population and waste generation estimations only for Urban local bodies and does not include areas under peri-urban and rural areas.

Table 51. Projected Plastic Waste Generation

ULB	Projected Population		Projected Waste Generation (MTPD		
	2031	2041	2021	2031	2041
Bageshwar	37313	43447		1.71	3.22
Kapkot	6207	6628		1.39	2.41
Garur	5946	6418		1.41	2.46

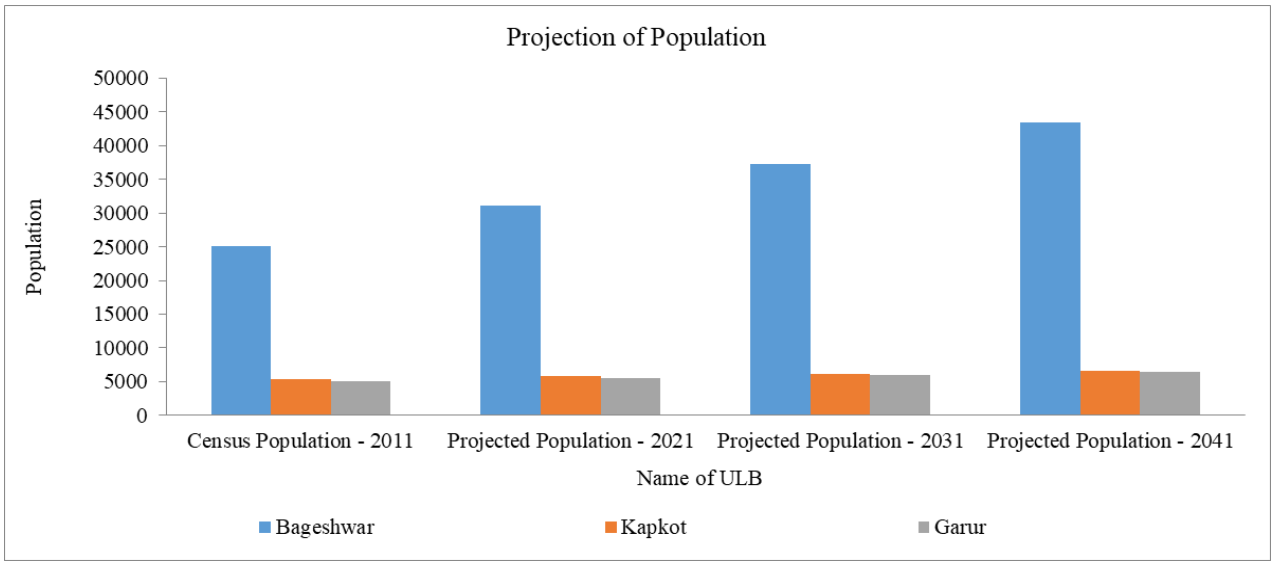


Fig: 5. Graphical Representation of the Projected Population

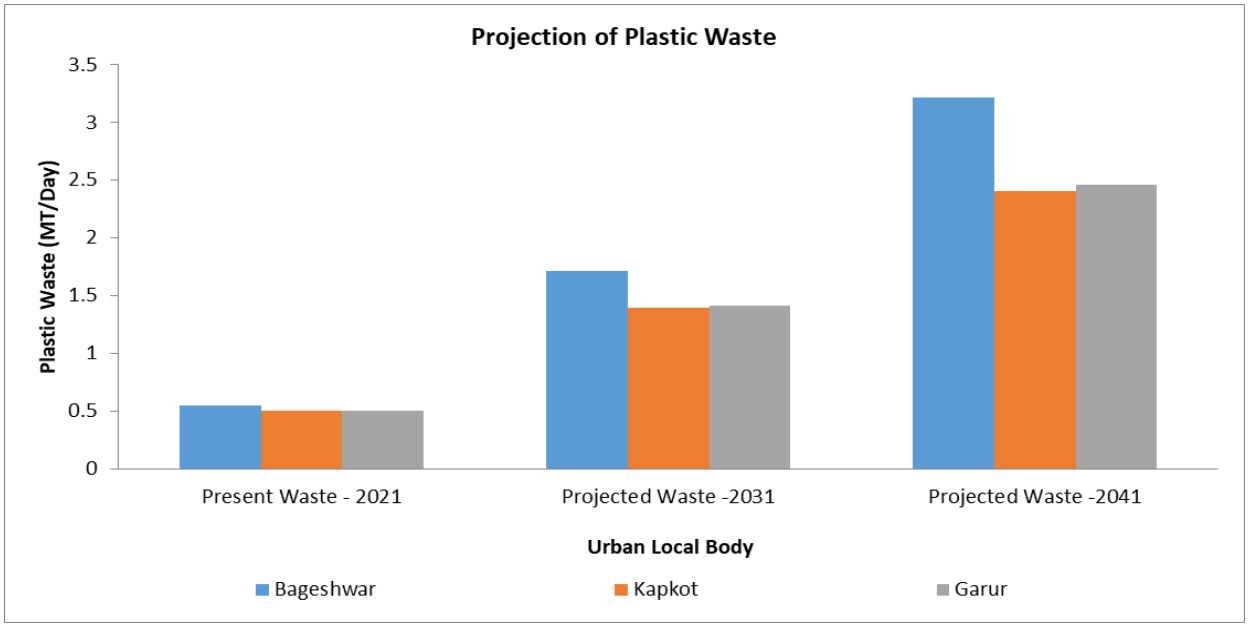


Fig: 6. Graphical Representation of the Projected Plastic Waste Generation

ASSESSMENT OF URBAN LOCAL BODIES

Table 52. Assessment of Urban Local Bodies in Bageshwar District

Indicators	**Maximum Points**	**Urban Local Bodies**	
		Nagar Palika Parishad Bageshwar	***Nagar Panchayat Kapkot***
Solid Waste Management			
Segregation	**4**	4	3
Collection	**4**	4	4
Segregated Waste Transport	**4**	3	3
Wet Waste Processing	**2**	2	2
Dry Waste Processing	**4**	2	0
Disposal	**2**	1	0
Inclusion of Informal Sector	**1**	0	0
Bio-medical waste Management			
Linkage with *Common Bio-medical Waste Treatment and Disposal Facility* (CBWTF)	**1**	0	0
C&D Waste management			
C&D Waste Processing	**1**	0	0
Hazardous Waste Management			
Linkage with *Treatment, Storage and Disposal Facilities* (TSDF)	**1**	0	0
E-Waste Management			
E-waste Collection and Linkage with Recyclers	**2**	0	0
General Information			
Innovation and use of indigenous Techniques	**2**	2	2
Enforcement of Bye-laws and Waste Management Rules,2016	**2**	2	1
Total	**30**	**20**	**15**

Table 53. Final Assessment of Urban Local Bodies of Bageshwar District

Name of ULB	Score (out of 30)	Score Percentage(%)
Nagar Palika Parishad Bageshwar	20	66.67
Nagar Panchayat Kapkot	15	50

Observations from data assessment

- None of the Urban Local Bodies has linkage with CBWTF (Common Biomedical Waste Treatment Facility) and TSDF (Treatment Storage and Disposal facility) for the disposal of municipal sanitary waste and domestic hazardous waste respectively.
- Both the ULBs are performing extraordinarily well in wet waste management but when it comes to the processing of dry waste it is still a point of concern for both of them (especially for Kapkot)
- Management of construction and demolition, domestic hazardous, sanitary and Electronic waste are some of the other key issues which need proper attention.
- Bageshwar is surpassing the Kapkot overall in waste management operations.

ACTION PLAN

Table 54. Action Plan for Solid Waste Management

Action Point	Concerning ULB	Strategy/Approach	Stakeholder Responsible	Purpose
Primary Segregation (Segregation at Source)	All ULBs	• Regular awareness campaigns • Manpower Management. • Behavioural change communication techniques.	Nagar Palika parishad/ Nagar Panchayat Residents and NGOs	• Higher Recovery of Recyclables. • Hygienic environment for handling of waste.
Segregated Waste Transport	All ULBs	Optimizing Waste Management Infrastructure (Collection trucks, trolleys).	Nagar Palika / Nagar Panchayat	• To reduce open dumping of waste. • Manpower optimization at the Recovery facility. • Reduction of transportation charges.
Linkage with TSDF (Treatment Storage and Disposal Facility) and CBMWTF(Common Biomedical Waste Treatment Facility)	All ULBs	• Separate bins for sanitary and domestic hazardous waste. • Setting up a common storage facility in the district from where waste can be lifted by a common treatment facility.	Nagar Palika parishad/ Nagar Panchayat	Segregation and proper disposal of Municipal sanitary waste and domestic hazardous waste.
Landfill mining	All ULBs	Converting bio-waste from landfill site into compost while plastic, glass etc., can be used for recycling.	Nagar Palika/Nagar Palika parishad/ Nagar Panchayat	• To mitigate the environmental impact of waste. (Methane emission) • Resource Recovery of excavated waste.
Scientific disposal of waste	All ULBs	Material recovery facilities and sanitary landfills should be established in the ULBs as soon as possible.	• Nagar Palika parishad/ Nagar Panchayat • State Government	• To reduce open dumping of waste. • To reduce the possible hazards due to contamination of the ambient environment.

Characterisation of waste	All ULBs	Continuous sampling can be done from various transfer stations and landfill sites to study the nature of municipal solid waste.	Nagar Palika parishad/ Nagar Panchayat	• To adopt proper treatment methods for disposal waste as per its nature. • To know the daily and seasonal variations in the generation of the waste
Linkage with authorised recyclers	All ULBs	Either the local scrap pickers can be authorised or direct linkage could be established with any recycling unit.	Nagar Palika parishad/ Nagar Panchayat	• To insure proper recycling of the waste. • Reduction of Historical waste.
Cluster-based Approach to Solid waste management	All ULBs	• By merging schemes from Central and state government department with Rurban Mission of Ministry of Rural development	• District Administration • (District Panchayati Raj Officer (DPRO)	• To club the villages in peri-urban areas of the town with the nearby solid waste management facility for effective waste management in rural areas. • To execute the Rurban mission of the Government of India.
Community participation for waste management	All ULBs	• Information, Education and Communication (IEC) activities in Educational institutions. • Inter-personal communication (IPC): School children and Sanitation workers to spread awareness amongst people regarding waste management.	District Administration	• Social and Behavioural Change Communication • Cleanliness drive campaigns throughout the district

Establishment of Green Protocol	All ULBs	By encouraging Green protocol in local schools, public functions, IEC campaigns, sports events, annual temple festivals and other gatherings.	District Administration	• To prevent the use of disposables and using alternatives like glass/Stainless steel etc. • To bring the generation of non-biodegradable waste close to zero.

Phytoremediation as a Mitigation Measure *(For Treatment of Solid Waste)*

Natural or planted vegetation on a landfill has an important role in erosion control and removal of contaminants, besides imparting aesthetic value. Moreover, it may also be used in leachate treatment. Phytoremediation is a promising, plant-based technology in which the plants and their associated microbes are utilized to absorb and clean up environmental contamination through engineered constructed systems. The ultimate aim is to either remove the pollutant from the contaminated media or to alter the chemical and physical nature of the contaminant so that it eliminates the risk to human health and the environment. Several plants are being identified to be used in phytoremediation task. Phytoremediation as a mitigation measures

Table 55. Phytoremediation as a mitigation measures

Botanical Name	Local and English Name	Life form	Assimilating capacity	Altitude (m)	References
***Bauhinia variegata* L.**	Kachnar	Tree	Absorbs Zn, Hg, As, Pb, Cu and Cd from wastewater	1250-1800	Das, 1981
***Bauhinia acuminata* L**	Kachnar	Tree	conversion of Hg to volatile chemical from groundwater	1150-1500	Chaphekar, et al., 1980
***Quercus leucotrichophora* A. Camus**	Banj oak	Tree	Microbial biodegradation, binding, holding soils, and/or decreased leaching	1200-2400	Meenakshy et al, 1981
***Berberis aristata* DC.**	Kingore	Shrub	Metals, radionuclides, hydrophobic organics	1350-2000	Das, 1981
***Berberis asiatica* Roxb. ex DC.**	Kilmora	Shrub	Adsorb' all the dissolved gases	1650-2400	Das, 1981
***Cynodon dactylon* (L.) Persoon**	Dubla, Doob	Herb	Absorbs Arsenic and Fluoride from wastewater	700-2500	Chaphekar, et al., 1980

Table 56. Policies Undertaken for Rural Waste Management in India

Current Policy	Sponsoring agency	Remarks
Decentralized Waste Management	Under SBM-G *(Swachh Bharat Mission-Gramin)*	Decentralized systems such as household compost and biogas plants shall be encouraged.
Community Sanitary Complex (CSCs)	Under SBM-G *(Swachh Bharat Mission- Gramin)*	Such complexes comprise an appropriate number of toilet seats, bathing cubicles etc.*(Only where there is a lack of space in the village for the construction of household toilets)*.
Cluster Approach to Solid Waste Management	Rurban Mission of Ministry of Rural Development	It aims at developing infrastructure and livelihood opportunities in a cluster of Gram panchayats that demonstrate economic growth potentials.
Community Participation through IEC *(Information, Education and Communication)* Activities	National Institute of Rural Development and Panchayati Raj	All the stakeholders need to plan for a series of IEC campaigns to educate the residents on how proper segregation at the household levels eases the entire process of managing waste at subsequent stages.

Table 57. Action Plan for Bio-Medical Waste

Action Areas	Purpose	Stakeholders
Governance		
Periodic inspection of Health-care Facilities (HCFs) by Uttarakhand state Pollution control board (UKPCB).	To ensure proper segregation of Biomedical waste as per Biomedical waste management rules, 2016.	Uttarakhand state Pollution control board (UKPCB)
Linkage of District level hospitals and Community Health Centres (CHCs) with Common Biomedical waste treatment facility (CBWTF).	To ensure proper disposal of Biomedical waste as specified under Biomedical waste management rules, 2016.	Health Department
Linkage of ULBs with Common Biomedical waste treatment facility (CBWTF).	To ensure segregation of Biomedical waste from Municipal solid waste and thus its proper disposal as per Biomedical waste management rules, 2016.	All ULBs
Infrastructure		
Construction and maintenance of Biomedical waste collection shed at district level HCFs and CHCs.	To ensure proper segregation of Biomedical waste into different categories as specified under Biomedical waste management rules,2016.	Health Department
Installation of effluent treatment plants in district level HCFs and CHCs.	To ensure disposal of liquid effluent generated in the HCFs.	Health Department
Training and Immunisation		
State-level and District level orientation programs for healthcare workers to sensitize them about effective Biomedical waste management.	To ensure proper handling and segregation of biomedical waste in HCFs	Health department
• Setting up of Biomedical Waste Database at State level (specifically for primary healthcare facilities) • Training on biomedical waste management information system (BMWMIS) to all data entry operators and pharmacists.	To keep records of biomedical waste generated in every HCF of the district (especially in PHCs in rural areas).	Health department
Immunisation (Tetanus and complete doses of Hepatitis-B) of all hospital staff involved in Biomedical waste management.	To avoid any kind of infection while handling Biomedical waste.	Health department
Services		
Establishing bins and bags at each generation points in HCFs with IEC posters displayed.	• To ensure segregation at each generation point and avoid mixing with MSW.	Health department

	• To spread awareness amongst the people related to Biomedical waste management.	
Timely replacement of bags, BMW transfer to collection shed and then prompt lifting to biomedical waste treatment facility from the shed.	To ensure timely disposal of biomedical waste.	Health Department and Uttarakhand state Pollution control board (UKPCB)
Bar code system for tracking bags and containers and use of GPS enabled systems in vehicles.	To ensure tracking of biomedical waste collection, Transportation, disposal and recycling as specified under Biomedical waste management rules,2016.	Health Department and Uttarakhand state Pollution control board (UKPCB)
Information		
Development of an IT-enabled data management system to keep an inventory of the waste collection, consumables supply, training programs etc. in HCFs (including PHCs in the district)	To ensure transparency in the biomedical waste management system up to the primary level.	Health Department
Display details of authorisation, treatment, annual report of all Health-care facilities (HCFs) on the website.	To make the information open-source and ensure transparency.	Health Department and Uttarakhand state Pollution control board (UKPCB)

Table 58.Action Plan for C&D Waste Management

Action Point	Strategy/Approach	Stakeholder Responsible	Purpose
Setting up of C&D waste dumping site for local construction activities and road construction debris.	• Establishment of dumping zone such that it also caters for C&D waste of Peri-urban areas and nearby villages. • Proper collection and transportation systems should be set up to aid processing. • Illegal dumping practices must be discouraged by charging penalties. • Establishment of dumping zones along district & village roads.	• All ULBs and District Panchayati Raj officer (DPRO) • Public Works Department (PWD)	To ensure compliance with C&D Waste Management Rules 2016.
Framing by-laws for C&D waste management.	• By-laws should be framed by each ULBs and DPRO as per the C&D waste management rules for proper disposal of C&D waste in the district. • The provision of heavy fines should be done under these by-laws for illegal dumping of demolition waste such as excavated earth material on the banks of the river or the hill slopes.	• All ULBs and District Panchayati Raj officer (DPRO) • Public Works Department (PWD)	To ensure compliance with C&D Waste Management Rules 2016.
Management of C&D waste.	• Managing C&D waste separately from municipal solid waste. • Enhancing awareness and incentivization for efficient C&D waste handling and processing.	• All ULBs and District Panchayati Raj officer (DPRO) • Public Works Department (PWD)	To ensure that C&D waste comes to the recycling plants as segregated input, and the recycled products are picked up for use in construction.
Plantation in old dump sites.	Plantation at the old dumping zone should be done with the help of community participation to stabilize the slope over there.	• All ULBs and District Panchayati Raj officer (DPRO) • Public Works Department (PWD)	Stabilisation of the slope at old dumping zones.

Table 59. Action Plan for Hazardous Waste

Action Point	Strategy/Approach	Stakeholder Responsible	Purpose
Linkage of ULBs with common TSDF *(Treatment, Storage and Disposal Facilities)* or disposal facility	• All the ULBs of the district should establish linkage with nearby common TSDF or disposal facility to ensure proper disposal of hazardous waste to avoid its dumping in the landfill site. • A collection facility should be set up in the district to collect domestic hazardous waste from both the rural and urban areas of the district.	All ULBs & District Panchayati Raj officer (DPRO)	To ensure segregation of domestic hazardous waste from municipal solid waste and its proper disposal.
Training of sanitation workers regarding segregation of domestic hazardous waste	Training programmes should be organised at the state/district level for handling and segregation of domestic hazardous waste so that sanitation workers should not catch any kind of infection during its handling and its proper segregation could be possible.	• State government • District Administration	To ensure segregation of domestic hazardous waste from municipal solid waste
IT-enabled systems for the inventory of the hazardous waste	The state pollution control board should inventory the generation, collection, and disposal of both domestic and industrial hazardous waste on its website so that complete transparency is maintained in the management of hazardous waste in the district.	State pollution control board	To ensure compliance to Hazardous waste management rule 2016.

Table 60.Action Plan for E-Waste

Action Point	Strategy/Approach	Stakeholders Responsible	Purpose
Establishing E-waste collection centers	• Collection centres should be established in all ULBs in such a way that they could also cater for the collection from nearby rural areas. • A Toll-Free Number must be issued for the collection of E-waste	All ULBs	• To ensure proper segregation of E-waste from municipal solid waste • Capacity building of stakeholders to promote effective E-waste management.
Authorization of E-Waste Pickers	Authorization of E-waste pickers should be done by the district administration and urban local bodies. For that, Identity cards should be issued to them.	District administration and ULBs	To avoid illegal trading and processing of e-waste.
Linkage of ULBs with authorized recyclers/ Dismantlers	All the ULBs in the district should establish linkage with any of the five authorized E-waste recyclers.	All ULBs	To ensure proper recycling if possible and if not then proper disposal as per E-waste management rule 2016.
District level Awareness campaign	• Promoting Information, Education and Communication (IEC) activities in educational institutions (Schools, Colleges etc.) • Promoting Awareness programmes under Digital India Initiative (Initiated by Ministry of Electronics and Information Technology) about alternate methods of disposing of E-waste.	District administration	Promoting behavioural change in public.
Extended Producer Responsibility	• A random sampling of electrical and electronic equipment's placed on the market to monitor and verify the compliance of RoHS (Restriction of Hazardous Substances) provisions as per the guidelines of CPCB (Central Pollution Control Board) • "E-waste Return" Programme should be initiated to incentivize people and bring about behaviour change	State government	• Proper Collection and Disposal of E-waste • Channelization of e-waste generated from the "end-of-life" products to ensure environmentally sound management

Table 61. Action Plan for Wastewater Management (STPs)

Action Point	Concerning ULB	Strategy/Approach	Stakeholder Responsible	Purpose
City sanitation plan under national urban sanitation policy	All ULBs	• Enhance synergy among municipal government agencies, the private sector, NGOs and others. • Increase funding from sources other than municipal government(such as from the national and provincial governments, donor agencies, the private sector)	State Government	• Citywide Sanitation Sector development. • Awareness generation and behaviour change in the field of Sanitation. • Sanitation and safe disposal of waste.
Decentralized wastewater management under Atal Mission for Rejuvenation and Urban Transformation (AMRUT) by Faecal Sludge and Septage Management system (FSSM)	All ULBs	• In line with the National FSSM policy, each state is expected to develop and issue an FSSM implementation strategy and plan guideline. This may be integrated with overall city land-use planning. • Capacity building and training on FSSM (at City level) to build their personnel capacities and organizational systems for delivery of sanitation services.	Ministry of Housing and Urban development Government of India	• Promoting community-planned and managed faecal sludge and septage management for a group of households. • Rehabilitation of old sewerage system. • To augment limited treatment capacity. • Recycling and reuse of wastewater for beneficial purposes.
New FSTP Requirement	All ULBs	Faceal Sludge and septage collected from the onsite facilities such as leach pits and septic tanks collected	State Government	• Treatment of Faecal Sludge/Septage. • Reuse of bio-solids and treated wastewater
Revamping on-site sanitation facilities	All ULBs	The state-level policy should be framed for the design of on-site facilities such as septic tanks with the essential provisions of periodic desludging.	State Government	To ensure compliance with IS 2470 Part 1&2 (Code of practice for installation of septic tanks)

Action Plan for Water Resources Management and Groundwater Extraction/Contamination

*Water Resources and Groundwater management requires an integrated approach from different departments such as District administration, Panchayati Raj, Jal Sansthan, Jal Nigam, Payjal Nigam, Forest Department etc. Each department is expected to work in tandem with each other to achieve effective management of resources, be it land or water.

Table 62. Water Resources Management

Action Point	Strategy/Approach	Purpose
Integrated water resources management (IWRM) at River basin level	By Considering basin/sub-basin as a basic unit for planning and management.	To achieve water security for all purposes, managing risks and mitigate disasters
River Basin Master Plan	By analysing River Basin Characteristics	Periodic review of hydrological conditions prevailing over a basin Identification of protected areas
Mapping of water-scarce areas in a district	• By using modern mapping tools such as GIS (Geographical Information System) and Remote sensing • By setting up an interdisciplinary framework consisting of Local institutions and empowered government agency	To get an estimate of vulnerable areas in the district.
Assessment of water resources in the various river basins	Using modern technology and Hydrological modelling	To collect reliable data To assess water resources potential and analysing water requirements for various uses,
Public awareness and use of low-cost technologies	Using field application methods such as drip irrigation/micro-sprinkler irrigation systems in water-scarce areas. This can be achieved by bringing government subsidies in this area as the local people needs incentives to up bring this modern technology.	For better water application efficiency
Integrated Rural area Programme (IRAP)	By bringing together all the programmes of different ministries as well as rural employment and development programmes into one for effective collaboration and planning.	• For constant interactive relationships between different departments • Location-specific programmes can be drawn up locally under this overall programme.

Table 63. Groundwater Management

Action Point	Strategy/Approach	Purpose
Multidisciplinary Approach (Nexus between groundwater, agricultural policy, urban infrastructure and energy consumption)	By integrated vision and coordination amongst different departments.	For groundwater sustainability
Mapping of the aquifer at the micro-level	By Maintaining an Aquifer information and Management system	• To quantify the available groundwater resources • To formulate a plan appropriate to the scale of demands and aquifer characteristics.
Artificial recharge of Groundwater	• By demarcating groundwater recharge zones by identifying critical natural recharge areas of an aquifer and those areas that require special attention concerning recharge of groundwater. • By using broadleaf plants to improve the moisture content in the soil and thereby increase the groundwater level and water holding capacity of the soil. • Improving the scale of work done through various schemes such as MNREGA will help develop indigenous recharge methods (such as Chal-Khal).	• To ensure the sustainability of groundwater resources • To ensure the quality of recharge to prevent possible contamination
Identification of Non-point sources of pollution (Pollution resulting from land runoff, precipitation, drainage, seepage etc.)	• Controlling soil erosion by planting more trees and covering bare soil with vegetation. • Constructing wetlands.	Non-point source pollution is a leading cause of deteriorating water quality as when the runoff moves, it picks up and carries away natural and human-made pollutants finally depositing them in lakes, rivers and groundwater.
Mitigating Groundwater Contamination	• Reducing the use of pesticides and fertilizers. • Encouraging Organic farming in the area by organising various Information, Education and Communication (IEC) campaigns.	• To ensure the groundwater quality of an area. • To reduce health hazards caused due to contaminated water.

Table 64.Action Plan for Air Quality Management

Action Areas	Strategies/Approach	Stakeholders	Purpose
Air quality monitoring	Ambient air quality monitoring stations can be installed in all the urban centres and other identified areas such as construction sites after manual air quality monitoring.	Uttarakhand state pollution control board (UKPCB)	To identify the hotspots within the district and further development of mitigation measures for those areas.
Solid waste collection system	• Door to Door collection of waste in the peri-urban areas and provision of dry waste collection from rural areas within the district. • After implementing a proper collection mechanism, the provisions of heavy fines should be made on the open burning of waste.	All ULBs and DPRO District Panchayati Raj Office (DPRO)	To reduce the emission of harmful gases by open burning of waste especially in urban areas.
Control over forest fires	• Providing the forest department with adequate manpower and machinery to control forest fires. • Proper coordination between various departments involved in this operation. • Proper inspection of civil forests and forests under van panchayats by training the personnel engaged in the maintenance of these forests. • The use of pine leaves could be done for making biofuel and further generation of electricity, Moreover, the collection of pine needles could be linked with MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act). • Development of mixed forests by planting indigenous broadleaf plants which maintain moisture in the soil and reduce the chances of fire.	Government of Uttarakhand and District Forest Department	To reduce harmful emissions due to massive forest fires in the district.
Vehicular traffic management	• Checking adulteration of fuel • Promoting intercity and intra-city public transportation with green fuel alternatives such e-buses & e-rickshaws etc. • Paving of road shoulders especially in urban areas.	• Department of Police • Transport Department • Public works department	To reduce emissions caused by vehicles.
District level action plan for air pollution	A district-level task force with some experts can be formed for air quality management in the district.	District Administration	To improve existing air quality.

Awareness of air quality	Mass awareness can be promoted with IEC activities by involving institutions such as schools and colleges for this purpose.	District Administration	To promote awareness among the masses regarding the issue.
Complaint redressal system	Online complaint registration and redressal system should be formed at the district level to register complaints regarding air pollution issues.	• Uttarakhand state pollution control board (UKPCB) • District administration	To sort out grievances registered by citizens

Table 65. Action Plan for Noise Pollution Management

Action Areas	Strategies/Approach	Stakeholders	Purpose
Noise level monitoring	• Noise monitoring studies need to be done in the district especially within the urban centres within the district by manual monitoring. • In the areas identified as hotspots, continuous monitoring stations should be set up.	Uttarakhand state pollution control board (UKPCB)	To recognize the current situation of noise levels in the district and identify the hotspots
Traffic management	• Signboards should be placed at sensitive locations in the towns within the districts and if required silent zones should be established. • Green belts can be formed along the roads in urban areas to reduce noise levels.	• District Administration • Public Works department and ULBs	To ensure noise level within permissible limits
Complaint redressing system	Online complaint registration and redressal system for noise pollution should be made which can be used by citizens, Traffic police, ULBs, and state pollution control board.	District Administration	To sort out grievances registered by citizens
Mass Awareness	Mass awareness campaigns must be organized with the help of IEC activities by taking the help of institutions such as schools and colleges for this purpose	District Administration	To promote awareness among the masses regarding the issue

Table 66. Mining Activity Management Plan

Action Areas	Strategies/Approach	Stakeholders	Purpose
Monitoring of mining activity	• A district-level task force should be formed to monitor mining activities, to conduct river audits and surveillance. • For the rivers marking the boundaries with other districts, a combined task force should be formed to monitor mining activity in the river.	District Administration	To ensure sustainable mining activity within the district.
System for Online purchase and sale of Sand and Other RBMs (River Bed Minerals)	An online system should be made at the state or district level for e-auctioning the mines and for the purchase of RBMs (River Bed Minerals) to ensure transparency in the system.	State Government and District Administration	To ensure compliance to Enforcement and Monitoring guidelines for Sand mining, 2020.
Identification of hotspots for illegal mining	The district task force should identify the possible hotspots for illegal mining through surveillance and patrolling.	District Administration	To have a check on the mining activities in the district.
Community participation	A toll-free number must be issued for citizens in the district to register any complaint against any illegal mining practices as identified by them in their vicinity.	District Administration	• To understand the local community's willingness in curbing illegal mining from the area. • To have a local check on the illegal mining activities in the district.

ACTION PLAN FOR REJUVENATION OF WATER BODIES

*Rejuvenation of water bodies requires an integrated approach from different departments such as District administration, Panchayati Raj, Jal Sansthan, Jal Nigam, Payjal Nigam, Forest Department etc. Each department is expected to work in tandem with each other to achieve effective management of resources, be it land or water.

Table 67. Action Plan for Rejuvenation of Water Bodies

Action Point	Strategy/Approach	Purpose
River Catchment/Basin Management	Participatory and self-management institutional framework for administering the catchment with a combination of engineering, social and scientific management.	Reducing levels of potential contaminants in raw water.
Plantation in Flood plain zones (FPZ)	Vegetation that acts as naturally resistant to soil disturbances and standing water must be encouraged.	To reduce shoreline erosion Act as natural barriers to dissipate waves and back-lying areas from flooding.
Prohibition of disposal of Municipal Plastic waste and Biomedical waste (Specially in flood plain zones)	• A proper waste collection system should be implemented across the district. • Provision of heavy fines should be done on dumping of waste near water bodies	To maintain ecological balance of the water body To stop pollution
Spring-shed and Stream shed management	By Constructing loose boulder check dams. Encouraging Information, Education and Communication (IEC) activities to ensure community participation.	To improve water resource sustainability To enhance water discharge from springs and rivers

Table 68.Action Plan for Plastic Waste Management

Action Point	Strategy/Approach	Stakeholder Responsible	Purpose
Source segregation	• ULBs should distribute separate bins to households, street vendors and other shopkeepers. • Distribution of separate bins to every household and shopkeeper in rural areas under Swachh Bharat Mission Gramin should be ensured. • Mass awareness programmes regarding source segregation with the inclusion of institutions such as schools and colleges.	All ULBs, District Panchayati raj Officer (DPRO), Village Panchayats	• To ensure better efficiency in waste processing • Higher recovery of resources. • To ensure optimum utilisation of manpower
Effective Collection and segregated waste transport	• Training waste pickers and providing them with types of equipment suitable as per the topography of the area for door to door collection in urban areas. • Establishing plastic waste collection centres in rural areas where door to door collection is not possible. • Provision of separate vehicles for dry and wet waste. • ULBs can establish linkage with the NGOs and private firms working in this field for effective waste collection in the urban areas.	All ULBs, District Panchayati raj Officer (DPRO), Village Panchayats	• To reduce open dumping of waste • To reduce monkey menace (which is a huge issue in the urban areas of the state) • To ensure compliance with plastic waste management rules 2016
Linkage of ULBs & other collection centres with recyclers/ cement plants / Construction Agencies	• Plastic waste collection centres to be started in rural areas should also be linked with recyclers. • Plastic waste can be utilised in road construction for this ULBs should coordinate with the construction agencies such as Public Works Department.	All ULBs, DPRO District Panchayati Raj Officer),	• To avoid open dumping of plastic waste. • To ensure reuse and recycle of plastic waste.
Implementation of extended producer responsibility (EPR) through producer/Brand owner	ULBs can ask the manufacturers collectively or individually in line with the principle of Extended Producer Responsibility (EPR) to provide the required finance to establish plastic waste collection centres.	All ULBs	To reduce the workload of ULBs

Community participation for waste management	• Information, Education and Communication (IEC) activities in Educational institutions. • Inter-personal communication (IPC): School children and Sanitation workers to spread awareness amongst people regarding waste management	District Administration	• Social and Behavioural Change Communication • Cleanliness drive campaigns throughout the district
Establishment of Green Protocol	By encouraging Green protocol in local schools, public functions, IEC campaigns, sports events, annual temple festivals and other gatherings.	District Administration	• To prevent the use of disposables and using alternatives like glass/Stainless steel etc. • To bring the generation of non-biodegradable waste close to zero.

CONCLUSION

Over the past few decades, ever growing environmental problems have invited lots of attention of the stakeholders like academicians, local government, environmental planners, social activists and judiciaries. The environmental issue has therefore raised a large scale public concern. Many actions have been taken by the Government of India and concerned Environmental Protection Agencies to protect different environmental components, ecosystem services and human health from a particular pollution and degradation threat. Despite, some of the successes achieved on the grounds, many more problems continue to remain unresolved with the new ones emerging continuously day by day. With the ever increasing native and floating population and resultant anthropogenic pressures, sometimes addressing a strategy becomes a bit difficult. However, combined and interdependence might reduce complexity of environmental systems. The present new challenges before planners and policymakers might be resolved if a scientific spirit could be maintained in management actions on a ground. Scientific research could play an important role in managing and minimising pollution loads. The scientific studies and their implementation on ground will continue to play its vital role in resolving environmental problems. The environmental problems may lead to a sectoral view of problems like pollution, health, basic sanitation, land management, and conservation and sustainable use of natural resources. Decisions based on incorrect or incomplete understanding of environmental components would not allow to achieve the targeted goals of environmental management with lower risks and cost. This report as an environment plan of the district describes a framework for acquiring an idea to manage current problems of environmental aspects such as solid waste, biomedical waste, C&D waste, e-waste, industrial waste water, plastic waste, etc. These problems need to be considered as a tool to prepare for a variety of problems in view of emerging in near future. Though there is no any optimal institutional framework for environmental and natural resource management at the district level, yet some general features of an ideal institutional system could be many. These could be as follows: (i) flexibility of a plan or a model, (ii) capacity to generate information and create awareness of the importance of environmental problems among the decision-makers at all levels, (iii) decentralized decision-making and enforcement, (iv) involvement of individuals for a clear-cut role, and consensus of stakeholders (governmental agencies, non-governmental organizations, community groups and other associations) in environmental management; and (v) a high-level political will and support . There is a need to apply from the sectoral approach to collaborate

approach. This is a need of the hour to mitigate and minimise the environmental impacts in our surroundings.

Environmental planning for different environmental components need to be adhered to the principle of sustainability where science serves as a quantifiable tool. The environmental management approach needs to be holistic in nature. Decision making is an integration of science and management to get people involved and managers to act and to plan.

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