

# Waste Map Book Bardibas

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**Project CAP:**  
Collaborative Approach For  
Preventing Plastic Leakages In Rivers Of Nepal



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# PROJECT CAP: COLLABORATIVE APPROACH FOR PREVENTING PLASTIC LEAKAGES IN RIVERS OF NEPAL

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## Disclaimer:

This Map Book was produced under Project CAP with the financial support of the PLEASE Project (Plastic Free Rivers and Seas for South Asia Project), implemented by the South Asia Co-operative Environment Program (SACEP) and supported by UNOPS and the World Bank. The contents of this publication are the sole responsibility of CREASION and do not necessarily reflect the views of SACEP, UNOPS, or the World Bank.

# FOREWORD

Nepal, with a population of approximately 29 million, faces significant challenges in waste management. This issue has become increasingly pressing, not only for human well-being but also for the natural environment. Despite efforts at various levels—including informal waste workers, local governments, NGOs, INGOs, and private waste enterprises—effective waste management remains largely neglected. A major obstacle is the lack of relevant data on solid waste generation across municipalities, making it difficult to design and implement efficient waste management strategies.

This Waste Map Book, developed with field data from Bardibas Municipality in coordination with local authorities, takes a crucial step toward addressing this gap. By generating data and presenting a clear picture of the waste scenario, this map book serves as a baseline for understanding and managing waste more effectively. It provides insights into waste composition, plastic waste distribution, and waste hotspots within the municipality. These details can support stakeholders in implementing targeted and geographically informed waste management strategies

CREASION extends its gratitude to all individuals involved in producing this Waste Map Book and acknowledges the unsung heroes—waste workers—who play a vital role in environmental conservation.



**Aanand Mishra**  
Founder and President  
CREASION

# ACKNOWLEDGEMENT

CREASION extends its sincere gratitude to the PLEASE Project for financially supporting the implementation of Project CAP (Collaborative Approach for Preventing Plastic Leakages in Rivers of Nepal)—a project implemented by SACEP with the support of UNOPS and the World Bank. We deeply appreciate the dedication of all stakeholders who contributed throughout the project period.

We also express our heartfelt thanks to the municipal governments for their coordination and commitment to implementing Project CAP within their municipalities. Their proactive efforts in waste management have been instrumental in achieving the project's goals, particularly in initiatives such as Waste Smart Schools, the Volunteer for Change (VFC) youth cohort, and the engagement of tribal communities like the Bote and Majhi, as well as Informal (IWWs)

Additionally, we acknowledge the indispensable contributions of municipal elected representatives, municipal officials, Environment Focal Persons, and community members. Their dedication to data collection, validation, and providing insights into the waste sector has been pivotal in the creation of this Waste Map Book.

A special appreciation goes to our VFC youth cohort, whose enthusiasm and commitment during field visits greatly enriched this initiative. Lastly, we extend our gratitude to all individuals who have directly or indirectly contributed to the development of this Map Book—your efforts are truly valued.

# ABOUT THE PROJECT

Project CAP (Collaborative Approach for Preventing Plastic Leakages in Rivers of Nepal) is funded by PLEASE (Plastic-Free Rivers and Seas of South Asia) Project, implemented by the South Asia Co-operative Environment Programme (SACEP) with support from the United Nations Office for Project Services (UNOPS) and the World Bank. Led by CREASION (Center for Research and Sustainable Development Nepal), this initiative addresses the urgent issue of plastic pollution in Nepal's river systems. The one-year project was implemented across seven municipalities in two provinces, focusing on diverting plastic waste from landfills and waterways into the product value chain by strengthening collection systems and promoting recycling through innovative technologies. The project aims to divert 720 tons of plastic waste through recovery and 190 tons through recycling from rivers and landfills throughout the project period.

Using a 360-degree collaborative approach, Project CAP has introduced advanced plastic waste management solutions, particularly targeting Polyethylene Terephthalate (PET) bottles. By integrating ISO-standard machinery and Effluent Treatment Plants (ETP), the project enhances microplastic treatment, ensuring high-quality recycled outputs targeting suitable food-grade products.

The initiative actively engages seven municipalities, 12 Waste Smart Schools, and 12 youth groups, creating a significant impact in raising awareness about waste management at the grassroots level. Through training programs for tribal communities such as the Bote and Majhi, as well as informal waste workers (IWWs), Project CAP has successfully mainstreamed marginalized communities into the circular economy—providing them with income-generating opportunities through plastic waste collection from rivers. This not only offers additional livelihoods but also contributes to environmental conservation.

Moreover, Project CAP collaborates with local governments to enhance plastic waste management policies and advocacy efforts. By engaging a wide range of stakeholders—including local authorities, IWWs, tribal communities, students, and youth—the project fosters long-term behavioral change, promoting plastic recycling standardization and dissemination for a sustainable future.

Through this collaborative effort, plastic waste is reintroduced into the economy instead of polluting Nepal's rivers. Over time, this initiative will lead to cleaner waterways, healthier aquatic ecosystems, and improved community well-being—a true win-win for people and the environment.



# SUMMARY

This map book has been developed by CREASION Nepal as part of Output 4, Activity 9 of the Project CAP: Collaborative Approach for Preventing Plastic Leakages in Rivers of Nepal. The project is funded by PLEASE (Plastic-Free Rivers and Seas of South Asia) and implemented by the South Asia Cooperative Environment Program (SACEP), with support from the United Nations Office for Project Services (UNOPS) and the World Bank. Project CAP has developed a collaborative model to engage key stakeholders in establishing a robust plastic waste value chain.

The data presented in this map book was gathered through a multi-method approach, including Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), GPS tracking for hotspot identification, and in-situ sampling to validate plastic waste generation. Additionally, plastic waste sampling facilitated an accurate analysis of solid waste composition found in municipal landfills. The primary objective of this map book is to support policymakers in identifying major plastic waste hotspots, understanding the types of plastic present, and pinpointing key leakage sources. Developed in close collaboration with each municipalities, the information presented ensures accuracy and relevance to local needs. By offering detailed insights into plastic waste composition, this map book serves as a valuable tool for municipalities to design effective waste management strategies and develop policy frameworks aimed at preventing plastic leakage into rivers.

# HOW TO UNDERSTAND THIS MAP BOOK?

This map book is organized into two thematic sections: Administrative Maps and Plastic Waste Composition Maps. It visually presents plastic waste hotspots within the municipality, detailing plastic types, leakage sources, and distribution patterns. Additionally, it features visual descriptions of various plastic types to improve understanding and support effective waste management strategies.

Each title of this map reflects its respective theme. A legend is included in every map, explaining the symbols and icons used to represent various features. Additionally, each main map is accompanied by an inset map at the district level, highlighting the specific municipality or rural municipality featured.

The thematic administrative map displays major physical infrastructure alongside administrative boundaries sourced from the Survey Department of Nepal and OpenStreetMap (OSM). It also includes municipal demographic details such as total population, population density, total area, male-to-female population ratio, and total households. The plastic waste composition map incorporates Environmental Systems Research Institute (ESRI)'s topographic base map and land cover data from International Centre for Integrated Mountain Development (ICIMOD), along with solid waste composition data obtained through in-situ sampling at identified hotspots. To images from the hotspot locations.

# METHODOLOGY OF THE MAP BOOK

This Map Book has been developed using field data collected through key informant interviews and focused group discussions. Primary data collection followed the "Guidelines for the Monitoring and Assessment of Plastic Litter in the Ocean" by the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP), published by UNEP in 2019, to ensure standardized methodologies. Additionally, a review of various literature sources provided secondary data on municipal waste. On-site sampling and site verification were conducted at the waste hotspots to further clarify waste management scenarios.

# CONSENT FOR THIS MAP BOOK

This Map Book has been published in coordination with the respective municipalities, with the full consent of the respective stakeholders and local authorities involved in waste data collection and field verification. It is a collective effort of individuals engaged in gathering and verifying waste data at the ground level. This Map Book ensures the agreement and approval of all stakeholders, both directly and indirectly associated.

# LIMITATION OF THIS MAP BOOK

The maps in the map book have been developed using primary data collected through field surveys, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs) conducted during the sampling process. Additionally, secondary data sources, including the Department of Survey Nepal, OpenStreetMap, ESRI, municipal databases, and the Forest Research and Training Centre, have been incorporated.



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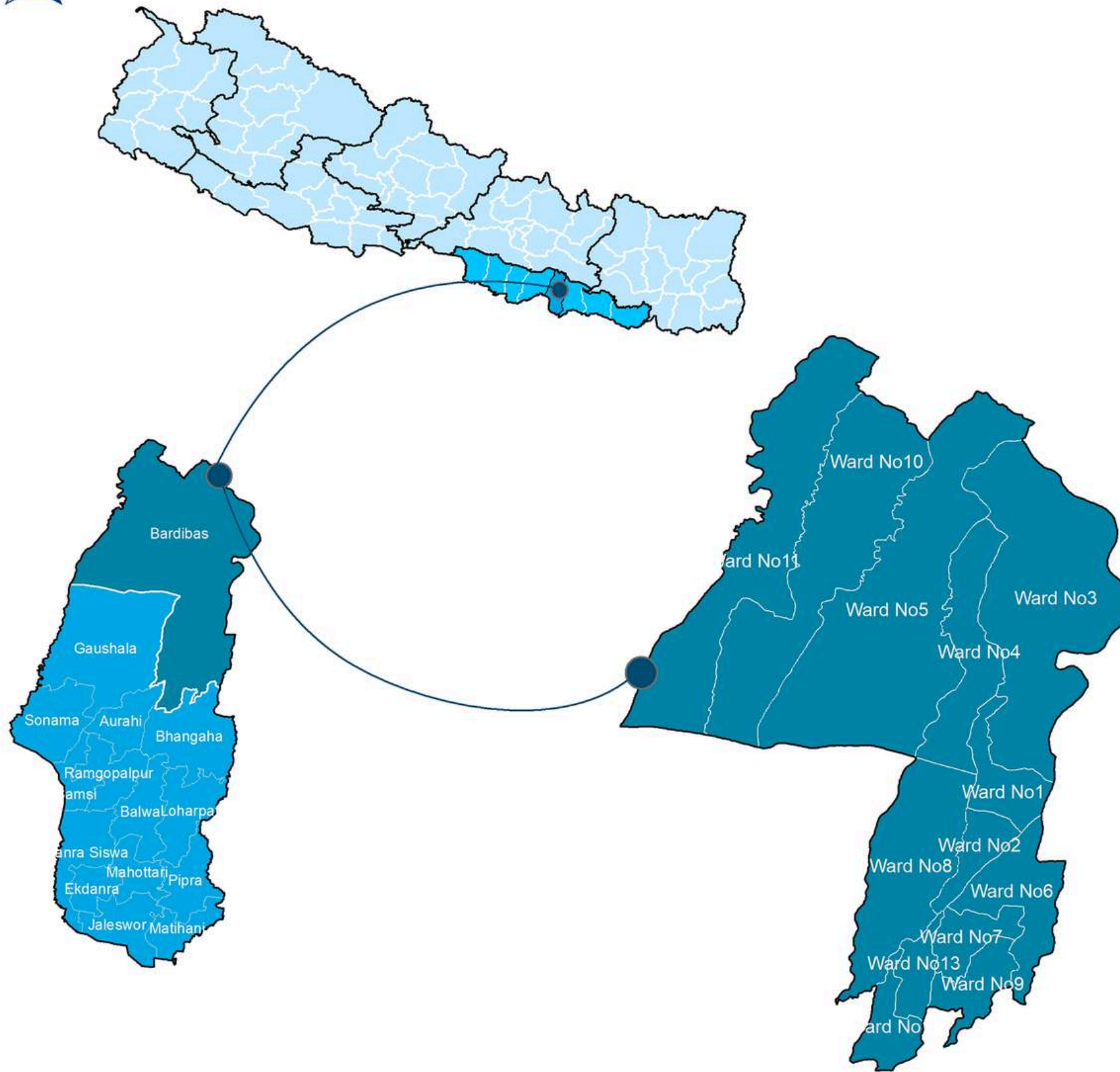
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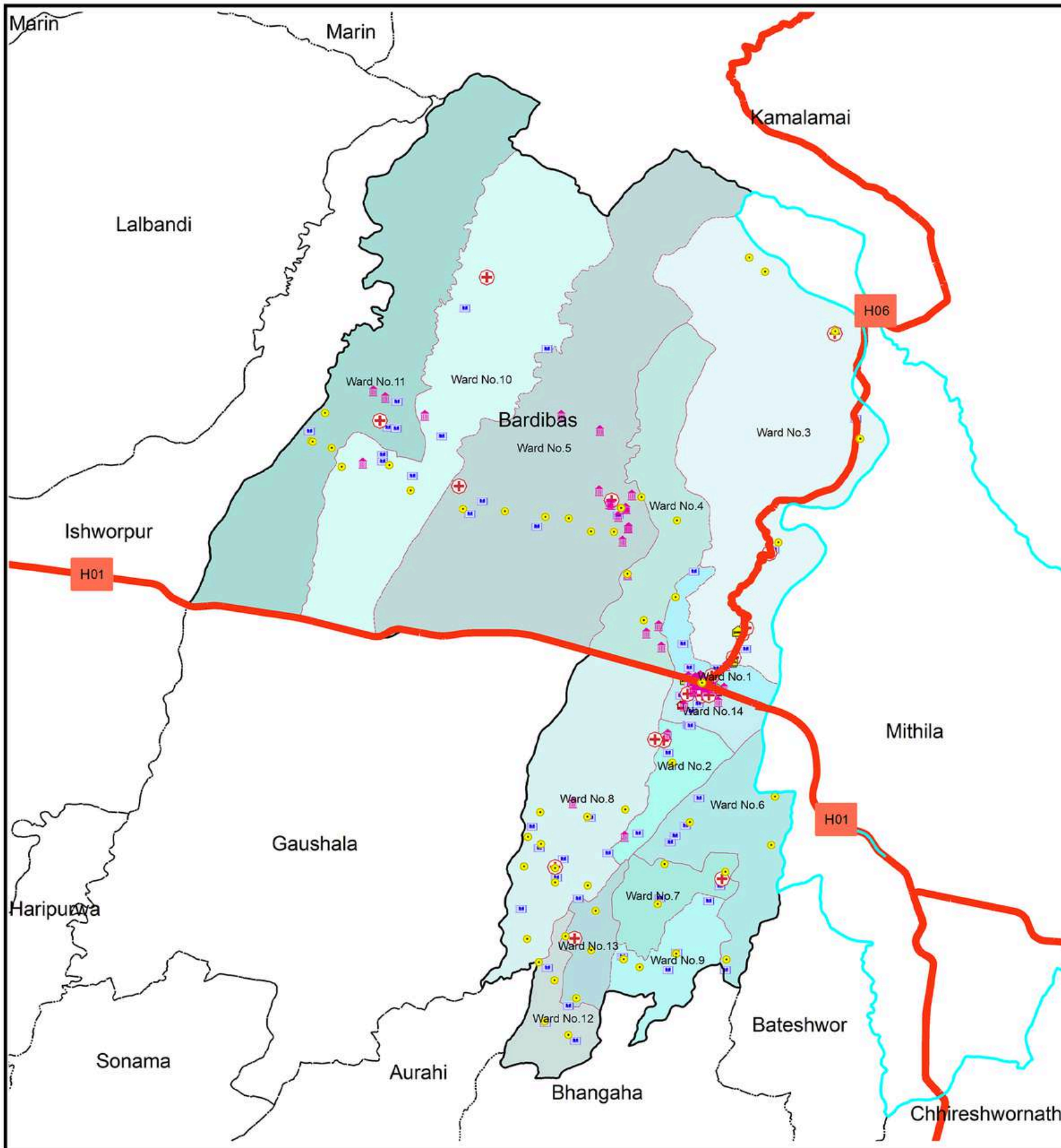


# INTRODUCTION

Bardibas is a vibrant municipality located in the Mahottari District of Nepal, nestled at the foothills of the Chure range. Strategically positioned along the East-West Highway, it serves as a vital link between the Kathmandu Valley, Madhesh Province, and Koshi Province. Covering a total area of 315.57 square kilometers, Bardibas is divided into 14 wards and has a population of 68,353, with 16,824 households and the literacy rate of 67%. (Census, 2021).

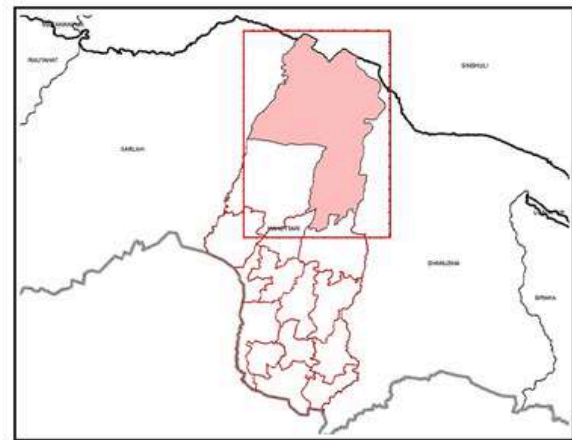
Located at an altitude of approximately 80 meters (262 feet) above sea level, Bardibas sits at coordinates 26.98°N, 85.90°E. The municipality is enriched by one major river—Ratu—that lies East to Bardibas. The river play a crucial role in supporting local agriculture, providing essential water resources for irrigation, and sustaining the livelihoods of the community. The fertile land and abundant water resources make Bardibas a key agricultural hub in the region, where farming is central to the local economy and way of life.

The river not only supports agriculture but also contributes to the region's ecosystem. However, like many rivers in Nepal, they are increasingly threatened by plastic waste leakage, which poses a serious environmental challenge. Protecting these rivers from pollution is essential for maintaining the health of the community and the natural resources that sustain it.



# ADMINISTRATIVE MAP

Bardibas Municipality, Mahottari, Madhesh Province, Nepal



0 0.5 1 2 Kilometers

### Coordinate System

Coordinate System: GCS WGS 1984  
 Datum: WGS 1984  
 Units: Degree

### Data Source

1. Survey Department
2. Open Street Map (OSM)

### Legend

- Provincial Boundary
- District Boundary
- Municipal Boundary
- Ward Boundary
- Settlement Area
- Village Area
- Highway
- Police Station
- Health Facility
- Educational Institute
- Financial Institute
- Bus Station
- Hotel and Restaurants
- Religious Site

### Infograph

74,361 Total Population	236 KM <sup>2</sup> Population Density	315.57 KM <sup>2</sup> Total Area
36,711 Total Male	37,650 Total Female	16,824 Total Household










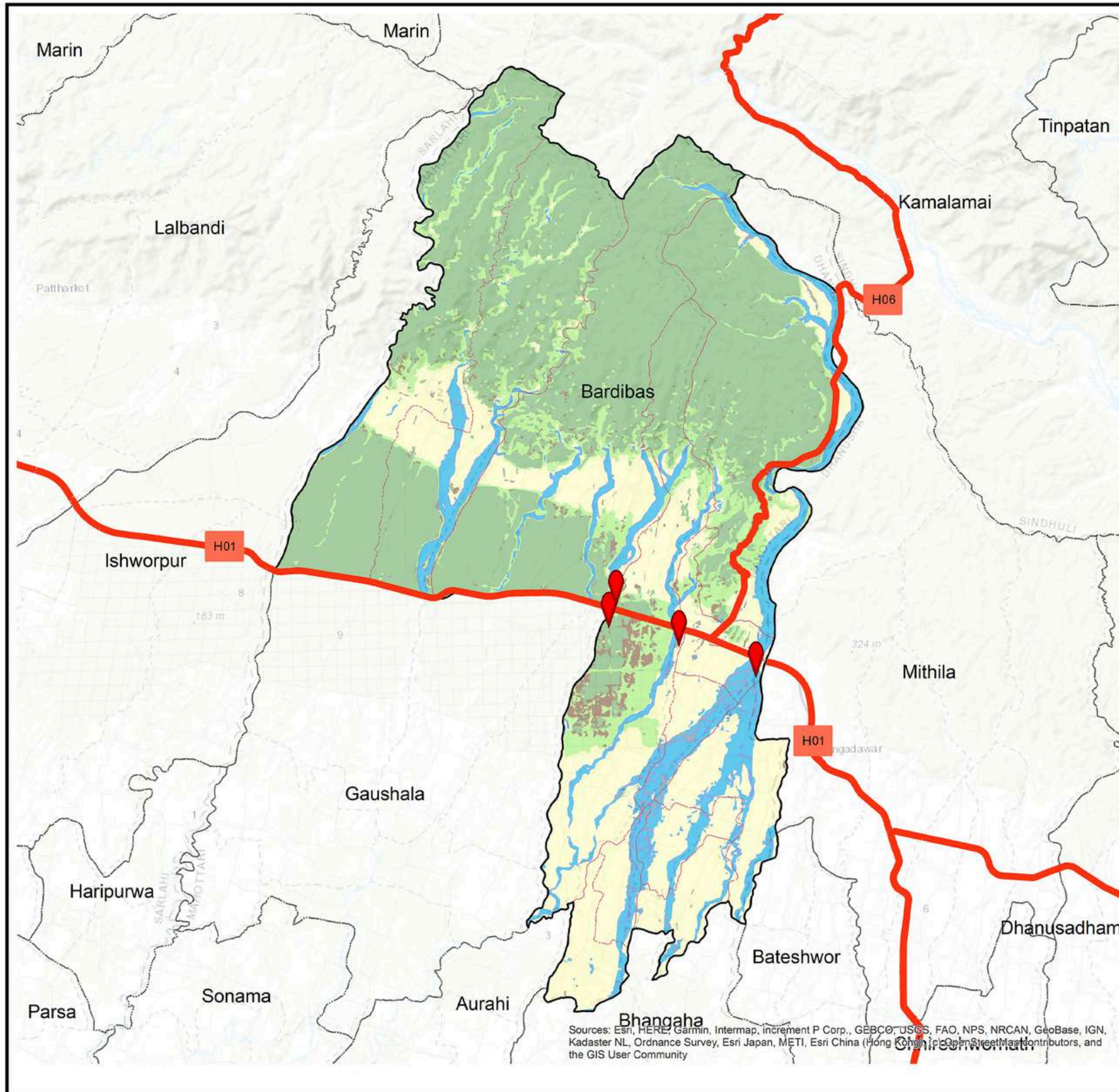
## STATUS OF SOLID WASTE IN BARDIBAS MUNICIPALITY

Solid waste refers to any non-liquid waste material discarded by humans, including household, industrial, and commercial waste. To assess the status of solid waste management in Bardibas, various sections of disposal sites were sampled to determine the composition of waste in the municipality.

### INTRODUCTION TO PLASTIC WASTE

Plastic wastes are comprised of different types generally categorized into 7 forms based on its composition and resistance.

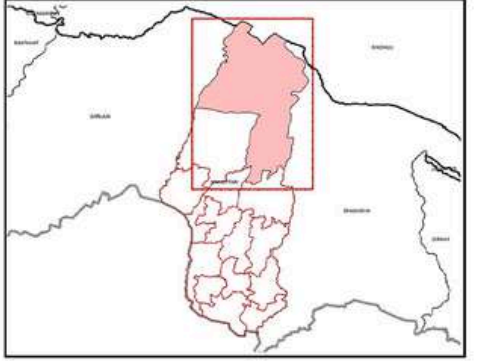
Plastic Type	Product Name	Images	Product Use	Material	Recyclability
Polyethylene Terephthalate (PET)	PET, Polyester		Soft drink bottles, food containers, textiles	Rigid/Soft, Transparent	Widely recycled
High-Density Polyethylene (HDPE)	HDPE		Milk jugs, detergent bottles, toys	Rigid and opaque	Widely recycled
Polyvinyl Chloride (PVC)	PVC, Vinyl		Pipes, flooring, window frames, credit cards	Rigid/ Soft	Non- Recycled
Low-Density Polyethylene (LDPE)	LDPE		Grocery bags, some food wraps, clothing	Soft and flexible	Non- Recycled
Polypropylene (PP)	PP		Food containers, straws, automotive parts	Rigid	Recyclable
Polystyrene (PS)	PS, Styrofoam		Disposable cutlery, packaging, insulation	Soft (when foamed)	Non- Recycled
Others	Multilayer Plastics		Eyeglass lenses, electronic components, bottles	Rigid	Non- Recycled



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, Mapbox Contributors, and the GIS User Community

## PLASTIC WASTE HOTSPOTS AND ITS COMPOSITION

Bardibas Municipality, Mahottari, Madhesh Province, Nepal



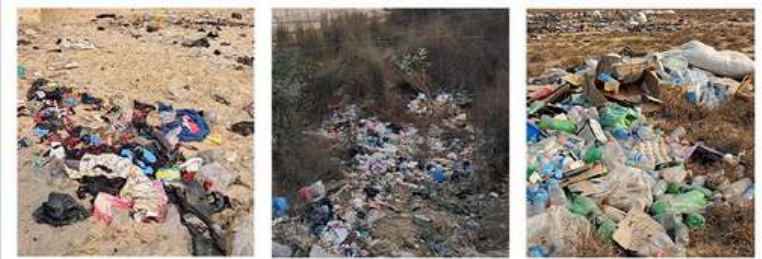
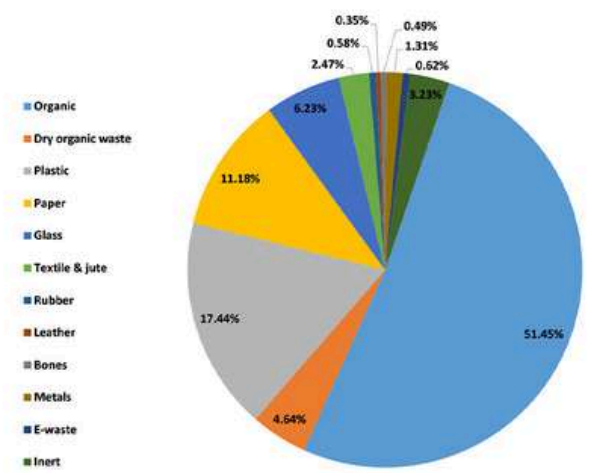
0 1 2 4 6 Kilometers

**Coordinate System**  
 Coordinate System: GCS WGS 1984  
 Datum: WGS 1984  
 Units: Degree

**Data Source**  
 1. Survey Department  
 2. Open Street Map (OSM)

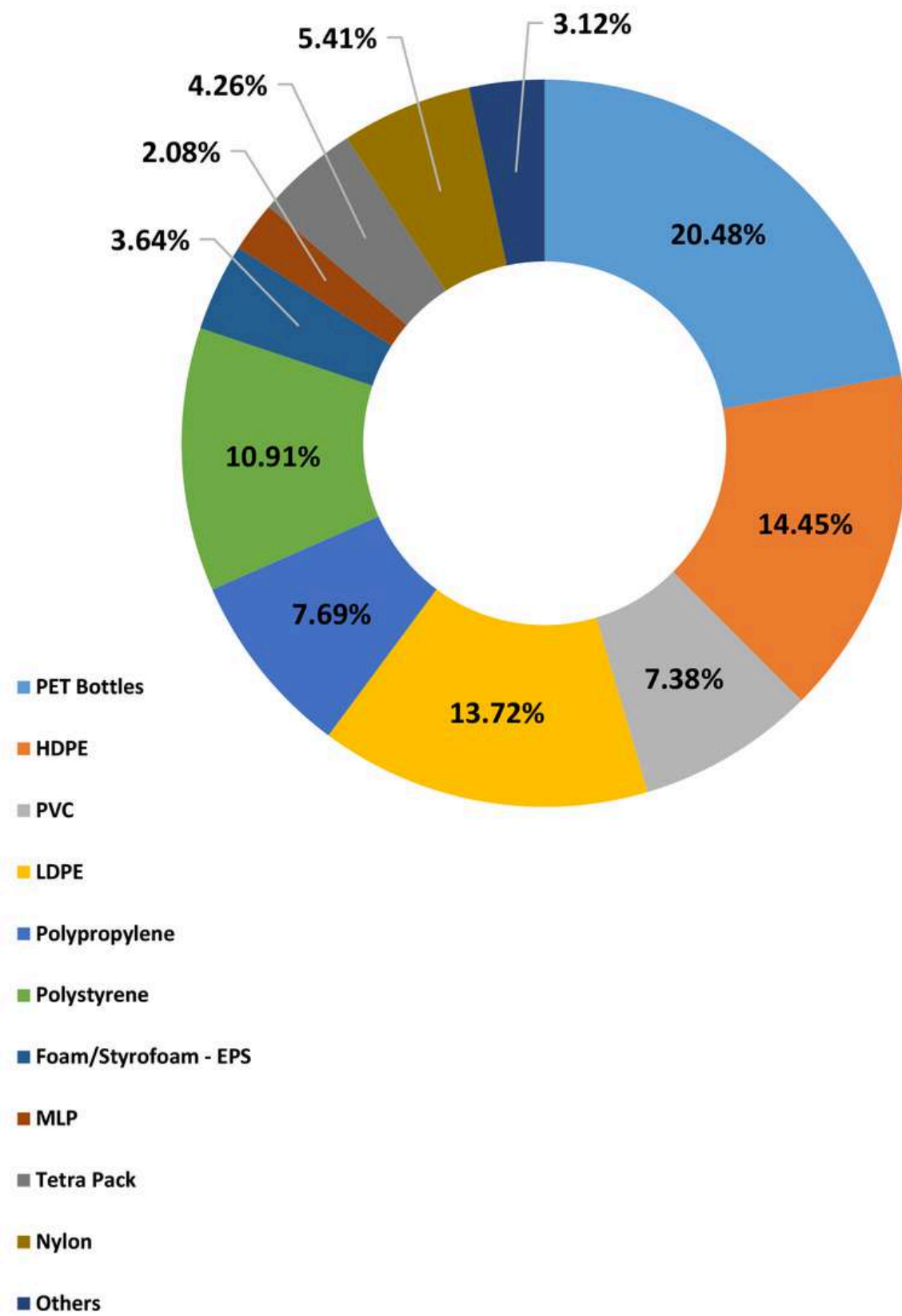
### Legend

- Provincial Boundary
- - - District Boundary
- Municipal Boundary
- Ward Boundary
- Highway
- 📍 Major Plastic Waste Hotspot
- 🌲 Forest
- 🌳 Other Wooden Land
- 🌱 Grassland
- 🌾 Cropland
- 🟡 Baresoil
- 💧 Waterbody
- 🌊 Riverbeds
- 🏠 Built-up Area

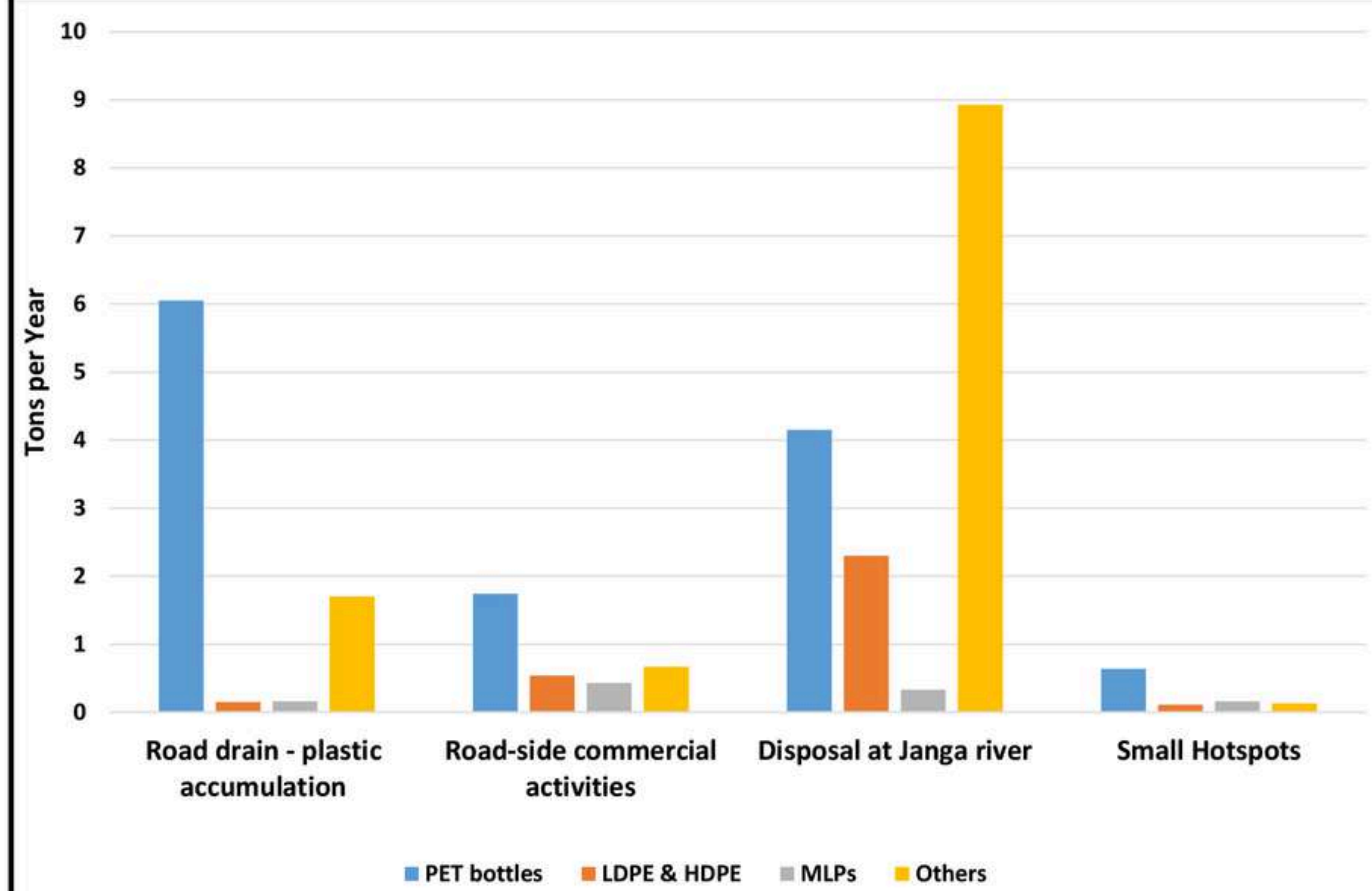


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### PLASTIC WASTE COMPOSITION IN THE HOTSPOTS



### SOURCES AND TYPES OF PLASTIC WASTE LEAKAGE

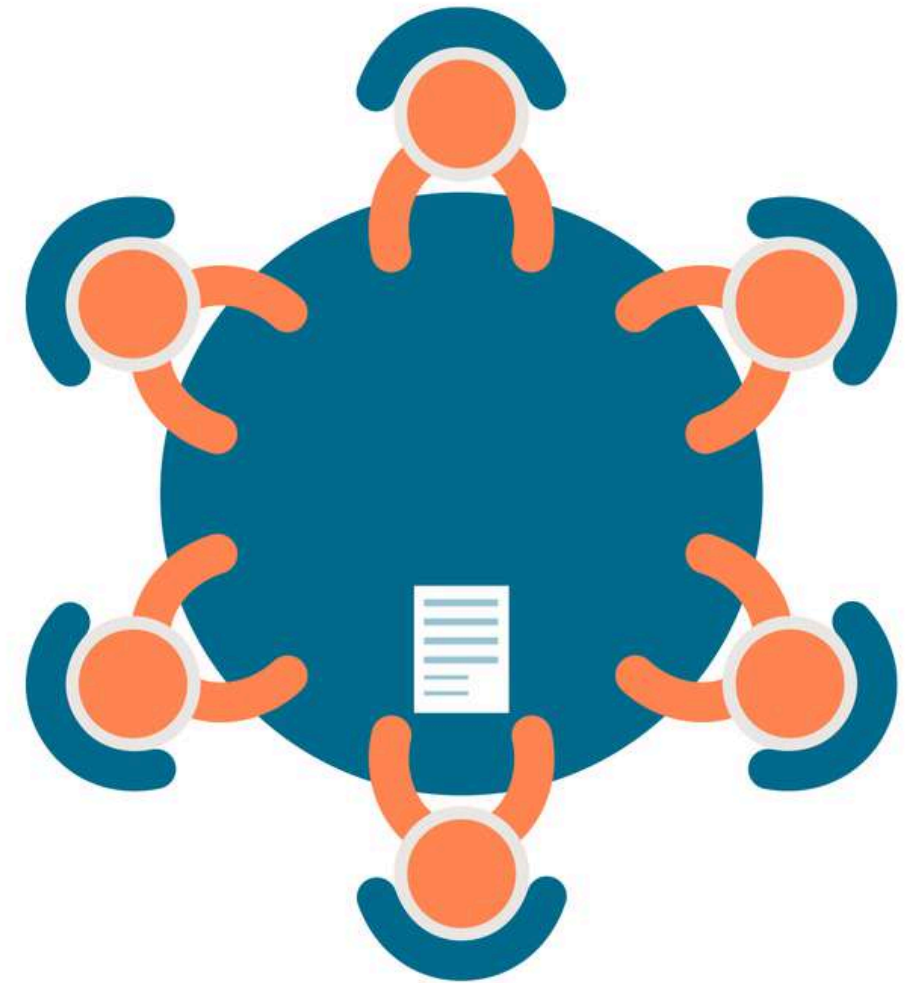


# HIGHLIGHTS OF FOCUS GROUP DISCUSSION (FGD)

## BARDIBAS MUNICIPALITY:

On November 10, a Focus Group Discussion (FGD) was conducted in Bardibas Municipality with five local stakeholders working in the waste sector to discuss updates on the solid waste management system. It was reported that municipal waste collection occurs daily in urban wards using a modified tractor, while waste disposal currently takes place along the riverbanks of Jangha Khola in Ward No. 14.

A previously used waste disposal site was closed due to overcapacity and concerns raised by the local community. To address these challenges, the municipality is planning to establish a new Waste Processing Center through a Design-Build-Operate-Transfer (DBOT) model, which will require an expansion of waste collection coverage. The discussion highlighted the significant revenue generation potential in solid waste management through private sector involvement and the engagement of youth, which holds promising future prospects. Additionally, the municipality emphasized the need for greater awareness and behavioural change at the community level to ensure effective solid waste management.



# CAP AT A GLANCE





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