



# **TAYAR NEPAL PROGRAM**

## DEVELOPING RISK SENSITIVE LAND USE PLANNING FOR GODAWARI MUNICIPALITY

Disaster Risk Reduction Management Planning &  
Intervention

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# I DRR PRIORITY AREA & DISASTER RISK REDUCTION MANAGEMENT PLANNING

Reducing disaster risk through urban land use management processes requires long-term systemic thinking and involvement of multiple stakeholders from diverse sectors. It also requires reducing the exposure or vulnerability of communities and assets to hazards using policies, structural measures and planning tools, such as Risk Sensitive Land Use Planning, RSLUP and disaster risk reduction management plan. Among a number of disaster-resilient planning techniques used, the RSLUP is regarded as an evidence-based tool to understand risk, plan and to reduce risk (Hada et. al., 2021). The RSLUP process starts with: i) mainstreaming disaster risk reduction/management into land use planning with integrated multi-sectoral plans; ii) formulating institutional bodies and with legal mandates, roles and responsibilities; iii) institutional strengthening through capacity building/support; iv) endorsement of plan, policy and legislation; v) plan implementation, enforcement; and vi) monitoring and evaluation. The following sub-sections provides the snapshots of existing status and scenario of the municipality on various DRRM related aspects and finally identifies the Gaps and suggests DRRM interventions/projects at local level.

## I.1 POLICIES, LEGAL AND REGULATORY MECHANISMS FOR URBAN AREAS

Preparation of DRRM plans, Local Disaster & Climate Resilience Plans (LDCRPs) at municipal level is an ongoing effort to mainstream DRM priorities into regular development planning and practices for internalization of safety and resilience issues in urban development and management. Some of the efforts includes 'Guideline for Settlement Development, Urban Planning and Building Construction, 2015' (Basti Bikash, Sahari Yojana tatha Bhawan Nirman sambandhi Adharbhut Nirman Mapdanda, 2072), for sustainable urbanization and resilient settlement development, Strategy for Resilient Local Communities, 2018 (MOFAGA, 2018) to enhance the participation of local communities in disaster management and climate change adaptation activities, *Integrated settlement development procedure, 2018* (Jokhim basti shanantaran tatha ekakrit basti Bikash sambandhi karyabidhi, 2075BS) for effective response to safer settlement. In addition, the Fifteenth periodic plan (2019/2020–2023/2024) emphasizes strengthening disaster resilience governance by ensuring disaster risk-informed planning and infrastructure development processes, capacity-building in multi-hazard disaster risk-mapping, information-based disaster risk forecasting, preparedness, response and recovery at all levels and; strengthening resilience from the community level up through increased public, private and community investments in DRRM. Likewise, National Urban Development Strategy (NUDS) formulated in 2017 with one of the guiding principles focusing on urban resilience through physical, social, economic and institutional resilience for mitigating short/long-term vulnerability resulting from disaster and impacts of climate change. The strategy focuses safer and resilient urban community through the use of tools and implementation of guidelines, rules and regulations like land-use zoning and regulations, enforcement of building codes and by-laws; enhancing preparedness to tackle disaster risks, operating guidelines that guide/prohibit location of settlements, designated evacuation areas and safe community shelters etc.

All the policies, legal and regulatory frameworks and institutional arrangement developed and implemented to date are aimed at covering all phases of disaster management cycle. However, lack of or minimum effort towards integrated risk sensitive development activities into local governance and development activities due to limited institutional capacity and arrangement; lack of comprehensive zoning regulations and land use controls in urban development planning practices are major constraints outlined by different sectors (NSDRM, 2009; NUDS, 2017, MOHA, 2018, IOM, 2020). In order to implement DRR related policy and regulations, carry out and manage DRR activities, there is a provision of Local Disaster Risk Management Committee and mandate to form other related sub-

committees. The process of formation, composition and functions, duties and powers of the Local Disaster Management Committee and provision of disaster fund establishment is clearly spelled out under Disaster Risk Reduction and Management Act, 2074 and Disaster Risk Reduction and Management Rules, 2076 (2019) as well as under Section 11, Chapter 3, of Local Government Operation Act, 2074BS (LGOA, 2017). Efficient and effective implementation of programs and activities and dynamic institutional arrangement is critical to achieve DRR targets and priority actions at local level. In this context, DRRM strategy and plan at local level for implementation is highly realized.

## **I.2 DISASTER INCIDENTS AND RISK SCENARIO**

### **I.2.1 DISASTER EVENTS AND IMPACT**

The historical disaster incident inventory of 38 years (1983-2020) period was carried out in first quarter of 2021. Though a total of 260 disaster incidents of 12 different types of disaster are found in the municipality between the period of 38 years it was found that the major disaster were the consequences of monsoon and extreme weather-related phenomena. The probabilistic multi hazard risk assessment showed the higher risk of weather-related hazards like windstorm, flood, fire and landslide (in hill area) followed by geo-hazard, earthquake. It is also evident that type and number of incidents have increased with the time. The type and frequency of major disaster incidents, damage to population, building structure, infrastructure and agriculture/crop land is presented in **Table I.1** and **Fig. I.1**. It is evident from the table that windstorm followed by flood, fire and flash flood are the major incidents which have major impact on building structure, lives of people and agriculture land and crops. Type and frequency of disaster events by ward and settlement is presented in **Annex IX of the Final RSLUP Report**. Details on historical disaster incidents, vulnerability, exposure, risk and other MHRA details are presented under separate **Multi-Hazard Risk Assessment Report (2021)** and **Final RSLUP Report** of the municipality and summary is presented under **Final RSLUP Report**.

### **I.2.2 EXPOSURE, VULNERABILITY AND RISK**

The exposure analysis of building structure based on construction type and material, roof type, number of floors and living population within the municipality showed that number of buildings are exposed to high risk of windstorm, flood and landslides hazard within the 20-25 years return period. **Table I.2** outlines the building exposure to different hazards by ward. Highest number of buildings are exposed to windstorm followed by flood risk. Ward number 1 has the highest number of building exposure followed by Ward Nos. 12 and 4. Number of buildings are under medium and low risk in ward number 3, 5 and 7. However, it is to be noted that the building exposed to one type of hazard incident is not mutually exclusive to another hazard type. This exposure of existing buildings to different types of hazards highlights the need of building/construction regulations.

Similarly, multi-hazard risk analysis of the municipality showed that of the total area, 23.17% of the municipal area is under high hazard risk. More than 50 % area is under medium hazard risk where as low risk area constitutes around 27% of the total municipal area. Ward number 4 has the largest area under high hazard risk followed by ward number 12 and 9. Ward number 5 followed by ward number 11 has the smallest area under high hazard risk. **Table I.3** details the area and percentage share of wards under different levels of hazard risk.

Besides, high hazard risk to physical structures like private and institutional buildings, based on MHRA, it is found that in spite of awareness and fair knowledge on hazard risk, level of preparedness is low

**Table I.1 Major Historical Disaster Events (1983-2020).**

MAJOR HISTORICAL DISASTER EVENTS (1983-2020)						
TYPE & FREQUENCY			LOSS/DAMAGE			
S.N.	HAZARD INCIDENT	NO OF INCIDENT	PEOPLE	BUILDING	INFRASTRUCTURE	AGRICULTURE LAND/CROP (HA)
1	Fire	20	4	24	1	0.5
2	Forest fire	13			1	0.0
3	Flash flood	16		5		14.75
4	Flood	57	124	753	2	590.7
5	Landslide	6	5	32	2	0.75
6	Windstorm	75	11	1394	6	4.5
<b>Total</b>		<b>187</b>	<b>144</b>	<b>2208</b>	<b>12</b>	<b>611.2</b>

Source: Field survey, Historical hazard incident inventory, 2021

**Table 1.2 Exposure of Building to Hazard Risk**

EXPOSURE OF BUILDING STRUCTURE TO HIGH RISK			
20-25 YEARS RETURN PERIOD			
WARD NO	FLOOD RISK	LANDSLIDE	WINDSTORM
1	82	0	3510
2	10	0	20
3	0	0	0
4	223	227	287
5	0	0	0
6	15	0	0
7	0	0	0
8	31	0	0
9	169	0	10
10	10	0	0
11	6	0	10
12	28	54	1172
<b>Total</b>	<b>574</b>	<b>281</b>	<b>5009</b>

Source: Multi-hazard risk assessment, Godawari Municipality, 2021

**Table 1.3 Area Coverage under Multi-hazard risk.**

AREA COVERAGE UNDER MULTI-HAZARD RISK					
AREA UNDER MULTI-HAZARD RISK (HA)					
WARD NO	LOW	MEDIUM	HIGH	TOTAL	% HIGH
1	143.98	682.23	70.08	896.27	7.92
2	245.37	476.38	136.06	857.81	15.97
3	327.09	729.42	138.41	1194.93	11.64
4	2188.82	5554.54	3681.53	11424.89	32.26
5	675.66	490.12	19.41	1185.20	1.58
6	372.56	261.52	44.31	678.38	6.64
7	523.50	344.09	45.73	913.31	5.12
8	516.22	1018.59	290.46	1825.26	15.70
9	573.88	729.87	298.53	1602.26	18.38
10	874.19	741.18	266.60	1881.97	14.28
11	531.93	363.73	24.76	920.43	2.80



AREA COVERAGE UNDER MULTI-HAZARD RISK					
AREA UNDER MULTI-HAZARD RISK (HA)					
WARD NO	LOW	MEDIUM	HIGH	TOTAL	% HIGH
12	1240.79	4028.68	2111.50	7380.97	28.68
<b>Total</b>	<b>8213.99</b>	<b>15420.35</b>	<b>7127.38</b>	<b>30761.66</b>	<b>23.17</b>
<b>Percent coverage</b>	<b>26.71%</b>	<b>50.11%</b>	<b>23.18%</b>		

Source: Multi-hazard risk assessment, Godawari Municipality, 2021

**Table 1.4 Institutional vulnerability and DRR preparedness.**

INSTITUTIONAL VULNERABILITY AND DRR PREPAREDNESS				
INSTITUTIONS	NO OF INSTITUTIONS	VULNERABILITY (%)		
		LOW	MEDIUM	HIGH
Educational	81	23.29	68.49	8.22
Financial	92	17.65	70.59	11.76
Health	37	11.11	86.11	2.78
Industries	116	18.10	70.69	11.21
Availability (%)				
DRR Component	Education	Financial	Health	Industries
Facilities for disaster response	8.1	22.80	8.50	23.10
Evacuation plan	52.3	33.60	29.30	35.40
Contingency Plan	9.7	18.40	2.50	20.50
DRM Knowledge Expert	4.2	5.40	2.30	9.40
Safe Assembly place	58.4	45.6	37.5	54.7

Source: MHRA, & Institutional Survey, 2021

among both households and institutions. Among four types of institutions, location of health institution is relatively safer followed by educational institutions so far as multi-hazard risk is considered. Location of higher number of industrial and financial units are in high hazard risk zone. However, more than 65% of all four types of institutions are located in medium hazard risk zone as evident in **Table 1.4**. So far as DRR preparedness is concerned, educational and health institutions are less prepared as compared to financial and industrial institutions. Among DRR components, identification of safer assembly place in case of emergency is the major preparedness practice of all type of institutions whereas availability/recruitment of DRM knowledge personnel/expert is least priority.

### 1.2.3 PRIORITY SETTING

As outlined in above sections, of past hazard impact, exposure and vulnerability regarding multi-hazard risk, windstorm, flood and landslides are major hazard risk and have a large impact on physical structure i.e. buildings and infrastructure, population, agriculture land and crops. Among these hazard risk, windstorm has the significant impact corresponding to both historical incidents and exposure to

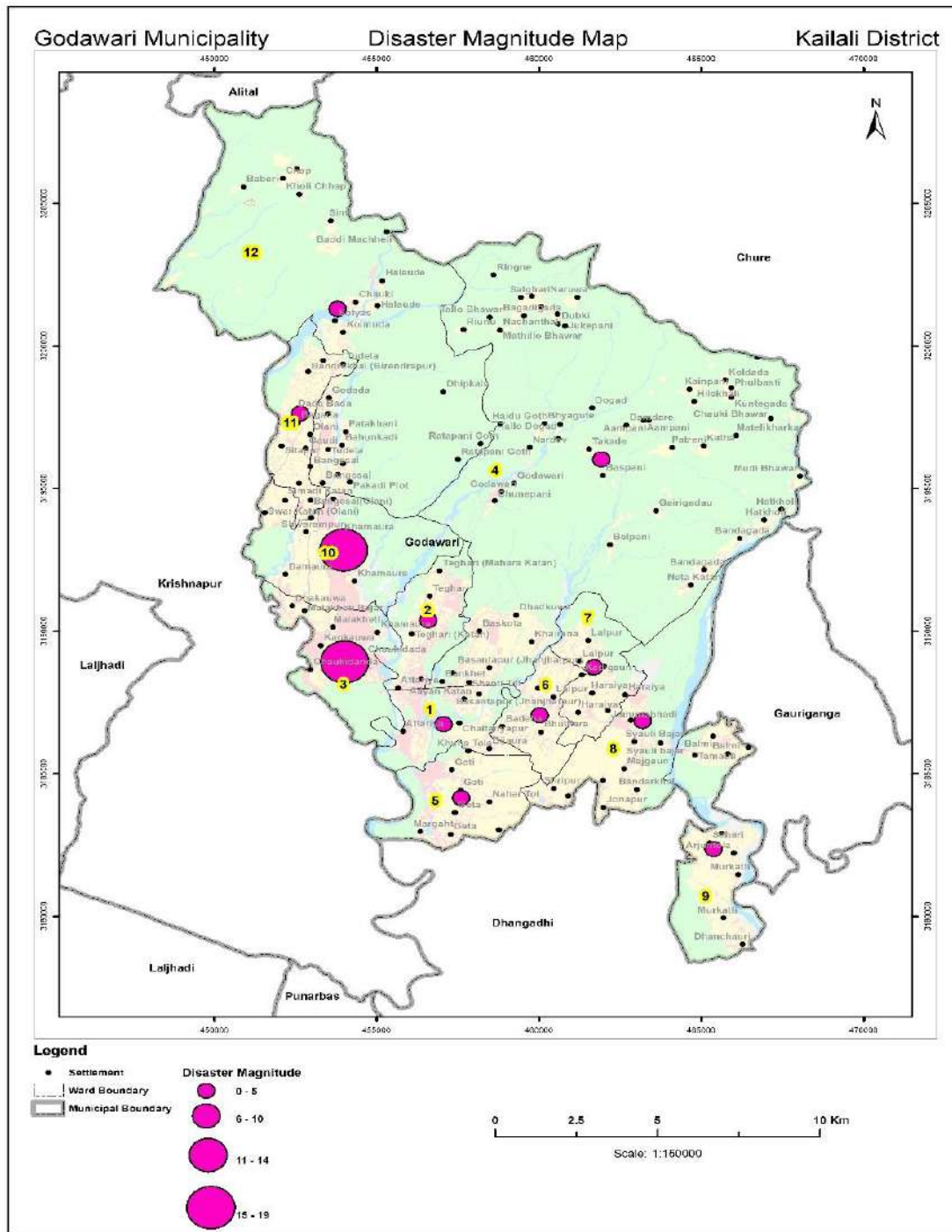


Fig. 1.1 Distribution and Frequency of disaster incidents in Godawari Municipality.

risk. It is followed by flood and landslides. The frequency of incidents, area coverage, loss and damage and level of risk in the municipality varies widely across locations. Based on the spatial distribution and impact of these disaster incidents and anticipated risk priority locations, scoring and ranking was identified. It is found that ward number 4 and ward number 12 are most susceptible to disaster risk and should have higher priority. The high priority area for DRRM among hazard risk is for windstorm, flood and landslide which need immediate attention for DRR program preparation and management. These three utmost hazards risk should be prioritized for DRR actions/interventions in Ward Nos. 4, 12, 1, 9, 2 and 11 respectively as illustrated in **Table 1.5**.

**Table I.5 Proritized Hazards and areas.**

PRIORITIZED HAZARDS RISK AND AREA FOR DRR ACTIONS				
COMPONENT	SUB-COMPONENT	PRIORITY AREA		
		1	2	3
Multi Hazard Risk		Ward 4	Ward 12	Ward 9
	Flood	Ward 4	Ward 9	Ward 1
Building Exposure	Landslide	Ward 4	Ward 12	--
	Windstorm	Ward 1	Ward 12	Ward 4
Historical disaster Incidents		Ward 4	Ward 12	Ward 11

Score	Rank
5	Ward 4
4	Ward 12
2	Ward 1 & Ward 9
1	Ward 2 & Ward 11

### I.3 MUNICIPAL PREPAREDNESS, CONSTRAINTS AND ISSUES

#### I.3.1 DISASTER INVESTMENTS

Recent developments in policy, legal, institutional and regulatory framework at national, regional and local level for mainstreaming DRR into local governance has highlighted the issue of DRR investment in disaster preparedness, prevention/mitigation and response. The municipality has two primary revenue sources: internal and external. It is relatively new municipality established in 2014 and has limited revenue sources. There was no practice and provision of separate budget allocation and investment in DRR sector before 2018 in the municipality as a separate heading. Disaster investment by municipality itself is limited but there are different Government and Non-Government authorities and organizations operating in different DRR related programs and activities at municipal level. With the implementation of National Disaster Risk Reduction and Management Act (2017), The Disaster Risk Reduction National Strategic Plan of Action (2018- 2030), mainstreaming DRR mechanism has been initiated in the municipality and **Disaster Risk Reduction and Management Act, 2018 Godawari Municipality** has also been implemented. The provision of fund allocation and budgeting for DRR related programs and activities was started in 2018 as a separated budget heading. Besides, 'Disaster Section' has also been established recently. The area of DRR investment by municipality was focused on response (relief and management of disaster afterwards) which has shifted to preparedness (Prevention & Control) since 2019. Capacity enhancement and infrastructure development is the main area of municipal investment since 2019 as depicted in **Table I.6**. This could largely be attributed to COVID-19 pandemic effect. Upsurge in awareness, inclusion of DRR component in institutional planning, budgeting and program activities are the major impacts after the experience of 2015 Gorkha earthquake and COVID-19 pandemic. Besides, understanding risk through risk profile mapping and strategic action plan development for river control are recent area of DRR investment.

**Table I.6 Municipal Investment in Disaster Sector.**

FISCAL YEAR	MUNICIPAL INVESTMENT IN DISASTER SECTOR					
	AREA OF INVESTMENT (NRs. 000)					
	PREPAREDNESS			RESPONSE		
	Capacity enhancement	Infrastructure	Prevention & Control	Management	Relief	Total
2018-2019				200	1000	1200
2019-2020	500	1500	64148.395			66,148.395
2020-2021			37048.673			

## MUNICIPAL INVESTMENT IN DISASTER SECTOR

FISCAL YEAR	AREA OF INVESTMENT (NRs. 000)			RESPONSE		
	PREPAREDNESS					
2021-2022	4000					
	500	1500	105197.1	200	1000	67348.4

Source: Godawari Municipality, Wards, 2021

### I.3.2 PREPAREDNESS

DRR, characteristically, is the multi-dimensional, multi sectoral and multiscale in nature and major issue related to DRR mainstreaming and institutionalization is intra and inter agency coordination and compatibility beside support in establishing, context specific technical assistance. Upsurge in awareness, inclusion of DRR component in institutional planning, budgeting and program activities are the major impacts after the experience of 2015 Gorkha earthquake and COVID-19 pandemic at local level. No proper preparedness of the municipal and ward authorities itself is another major issue which is most common at local level authorities which validate those institutions serving at-risk populations are as vulnerable as citizens to disaster risk. The physical infrastructure like building structure, WASH facilities and emergency preparedness equipment and materials as well as human resource is also found inadequate. The level of preparedness of municipality and wards as institution is summarized in **Table I.7**.

### I.3.3 ONGOING AND PLANNED EFFORTS

Number of structural and non-structural efforts are ongoing and planned for the disaster risk reduction and management in the municipality and wards. Current and planned efforts in the municipality and wards are summarized in the **Table I.8**.

**Table I.7 Institutional Preparedness (Ward and Municipality).**

WARD & MUNICIPAL PREPAREDNESS		
SN	INDICATORS	AVAILABILITY (%)
1	Safe assembly points in emergency	84.21
2	Gender friendly toilet	63.16
3	Evacuation plan	63.16
4	Exit route display	57.89
5	Infrastructure available for disaster response	52.63
6	Availability of fire extinguisher	47.37
7	Emergency plan	42.11
8	Disaster contingency plan	42.11
9	Drills for fire	42.11
10	Drills for other Hazard	42.11
11	Differently able friendly infrastructures	31.58
12	Drills for Earthquake	31.58
13	Earthquake alarm	5.26
14	Recruitment of disaster management personnel	5.26

Data source: Godawari Municipality, 2021

**Table I.8 Ward & municipal efforts.**

WARD & MUNICIPAL EFFORTS			
SN	DRR component	Current efforts	Remarks
1	Formation of DRR committees	Municipality and Wards 1, 2, 6, 8, wards	
2	Identification of Safe area/Open space for emergency	Wards 2, 6 & 8	Ward 8 has formed search & rescue team

<b>WARD &amp; MUNICIPAL EFFORTS</b>			
<b>SN</b>	<b>DRR component</b>	<b>Current efforts</b>	<b>Remarks</b>
3	Capacity Development on DRRM	Wards 1, 6, 9, 10, 11 & 12	
4	Conservation/protection/Plantation	Wards 6, 10,12	Ward number 3, 4, 5 & 7 has relatively fewer interventions and no specific activities are ongoing
5	River bank & flood protection measures	Ward 6, 10, 11, 12	
6	Emergency & Relief material storage	All wards	
7	Hazard inventory	Ward 9	
	<b>DRR component</b>	<b>Planned activities</b>	
1	Formation of DRR and Community DRRM committees	Ward 4,	Plan to continued /extension of ongoing activities in most of the wards where DRRM related activities are ongoing
2	Allocate budget for DRRM	Wards 2, 3, 8	
3	Capacity Development on DRRM	Wards 1, 3, 4, 5, 7, 9	
4	Hazard inventory	Ward 9	
5	Conservation Plantation	Ward 1, 3, 9	All wards have planned to purchase and store Emergency & Relief equipment and materials
1	Flood/Inundation control measures	Ward 1,3, 4, 9,	
2	Emergency & Relief storage	All wards	Identification of safer area is also planned where it is not identified

Source: Godawari Municipality and ward offices, 2021

### **I.3.4 CONSTRAINTS, ISSUES AND GAPS**

The Institutional survey of ward and municipal offices were carried out on availability facilities, resource and infrastructure as well as DRR preparedness and management. The status of preparedness for the municipality was determined by assessing availability and management of emergency and DRR related facilities and resources like Fire Brigade, ambulance service, physical infrastructure and space availability; working committees and volunteers, transportation means and vehicles, trained search, rescue and relief operators WASH facilities are operators.

Overlapping of program activities and role and responsibility at provincial, district and local level is still persistent due to administrative restructuring. However, in the municipality and ward, DRR investment with separate heading of budget allocation under DRR heading (Forest, Environment and DRR) has been started, second to road construction and improvement, major budget allocation is on protection and control of river bank cutting with structural interventions like, embankment, check dam etc.

Holding the mandate for the formulation, implementation/approval and, monitoring of local level planning and physical infrastructure/ building construction activities, the municipal authority plays the central and coordinating role, reaching each stakeholder. But low level of institutional capacity of the municipalities for effective urban development has been one of the major hindering factors. Weak implementation of existing policy, acts, rules and guidelines is one of the major issues which has resulted increased disaster vulnerability. Institutional capacity of implementation agency plays a major role in raising awareness and enforcing legislative frameworks at local level Capacity development of institution and human resource within institution is the foremost priority area for DRRM planning and implementation. Limited capacity and resource are the major constraints of the municipality as it is relatively new establishment and restructuring of administrative and local governance under federal structure has enforced decentralized responsibility. Generating internal revenue through local taxes, service charges, fees and municipal investments etc. is the major source of income of which

administrative expenditure has the largest share followed by development expenditure which is skewed towards physical infrastructure like road construction.

However, there are number of national and international funded DRR projects. But there is no dedicated technical resource as well as knowhow for financing and implementation of DRR programs and activities. Institutionalization (i.e., integration into daily municipal activities) and implementation of all regulatory and institutional framework within organization and at community level for at-risk population is another constraint due to regular municipal public service workload. Lack of objective and systematic method of identifying existing and future needs for DRR management is one of the major issues within ward and municipal authority. A comprehensive plan on revision and assessment of past disaster incidents and preparedness, risk safe and efficient DRR management is prominent requirement. The cost effectiveness of the current preparedness for future risk is realized but not in regular practice. Comprehensive training and orientation with identification of individual roles and responsibility of municipal and ward officials and sections on how integrated DRR and urban development and planning activities is to be implemented is realized and suggested. However, despite awareness and knowledge on importance of DRR activities and management in urban development context, a deficiency of number of factors which include financial resources, human resource, physical infrastructure was found which is the basic minimum requirement effective and efficient planning and implementation. The SWOT analysis is carried based on existing disaster scenario, capacity, preparedness, constraints and issues at municipal and ward levels as shown in **Table 1.9**.

Based on the overall assessment of municipal and ward level MHRA, (**Refer Final RSLUP Report**), Urban context (**Refer Final RSLUP Report**), and institutional survey and discussion through (workshops, interaction programs and KII consultations) on Disaster risk reduction and management efforts, investment, plans and institutional capacity the identified limitations, gaps and priority area is presented in **Table 1.10**.

**Table 1.9 DRRM effort and plan at municipal.**

<b>DRRM EFFORT AND PLAN AT MUNICIPAL</b>		
	POSITIVE	NEGATIVE
<b>Internal</b>	<b>Strength</b>	<b>Weakness</b>
	Higher Administrative at local level with power and authority for local development	Limited human resources and infrastructure, Limited financial resource
	Coordination, assistance and established linkages with all local organizations	No emergency fund allocation
	Local disaster risk reduction and management Act for effective functioning and mobilization during and after disaster incidents	Inadequate technical skills and knowhow of the committees and lead members
	Identified institutional structure for DRR management and implementation	Main focus on Disaster Response mainly relief distribution and search and rescue
Knowledge on local physical and socio-economic context	No formal mechanism on DRR & Hazard Inventory and record keeping	

## DRRM EFFORT AND PLAN AT MUNICIPAL

	POSITIVE	NEGATIVE
External	<b>Opportunity</b>	<b>Threat/Challenges</b>
	Local Resource mobilization to prepare and implement DRR plans and programs through PPP	Political pressure and interference
	Municipality as common forum for mainstreaming disaster as a cross cutting issue in local urban development programs	Limited public assurance and commitment on implementation of municipal regulations and bye-laws
	Local authority for incentives and disincentives for disaster resilient construction practices	Overlapping of roles and responsibility; Hindrance on authority
		Conflicting clauses on sectoral policy and regulations to address all disaster cycle

**Table 1.10 Limitation, Gaps and Priority area.**

LIMITATION, GAPS AND PRIORITY AREA		
LIMITATIONS AND GAPS	KEY PRIORITY AREA	KEY INSTITUTIONS
1 Limited technical skill and knowledge on risk understanding and governance to facilitate and coordinate local level disaster risk management in the municipality	Strengthening Skill and knowledge through capacity development and technical assistance to Municipal and ward officials/members	Municipality, Wards Support: National DRR organizations, MoFAGA, INGOs, NRCS
2 Limited institutional infrastructure to implement DRRM plans, programs and activities	Invest in physical infrastructure of municipal and ward offices for effective and efficient DRR planning and management	Municipality, Wards support: MoUD, MoFAGA, INGOs-DRR related cluster
3 Inadequate emergency services and low importance to management and maintenance aspect	Invest in emergency services like fire brigade unit, ambulance services and emergency equipment  Improve management and maintenance aspect for existing emergency services through adequate human and technical resource input	Municipality Support: INGOs, MoUD, MoFAGA, MoHA
4 Limited formal strategy, protocol and procedures for implementation of Disaster risk reduction and management efforts in local development activities	Formalization of standard protocols and procedure for integrated disaster risk reduction and management and development activities  Implementation of local landuse policy and regulations, building codes and bye-laws  Development of monitoring mechanisms. Strengthen preparedness and response mechanism through institutional set ups at local level.	Municipality, Support: Local organizations, Private institutions
5 Limited financial resource of municipality on DRRM and	Develop mechanism to participate in emergency fund for disaster risk reduction and management in	Municipality, MoFAGA, MoHA, INGOs

## LIMITATION, GAPS AND PRIORITY AREA

	LIMITATIONS AND GAPS	KEY PRIORITY AREA	KEY INSTITUTIONS
	minimal financial support of external organizations for disaster preparedness	preparedness, mitigation and response affected households and communities  Develop mechanism for risk transfer through risk financing	Municipality, Financial institutions (National and Local)
6	Poor WASH infrastructure and services within municipality and wards as well as other public service institutions	Initiatives on improvement of institutional WASH condition through access to resources  Improve hygiene and sanitation practices with adequate investment	Municipality  Support: NRCS, INGOs-WASH Cluster
7	Limited preparation/participation of Local private institutions in mainstreaming DRR and into their plans	Strengthening municipality and ward role as governing body for local level organizations to mainstream disaster risk management into their plan and activities  Improve institutional set up of public services and facilities	Municipality  Local Public and private institutions
8	Low resilience and adaptive capacity of population in general and  Low resilience and adaptive capacity socially vulnerable group in high hazard risk area  particularly on construction practices e.g. private building, local/ community buildings and roads) in high risk area	Develop programs on building resilience against high hazard through implementation of risk informed guidelines, protocols etc.  Improve construction and agricultural practices through risk understanding awareness and incentives  Improving structural risk reduction measures e.g.  bio-engineering solutions and increase community participation in construction and maintenance	Municipality, Ward  Community  MoUD, MoAC
9	Increasing constructions and Fragile agriculture practices along flood and landslide risk area	Investment in upstream-downstream linkages and risk mapping in flood and landslide risk area  Adoption of hazard resistance and agriculture practices such as agroforestry, plantation  Develop program focusing on agriculture resilience through awareness training, agriculture incentives for livelihood, introduction of better agriculture technology	Municipality, Ward  Community  MoUD, MoAC
10	Poor management and monitoring of Public open space for emergency/humanitarian use	Investment in improving existing institutional public open spaces  Identify open spaces for humanitarian / emergency use and build and manage infrastructure for emergency relief	Municipality,  Education, Health and Security Institutions,  NRCS  Humanitarian organizations



## LIMITATION, GAPS AND PRIORITY AREA

LIMITATIONS AND GAPS	KEY PRIORITY AREA	KEY INSTITUTIONS
	storage, emergency shelter and	
11 Poor management in technical trainings and general understanding of ground/sub-surface soil bearing conditions	<p>Develop training programs in two levels:</p> <p>i. For executive level: execute 1-day orientation training on soil test training at the site.</p> <p>ii. For physical planning level, engineers and community level: conduct 2-days field identification of soils and their engineering properties.</p>	Municipality, DRR section, Geological/Engineering Geological and Geotechnical Engineering Departments and Consultants.
12 No any preparations in Fire, Earthquake and Geohazards of the municipality.	<p>Develop programs for executive levels and physical planning levels, engineers and community levels.</p> <p>i. Conduct 1-day Fire Drill at municipal, ward and community level every six months.</p> <p>ii. Conduct 2-day Earthquake Drill at municipal, ward and community level every six months.</p> <p>Conduct 1-day site visits for executive level and 2-day site visits for planning levels, engineers and community levels to identify types of geohazards, causative factors and general mitigative/protective measures.</p>	Municipality, DRR section, Geologist/Engineering Geologist, Geotechnical Engineers, Structural Engineers, Earthquake Engineers/Seismologist/Geologist, institutions such as Department of Mines & Geology (DMG), Geology/Engineering Geology Departments, Government sectors of concerned departments/sections.
13 Poor understanding of impacts of multi-hazard risk analyses.	<p>Conduct detailed training every year for two levels:</p> <p>i. Executive level: 14-hours GIS training and enhance capacity to learn and understand multi-hazard risk analysis and risk sensitive land use plan (RSLUP) in detail.</p> <p>ii. Physical Planning level, engineers, community level: 49-hours GIS training and enhance the capacity to understand the analysis of multi-hazard risk and RSLUP in detail.</p>	Municipality, Engineering Consultants, Research Institutes, Government Agencies, DMG, Universities with available GIS based departments/sections, etc.

Local Disaster Risk Management Planning guidelines (LDRMP 2011) was the major document for preparing disaster risk management plan at local level. MoFAGA has recently endorsed the revised version as 'Local Disaster and Climate Resilience Planning Guidelines, 2017 (LDCRP Guidelines-2074) which integrates local climate change adaptation into disaster risk reduction and management. DRRM plan is a very important step towards achievement of effective disaster risk reduction and management. The suggested disaster risk reduction and management plan of the municipality has been developed based on context specific focus and priorities but is in line with the national and provincial priorities. It also reflects 4 priority areas stipulated by Sendai framework, 2015-2030 namely: i) Understanding Risk (multi-hazard risk assessment, Hazard & Disaster inventory, awareness and trainings etc.), ii) Strengthening Disaster risk Governance to Manage Disaster Risk (initiative for risk management, public and private partnership, implementation of regulatory mechanism etc.), iii) Investing in Disaster Risk Reduction for Resilience (mainstreaming DRR activities into development, risk transformation and financing, infrastructure development etc.), and iv) Enhancing Disaster Preparedness for effective

Response to “build back better” in recovery, rehabilitation and reconstruction (safer construction, retrofitting, early warning system, risk information sharing platform etc.). Reflecting the consistency with aforementioned priorities following sub-sections details municipal level DRRM plan and suggested interventions. The suggested plan is developed as part of RSLUP, and has incorporated holistic approach and hence has the limitation of comprehensive planning at ward and community level.

#### **I.4 DISASTER RISK REDUCTION AND MANAGEMENT PLAN**

Disaster Risk Reduction and Management Plan (DRRMP) as part of Risk Sensitive Landuse Planning (RSLUP) has following goal and objective:

##### **I.4.1 GOAL**

Reduction and Alleviation of disaster risk by increasing resilience of local authorities and communities through DRRM integrated urban planning and development.

Promotion of safe lives, livelihoods and safer settlement by reducing disaster risk ‘reduced disaster risk- enhanced livelihoods’

##### **I.4.2 OBJECTIVES**

- Enhance the municipal disaster management and response capacity
- Institutionalize DRRM into local level development planning and programs of municipality and wards
- Build, improve and strengthen institutional and community-based disaster preparedness and response

##### **I.4.3 STRATEGY**

In order to achieve the objectives and implement programs and activities, the major strategies are as following:

- Mainstreaming DRR and related activities into local and periodic development plan
- Coordination and participation to ensure capacity development of all sectors through relevant committees
- Community participation in all aspects of local disaster risk reduction and management ensuring the representation and inclusion of most vulnerable group and high risk area

##### **I.4.4 OPTIMAL AND SUSTAINABLE USE OF LOCAL RESOURCES**

Based on the identified goals and objectives, the detailed plan of activities is organized into disaster phase namely: mitigation, preparedness, response and recovery. Structural and non-structural intervention programs/activities are identified according to thematic sectors including policy and regulatory frameworks, institutional capacity, Physical infrastructure and community-based conservation/protection and management. The focus of the DRRM plan is on hazards with higher impact, geographic area of high and medium hazard risk, urban nodes, and ward and municipal institution.

#### **I.5 MONITORING AND EVALUATION OF DRRM PLAN**

The municipality shall review its policies and programs and monitor and evaluate the implementation of the local disaster management plan on regular basis. It is suggested that plan should be **annually**

reviewed and updated based on the recommendations of the implementation and monitoring and evaluation committees. The LDCRP and other disaster related guidelines outlines that monitoring and evaluation shall be conducted according to the indicators approved by the “National Priority Programs for Disaster Risk Reduction” for monitoring and evaluation of the programs. Some of the suggested indicators, time frame and means of verification are listed below in **Table I.11**.

**Table I.11 Monitoring and evaluation of DRRM Plan.**

MONITORING AND EVALUATION OF DRRM PLAN					
SN		TIME FRAME/TARGET	MEANS OF VERIFICATION)	REFERENCE DOC	
1	Reducing Physical Vulnerability	Baseline: current year	%	Progress Scoring:	Basti Bikash mapdanda, Municipal Building Bye-law, Integrated settlement development procedure, 2018 (Jokhim basti sthanantaran tatha ekakrit basti Bikash sambandhi karyabidhi, 2075BS  LGOA, (2074 BS) 2017, Chapter 3  Local Disaster and Climate Resilience Planning Guidelines, 2017 (LDCRP Guidelines-2074)
	Safer construction			< 25 % - 5	
	Infrastructure			25% - 3	
	Institutional	Increase by 50% 2 years		50% - 1	
	Private (Housing model building design from DUDBC)	Increase by 100% 5 years			
2	Increasing Disaster preparedness and knowledge	Baseline: current year	%	Progress Scoring:	National Policy for Disaster Risk Reduction 2018  Disaster Risk Reduction and Management Act, 2074 and Disaster Risk Reduction and Management Rules, 2076 (2019)  Disaster Risk Reduction and Management Act of Godawari Municipality, 2018
	Develop and implement Plan of action to mainstream the priorities within municipal planning process	Increase by 50% 1 years		< 25 % - 5	
				25% - 3	
	Increase Level of knowledge amongst households, community and institutions	Increase by 100% 2 years		50% - 1	
3	Reduced Social Vulnerability	Baseline: current year	%	Progress Scoring:	
	Effective financial investment for DRR			< 25 % - 5  25% - 3	

## MONITORING AND EVALUATION OF DRRM PLAN

SN	TIME FRAME/TARGET	MEANS OF VERIFICATION)	REFERENCE DOC
Effective leadership and participation	Increase by 50% 1 years	50% - I	
Increase coordination between Community and Local institution	Increase by 100% 2 years		

### 1.6 OPEN SPACES FOR DISASTER RISK REDUCTION AND MANAGEMENT

Providing secure sites for storing emergency equipment and relief providing safer emergency shelter for displaced population during and after disaster are major responsibility of local authority before, during and after a disaster incident. This requires the identification and management of humanitarian public open space by the municipality. Open Space in general, represents public open area, barren land, public land under government ownership, sports and playgrounds, green open spaces and institutional open spaces. Such open space needs to be identified and protected through certain regulations for the use during and after disaster condition. It is considered as one of important zone to be used for humanitarian response. Identification, improvement and management of public open space core component of local disaster risk reduction and management plan. **Fig. 1.2** shows the open space of the municipality.

#### 1.6.1 METHODOLOGY

Open spaces are mapped to strengthen emergency preparedness and to provide the initial response planning framework for the local governments and partner agencies. While identifying the humanitarian open spaces area of an open space, availability of water, sanitation and hygiene (WASH) facilities, distance from critical facilities, accessibility and security are some important parameters (IOM, 2020). However, these parameters as the international standards is not always feasible for selecting an open space location in developing country like Nepal which has urban area with dominant rural characteristics of few compact built up and vast agrarian area. However, these criteria are considered as far as possible for locating humanitarian open space for assembly and shelter during emergencies.

The primary sources of information for open space included a field-based observation, institutional survey and interaction program with ward and municipal personnel. GIS mapping of institutional and public open spaces were also carried out. The municipal and ward authority were consulted regarding the existing open spaces available and used during emergencies. Informal discussion on DRM efforts and existing status was carried out during sensitization workshop. Besides, a discussion on DRM was carried out with the municipal authority during the field visit and some open space sites were also observed together with the ward representatives. Total usable area, availability of water, sanitation and hygiene (WASH) facilities, and critical infrastructures near the open spaces are observed and recorded.



**Fig. 1.2 Institutional Open Space in the Municipality: JK Boarding school (left), Bageswori school (right).**

Open spaces for identification of humanitarian open space, are categorized into three groups based on the use and ownership characteristics namely:

- i. Institutional open space which comprised educational, health and security use spaces,
- ii. Public open space with government ownership as per cadastral database, and
- iii. Other opens space including sportsground, religious open spaces

However, open spaces of government and non-government organizations, industries, patches of barren lands and agriculture fields of the Municipality, are not considered as open space for humanitarian purpose.

Humanitarian Open-space selection criteria using GIS based overlay analysis:

1. Selections of parcels having Educational, Health and Security units i.e., OS parcels
2. Exclusion of OS parcels (identified in step i) area under forest and waterbodies
3. Overlay of OS parcels (identified in step ii) with MHRA layer
4. Identification of OS parcels under high, moderate and low risk zone area.
5. Selection of OS parcels under low-risk area
6. Identification of OS parcels in each ward
7. Identification of OS parcels with area above 200 m<sup>2</sup>
8. Identification of OS parcels under development nodes 2030 and 2050

Rationale for selection criteria of institutional open space is that these institutions have available physical spaces as well as building structures which are used in practice during emergency response educational commonly as emergency shelter, health space has emergency treatment and security spaces commonly as shelters for injured and emergency health facilities.

### **I.6.2 DISTRIBUTION AND CHARACTERISTICS OF INSTITUTIONAL OPEN SPACES**

Among different institutional open spaces, educational complex is the most common space used as emergency shelter for emergency response during and after the disaster. Open spaces of health facilities are used as emergency service and treatment whereas open spaces of security are used for both emergency shelter (for injured) and emergency health services besides emergency relief storage. The humanitarian open space identification process carried out using aforementioned methodology resulted total of 103 parcels with 12 km<sup>2</sup> area coverage. Ward wise distribution of open spaces, the smallest and largest size of open space patches, and approximate capacity of institutional open space is presented in **Table I.12** The highest number of parcels is found in ward number 10 comprising 17

**Table 1.12 Institutional open space and approximate capacity at ward level.**

<b>INSTITUTIONAL OPEN SPACE AND APPROXIMATE CAPACITY AT WARD LEVEL</b>						
WARD	NO. OF PARCEL	TOTAL AREA (M <sup>2</sup> )	SMALLEST PATCH SIZE (M <sup>2</sup> )	APPROX. CAPACITY IN SMALLEST PATCH SIZE	LARGEST PATCH SIZE (M <sup>2</sup> )	APPROX. CAPACITY IN LARGEST PATCH SIZE
1	10	24125.06	202.73	51	11664.70	2916
2	14	120951.88	225.92	56	60473.21	15118
3	8	84327.42	268.62	67	48787.08	12197
4	5	41716.75	518.74	130	13125.16	3281
5	8	213485.70	1117.84	279	163817.58	40954
6	14	28061.02	237.11	59	5697.63	1424
7	3	134192.37	3391.99	848	121696.89	30424
8	6	50796.24	847.17	212	35165.72	8791
9	12	347074.97	421.51	105	150243.33	37561
10	17	140250.45	202.90	51	105591.20	26398
11	2	8763.66	1500.88	375	7262.78	1816
12	4	12623.49	1276.20	319	7993.26	1998
<b>Total</b>	<b>103</b>	<b>1206369.01</b>	<b>10211.61</b>	<b>2553</b>	<b>731518.54</b>	<b>182880</b>

Source: GIS mapping & calculation and Field survey, 2021

parcels with total of 140250.45 m<sup>2</sup>, while ward number 11 has the lowest number of open space parcels covering 8786.6 m<sup>2</sup>.

Though there are number of open space parcels in all wards, but parcel area of 200m<sup>2</sup> or larger are considered for emergency response as humanitarian open space so that space availability could be utilized for minimum of 50 persons. The spaces for emergency shelter could be provided to the total of 182,880 persons within the municipality. The approximate capacity of the smallest patches in all wards ranges from 51 persons in ward number 1 to 848 persons in ward number 7. The approximate capacity of largest patches, on the other hand ranges from 1424 persons in ward 6 to 40954 persons in ward 5. However, the calculated area coverage includes area covered by existing physical structure and other facilities are also inclusive which serve as the shelter as well as storage of emergency relief assistance.

The institutional open space is identified and approximate capacity is also calculated for the major development nodes in the municipality. Primary development node of the municipality is Attariya area which is extended in parts of ward number 1 and 2 and the largest open space patch can accommodate 149 persons for emergency shelter. Likewise, there are 3 secondary and 7 tertiary development nodes, of which Geta has the largest open space patch parcel (Geta hospital) which could accommodate 40546 persons followed by institutional open space of Teghari which has approximate capacity of 15118. Largest institutional open space patch of Godada could accommodate 620 persons. The details of institutional open spaces within primary and tertiary nodes are provided in **Table 1.13**.

### **1.6.3 DISTRIBUTION AND CHARACTERISTICS OF PUBLIC OPEN SPACE (GOVERNMENT OWNERSHIP)**

The public land under government ownership without any physical structure is considered as government open space. Similar process for institutional open space identification is applied for identification of public open space and approximate capacity is calculated all the wards where

government owned public open space is found. Among all, ward number 9 has the largest open space patch which shall accommodate more than 52 thousand populations. It is followed by ward number 5 and 7. The details of government owned open space is provided in **Table 1.14** Location of the largest open space parcels in each node, existing physical structure, their characteristics and access road is detailed in section 5.4.6: evacuation route and connectivity.

#### 1.6.4 DISTRIBUTION AND CHARACTERISTICS OF OTHER OPENS SPACE

There are 5 major public open areas in the project municipality which includes playground and other spaces in 2 different wards (ward 5 and 12) as listed in **Table 1.15**. The table also includes the access road condition and approximate capacity of open spaces calculated using the sphere standard 3.5 m<sup>2</sup> per person, with addition of 0.5 meter. It is evident from the table that all open space has only seasonal road access and ward number 12 has larger capacity.

**Table 1.13 Institutional open space and approximate capacity in major development nodes**

INSTITUTIONAL OPEN SPACE AND APPROXIMATE CAPACITY IN MAJOR DEVELOPMENT NODES							
Nodes	Ward	No. of Parcel	Total Area (m <sup>2</sup> )	Smallest patch size (m <sup>2</sup> )	Approx. Capacity in Smallest patch size	Largest patch size (m <sup>2</sup> )	Approx. Capacity in largest patch size
Primary							
Attariya	1	9	3268.85	202.73	51	597.67	149
Secondary							
Geta	5	5	209150.84	1727.49	432	163817.58	40954
Godada	12	1	2480.01	2480.01	620	2480.01	620
Teghari	2	5	109594.46	6559.19	1640	60473.21	15118
Total		20	324494.16	202.73	51	163817.58	40954

Source: GIS mapping & calculation and Field survey, 2021

**Table 1.14 Public open space and approximate capacity of Wards.**

PUBLIC OPEN SPACE AND APPROXIMATE CAPACITY OF WARDS						
Ward	Total Area (m <sup>2</sup> )	Smallest patch size (m <sup>2</sup> )	Approx. Capacity in Smallest patch size	Largest patch size (m <sup>2</sup> )	Approx. Capacity in largest patch size	
1	5747.39	40.62	10	4516.81	1129	
2	34291.55	21.15	5	20299.53	5075	
3	7623.67	2336.02	584	2951.63	738	
4	62044.33	0	0	10907.27	2727	
5	222508.95	412.14	103	147268.49	36817	
6	10401.23	698.77	175	4259.09	1065	
7	150373.37	0.07	0	85780.89	21445	
8	85382.02	0	0	64682.58	16171	
9	883264.88	19.72	5	208201.78	52050	
10	134679.16	398.12	100	41247.4	10312	
11	16912.33	98.97	25	4385.21	1096	
12	40304.95	7.99	2	9390.44	2348	

Source: Digital Cadastral database, Survey Department, 2016, GIS mapping & calculation 2021

**Table I.15 Characteristics of other public open space.**

CHARACTERISTICS OF OTHER PUBLIC OPEN SPACE										
S. N.	NAME	LOCATION	WARD NO.	AREA M <sup>2</sup>	ACCESS ROAD			APPROX. CAPACITY		
					TYP E	SURFACE	WIDTH 'M'			
1	Bhairab Tole Samiti	Bikash Maxapalan	5	80	Local	Gravel	6	20		
2	Kolmude Ground	Sport Kolmuda	12	6280	Local	Other	5	1570		
3	Patakani Ground	Sports Patakani Tole	12	530	Local	Earthen	4	133		
4	Shree Kalika Sewa Samaj complex	Geta	5	620	Local	Gravel	5	155		
5	Tudela Sport Ground	Kalika Tole	12	8250	Local	Earthen	6	2063		
Total				15760				3940		

Source: Satellite image and Field survey, 2021

### I.6.5 SANITATION AND WASTE MANAGEMENT OF HUMANITARIAN OPEN SPACES

One toilet per 20 as possible, or per 100 people, a defecation field with shallow trench latrines, and deep trench latrines are recommended construction of facilities, ensuring they are correctly used for high density emergency shelter while, hand-dug or drilled simple pit latrine are recommended in lower density, longer-term emergency shelters (UNHCR, 1999). When and urban area receive large numbers of displaced people during disaster, health risks due to inadequate excreta disposal may arise, so, services of cleaning and setting up temporary public toilets is required. Designated defecation areas should be identified. Open defecation along banks and in rivers and streams should be discouraged. If open defecation is inevitable, such should be restricted within 30 metres of wells or boreholes; within 10 metres of taps; on or above the surfaces prepared for rainwater catchment; within 30 metres uphill of a spring or 10 metres downhill; or within 10 metres of any water-storage tank or treatment plant. Preparedness should focus on construction of simple pit latrines, in identified emergency shelter areas. The implementing agency like local authority should work closely with community and should be involved in construction program (WHO, 2002).

The main options for wastewater discharge are Infiltration and temporary discharge into existing drainage system is suggested, whereas for solid waste, burial and incineration as temporary and waste recycling and sanitary landfill as permanent disposal is suggested. For temporary disposal of waste: Designated disposal areas, waste segregation and easy access for waste collection are required considerations. Minimum water quantities required in emergencies is 15 lpd according to Sphere standard, 2004 (Sphere Humanitarian Charter and Minimum Standards in Disaster Response) and water collection point should be within 500 meters. Similarly, WHO/WEDC (2013) has suggested water demand calculation for survival supply which incorporates livestock and emergency/ relief workers.

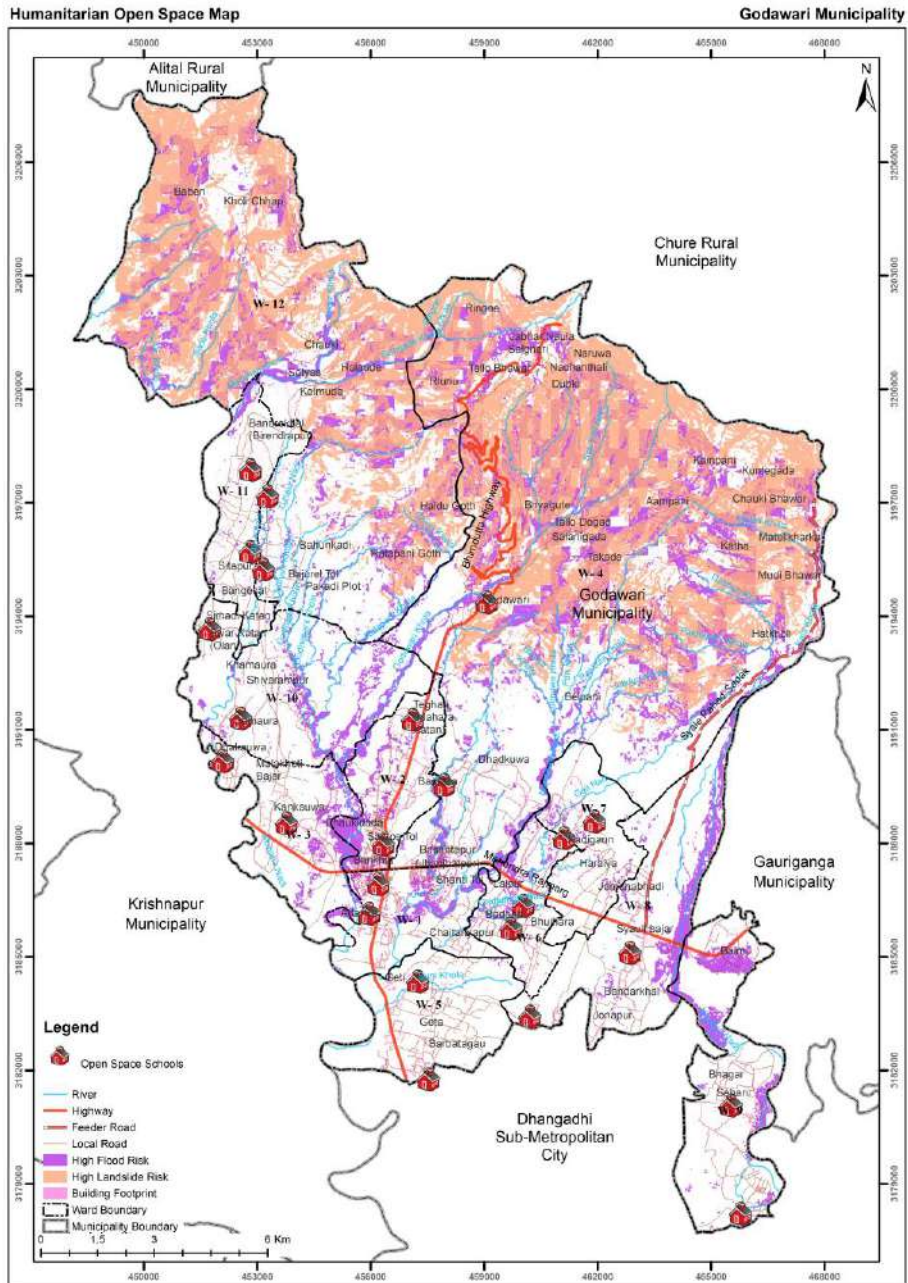
## I.7 DISASTER RISK REDUCTION INTERVENTIONS

### I.7.1 HUMANITARIAN OPEN SPACE AND ACCESS ROUTE



Once the open space for emergency response and temporary shelter are identified, access road and evacuation route to those open spaces are identified. For the open spaces in side development nodes and each ward, access routes to those open spaces are identified based on the conditions of roads, and accessibility infrastructure like, bridges, and culverts. The characteristics of each identified open space and evacuation Route in Development Nodes and wards together with the access/emergency route are listed below. Some of the identified institution has nearby access to public open space though the building area in small parcel area. The access and evacuation routes are those routes which shall be used by emergency vehicles like fire trucks, ambulances, relief material carrier and public carrier for affected/displace population. Identified Open Space location and details are provided in subsequent **Fig. 1.3** and **Table 1.16** and the integrated humanitarian open space is shown in **Fig. 1.4**.

Humanitarian Open Space DRR interventions: Infrastructure improvement and Building retrofitting, WASH facilities improvement, Security improvement including compound walls, and access road improvement for all schools.



**Fig. 1.3 Humanitarian Open space in the Municipality.**

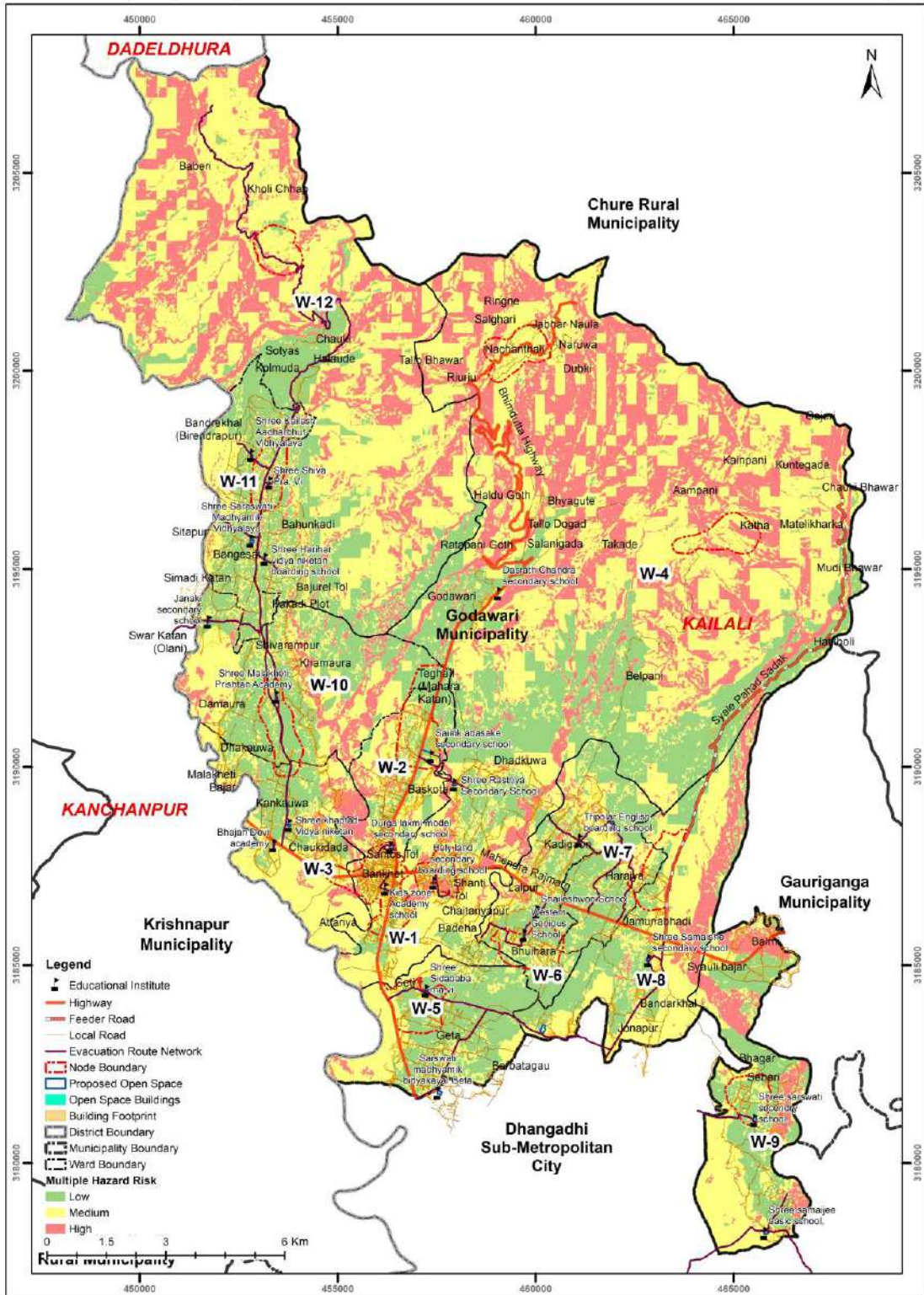


Fig. 1.4 Integrated Humanitarian Open space in the Godawari Municipality.

**Table 1.16 Characteristics of Open Space and Access Route in Development Nodes in Ward No. 1.**

CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN DEVELOPMENT NODES IN WARD NO. 1				
Ward/ Location	Open Space/ Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
Ward I	Shree Ghanteshwor secondary school	278.77 (Floor area)	Frame Structure-2, Load_Bearing-I	Ganteshwor Marg Sakha 5, Ghuwasi Tol
Ghuwasi Tol	<b>Location</b>	<b>Capacity</b>	Cement	Black Top Road
Primary Node: Attariya	LAT: 28.802134 LONG: 80.548714	70 Population	Floor-I RCC – 2, GI_Sheet-I	



Ward/ Location	Open Space/ Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
Ward I	Kids Zone Academy school	373.31	Frame Structure	Srijansil Road
Primary Node: Attariya	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.809172 LONG: 80.551174	93 Population	Floor-I RCC	



## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 2

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
Ward 2	Durgalaxmi model secondary school	355.82 1148.65 (Floor area)	Frame Structure	Bhimdutta Highway (20M)
Primary Attariya	Node: <b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.818623 LONG: 80.552459	287 Population	Floors 2-4, 1-2	
			RCC Roof	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
Ward 2	Shree Krishna Adharbhat School	632.14 (Floor area)	Frame Structure	Mahara Katan Marga
Primary Teghari	Node: <b>Location</b>	<b>Capacity</b>	Cement	
Teghari Manahara	LAT: 28.848381 LONG: 80.560361	158 Population	Floors-2	
			RCC Roof	



**CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 3**

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
3	Shree Khaptad Vidya Niketan School	732.85	Frame structure	Malakheti-Kulmuda-Krishna Mandir-Aurlani Road
Malakheti	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.823595 LONG: 80.526176	183 Population	Floor 2	
			RCC	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
3	Mukti Primary School	418	Frame Structure	Mukti Pra. Bi. Road
Malakheti	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.838363 LONG: 80.508844	104 Population	Floor 1	
			RCC	



### CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 4

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
4	Shree Rastriya Secondary School	870.38	Load bearing-5 Frame_Structure-1	Chadni Marga
Baskota	<b>Location</b> LAT: 28.832912 LONG: 80.568959	<b>Capacity</b> 217 Population	Cement  Floor-1-5. 2-1 RCC-3, GI_Sheet-3	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
4	Dasrath Chandra secondary school	289.44	Load Bearing-2	Bhimdutta Highway
Godawari	<b>Location</b> LAT: 28.876516 LONG: 80.580178	<b>Capacity</b> 72 Population	Cement  Floor I GI-Sheet	



## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 5

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
5	Shree Siddhababa Secondary School	1210.73	Load Bearing -3, Frame Structure-2	Aakaha Aspatal Road
Secondary Node: Geta	<b>Location</b> LAT: 28.78596 LONG: 80.56192	<b>Capacity</b> 302 Population	Cement Floors: 1-3, 2-2	

RCC-3, GI Sheet- 2



Ward/ Location	Open Shelter	Space/Emergency	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
5	Saraswoti School	Higher Secondary	1458.80	Load Bearing-2, Frame Structure-2	Saraswoti - Siddhababa Marga
Secondary Node: Geta	<b>Location</b> LAT: 28.764119 LONG 80.560367	<b>Capacity</b> 362 Population	Cement Floors -2-2, 1-2		

RCC-2, GI Sheet- 2





## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 6

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
6	Western Genius School	1749.78 (203*2 Building area)	Frame Structure	Aakaha Aspatal Sadak
Secondary Node: Bhulara	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.798684 LONG: 80.587152	101 Population	Floors -2	
			RCC	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
6	Saileshowri school	639.27	Load Bearing	Aakaha Aspatal Sadak
Badiha	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.804168 LONG: 80.590417	160 Population	Floor- 3	
			Tile roof	



## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 7

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access route	Road/Evacuation
7	Tripolar School	345.79	Load Bearing	Chandeshwor Marga	
Lalpur Gaudi	<b>Location</b>	<b>Capacity</b>	Cement		
	LAT: 28.82032 LONG: 80.601424	86 Population	Floor - I RCC-1, GI-Sheet-3 Rcc roof		



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access route	Road/Evacuation
7	Chandeshwor Lower Secondary School	791.74	Load Bearing-4	Janaki Marg	
Lalpur	<b>Location</b>	<b>Capacity</b>	Cement		
	LAT: 28.824333 LONG: 80.609639	198 Population	Floor I RCC-1, GI-Sheet-3		



## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 8

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
8	Shree Samaiji Secondary School	1344.44	Load Bearing-5, Frame structure -2	Samaiji Sadak
Majhgaun	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.793045 LONG: 80.619363	336 Population	Floor 1-3, Floor 2-4 RCC-3, GI-Sheet-4	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
8	Sharada Secondary School	816.86	Load Bearing-1, frame structure -2	Nahar-Shreepur Jonapur Sadak
Shreepur	<b>Location</b>	<b>Capacity</b>	cement	
	LAT: 28.777733 LONG: 80.592313	204 Population	floor 1 RCC-2, GI-Sheet-1	



## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 9

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
9	Shree Saraswoti Sec. School	1400.48*3	Load Bearing -5	Saraswati Marga
Sehari	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.756705 LONG: 80.646875	350/floor Population	Floor3-2, 2-1, RCC-4, GI-Sheet-1	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
9	Shree Samajji Basic School.	482.53	Load Bearing-4	Nageshwor Marg
Dhanchuri	<b>Location</b>	<b>Capacity</b>	cement	
	LAT: 28.730928 LONG: 80.649621	120 Population	floor 1 RCC-2, GI-Sheet-2	



**CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 10**

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
Ward 10	Ganesh Adharbhut School	388.87 (Floor area)	Load_Bearing-2	Ganesh School Marg Pragatisil Marg
Damaura	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.848591 LONG: 80.513662	97 Population	Floor - 1	
			GI-Sheet-2	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
10	Janaki Secondary School	435.76	Load Bearing	Pallo Khamaura Marga, urban road
Sitapur	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.869841 LONG: 80.505155	108 Population	Floor-I	
			RCC-2, GI-Sheet-I	



## CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO - 11

Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
11 Olaani	Shree Saraswoti Secondary School	497.38	Load Bearing-1, Frame structure -2	Olaani Nile Sadak
	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.888337 LONG: 80.516034	124 Population	Floor 1-2, Floor 2-1	
			RCC-2, GI-Sheet-1	



Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
11 Olaani	Shree Kailash Basic School	140.47	Frame structure	Kailash Marg
	<b>Location</b>	<b>Capacity</b>	Cement	
Kailash Tole	LAT: 28.907808 LONG: 80.516081	35 Population	Floor 1 RCC	



**CHARACTERISTICS OF OPEN SPACE AND ACCESS ROUTE IN WARD NO. 12**





Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
Ward 12	Shree Shiva Prathamik Vidhyalaya	314.77	Frame Structure	Shiva Ram Marga
Tertiary Godada	Node: <b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.901583 LONG: 80.520735	78 Population	Floor-1-1, 2-1	GI-Sheet










Ward/ Location	Open Space/Emergency Shelter	Area (m <sup>2</sup> )	Building Structure	Access Road/Evacuation route
12	Shree Harihar Vidya Niketan boarding	310.94*2	Frame structure- 2	Gaudi Marg
Gaudi	<b>Location</b>	<b>Capacity</b>	Cement	
	LAT: 28.884153 LONG: 80.51966	78/floor, Population	Floor -1-2, 1- 1	RCC










## I.7.2 DRR INTERVENTIONS FOR FLOOD AND LANDSLIDES

LANDSLIDE HAZARD INTERVENTION AREAS							
S N	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	TYPE OF INTERVENTION	INTERVENTION	AREA (HA)
1	Landslide	Budhitola	4	Godawari	Vegetative and Structural	Slope correction, Conservation Plantation	1.28
	Access road: Bhimdutta Highway,	LAT: 28.929455 LONG: 80.588695 Upstream of Tudela Nadi					
							
2	Landslide	Bagadigada/ (15,00,000)	Municipal 4	Godawari	Bio-Engineering and Structural	Conservation Trenching and Plantation	1.69
	Access road: Bhimdutta Highway,	LAT: 28.93089 LONG: 80.581378 Upstream of Tudela Nadi					
							




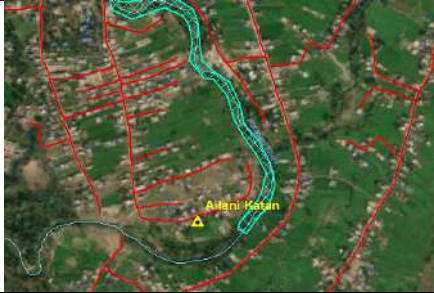
3	Landslide	Bhyagute	4	Godawari	Bio-Engineering Structural	and Slope Stabilization: Gully head Diversion Re-vegetation	34.70
<p><b>Access road:</b> Bhimdutta Highway,</p> <p>LAT: 28.896119 LONG: 80.589848</p>		 					
4	Landslide	Gairigadai	4	Godawari	Structural	Road Slope Stabilization: Cross Drainage Protection	6.32
<p><b>Access road:</b> Lalpur Gaudi Sadak</p> <p>LAT: 28.935965 LONG: 80.529264 Upstream of Pankula Khola</p>							
5	Landslide	Chauki	12	Godawari	Bio-Engineering Structural	and Shelter-belt Development and Agroforestry	3.16
<p><b>Access road:</b> Malakheti Nahar Sadak</p> <p>LAT: 28.867498 LONG: 80.624983 North-west of Gajar Khola</p>							

6	Landslide	Kidekot	12	Godawari	Bio-Engineering Structural and	Retaining-wall Construction, Agroforestry & Fruit Tree Plantation	30.95
<p><b>Access road:</b> Malakheti Nahar Sadak</p>		<p>LAT: 28.974774 LONG: 80.51527 Upstream of Chiuri Khola</p>					
7	Landslide	Sim/ Municipal (10,00,000)	12	Godawari	Bio-Engineering Structural and	Shelter-belt Development and Agroforestry	1.35
<p><b>Access road:</b> Malakheti Nahar Sadak</p>		<p>LAT: 28.955623 LONG: 80.518354 Upstream of Sade Khola</p>	 				
8	Landslide	Kholi Chhap	12	Godawari	Bio-Engineering Structural and	Slope Stabilization: Plantation and Slope reform	12.85
<p><b>Access road:</b> Malakheti Nahar Sadak</p>		<p>LAT: 28.96935 LONG: 80.515687 Upstream of Chiuri Khola</p>					





## FLOOD HAZARD INTERVENTION AREAS

SN	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	DRR INTERVENTIONTYPE	INTERVENTION	AREA (HA)	LENGTH (M)
1	Flood	Baskota	4	Godawari	Structural	Channel Stabilization and Drainage Improvement	0.45	0
		<p><b>Access road:</b> Baskota Marga</p> <p>LAT: 28.823641 LONG: 80.568951 Ratapani Khola</p>						
2	Flood	Santosh Tole	4	Godawari	Structural	Channel Stabilization and Drainage Improvement	2.15	600
		<p><b>Access road:</b> Shiv Marga</p> <p>LAT: 28.815512 LONG: 80.565826 Ratapani Khola</p>						
3	Flood	Jhanjhatpur	4	Godawari	Vegetative and Structural	Buffer strip (Plantation) and Spur Construction	0.41	0




## FLOOD HAZARD INTERVENTION AREAS

SN	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	DRR INTERVENTIONTYPE	INTERVENTION	AREA (HA)	LENGTH (M)
		<p><b>Access road:</b> Mahendra Rajmarg, Gwashi Samaiji Marg</p> <p>LAT: 28.815512 LONG: 80.565826 Manahara Nadi</p>						
4	Flood	Ailani Katan	4	Godawari	Structural	Channel Stablization and Drainage Improvement	1.51	900
		<p><b>Access road:</b> Basntapur Adarsha Marg</p> <p>LAT: 28.807514 LONG: 80.566493 Ratapani Khola</p>						
5	Flood	Lalpur	7	Godawari	Structural	Channel Stablization and Drainage Improvement	3.03	600

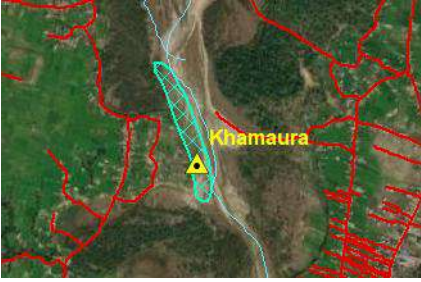


## FLOOD HAZARD INTERVENTION AREAS

SN	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	DRR INTERVENTIONTYPE	INTERVENTION	AREA (HA)	LENGTH (M)
		<p><b>Access road:</b> Govinda Marg</p> <p>LAT: 28.821762 LONG: 80.598235 Gail Nadi</p>				 		
6	Flood	Syaule	8	Godawari	Vegetative and Structural	Conservation Plantation, Agroforestry	2.47	0
		<p><b>Access road:</b> Mahendra Rajmarg</p> <p>LAT: 28.794591 LONG: 80.632881 Khutiya Nadi</p>				 		
7	Flood	Murkatti	9	Godawari	Vegetative and Structural	Buffer strip (Plantation) and Spur Construction	2.38	0

## FLOOD HAZARD INTERVENTION AREAS

SN	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	DRR INTERVENTIONTYPE	INTERVENTION	AREA (HA)	LENGTH (M)
		<p><b>Access road:</b> Mahendra Rajmarg</p> <p>LAT: 28.756619 LONG: 80.654414 Khutiya Nadi</p>						
8	Flood	Dhanchauri	9	Godawari	Vegetative and Structural	Buffer strip (Plantation) and Spur Construction	5.59	0
		<p><b>Access road:</b> Dhanchauri Ringroad</p> <p>LAT: 28.735668 LONG: 80.658915 Khutiya Nadi</p>						
9	Flood	Khamaura	10	Godawari	Vegetative and Structural	Conservation Plantation, Agroforestry and Spur Construction	7.14	0

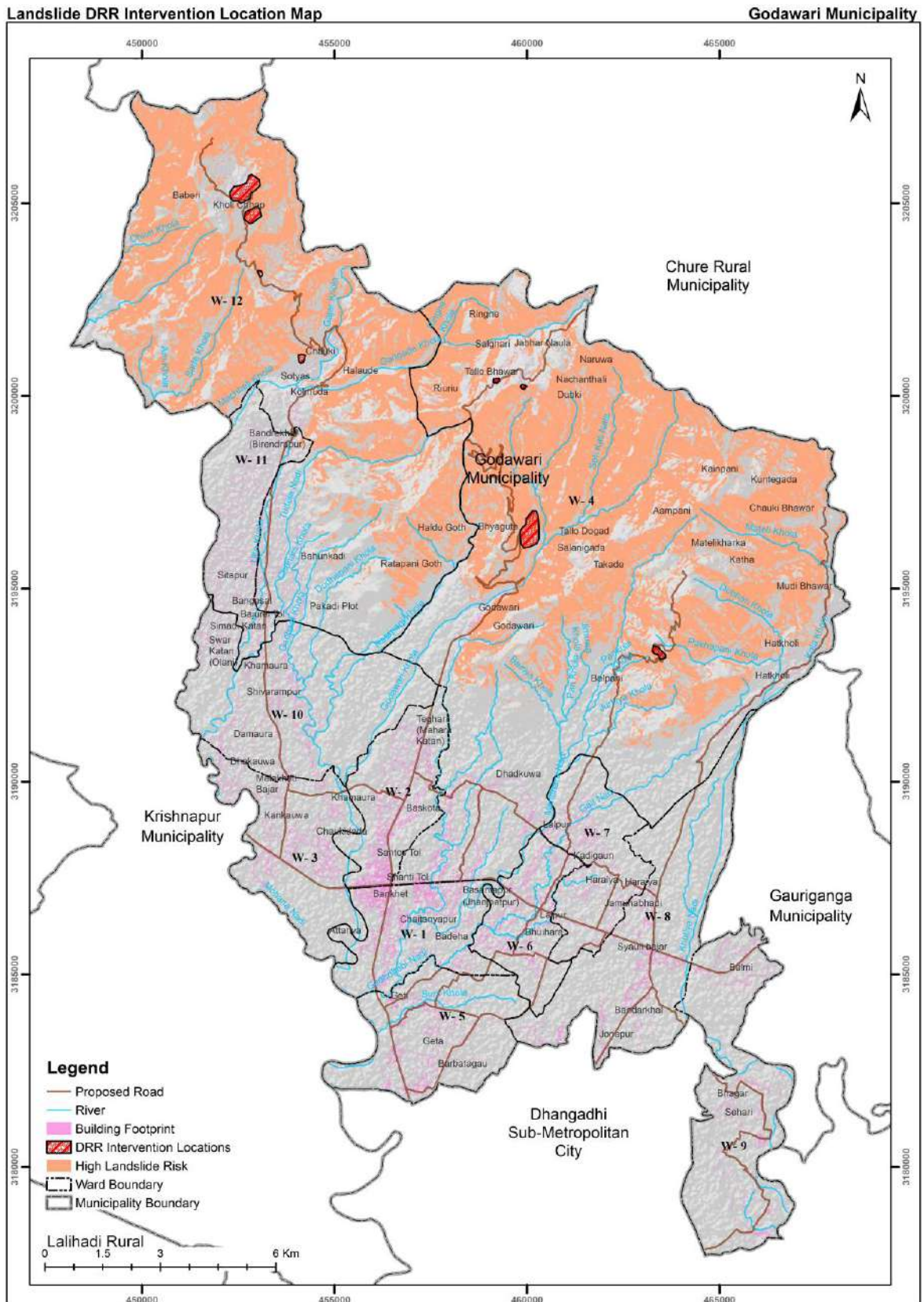
## FLOOD HAZARD INTERVENTION AREAS

SN	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	DRR INTERVENTIONTYPE	INTERVENTION	AREA (HA)	LENGTH (M)
		<p><b>Access road:</b> Jay Kalika Road</p> <p>LAT: 28.829401 LONG: 80.542157 Godawari Khola</p>						
10	Flood	Janaprabhat	10	Godawari		Vegetative and Structural together with Gabion work, and Plantation		0.623
		<p><b>Access road:</b> 10 km northwest of Attariya main chowk,</p> <p>LAT: 28.8719414 LONG: 80.5229210 Tudela/ Chakle Nadi</p>						
11	Flood	Adarsha basti	12	Godawari		Bio-Engineering and Structural together with Gabion work, Plantation		0.656

## FLOOD HAZARD INTERVENTION AREAS

SN	HAZARD	SETTLEMENT	WARD NO	MUNICIPAL	DRR INTERVENTIONTYPE	INTERVENTION	AREA (HA)	LENGTH (M)
		<p><b>Access road:</b> 3 km gravel road form Attariya</p>						
		<p>LAT: 28.8970727 LONG: 80.5254950 Tudela Nadi</p>						





**Fig. 1.5 Suggested major DRR interventions for Landslide Hazard.**

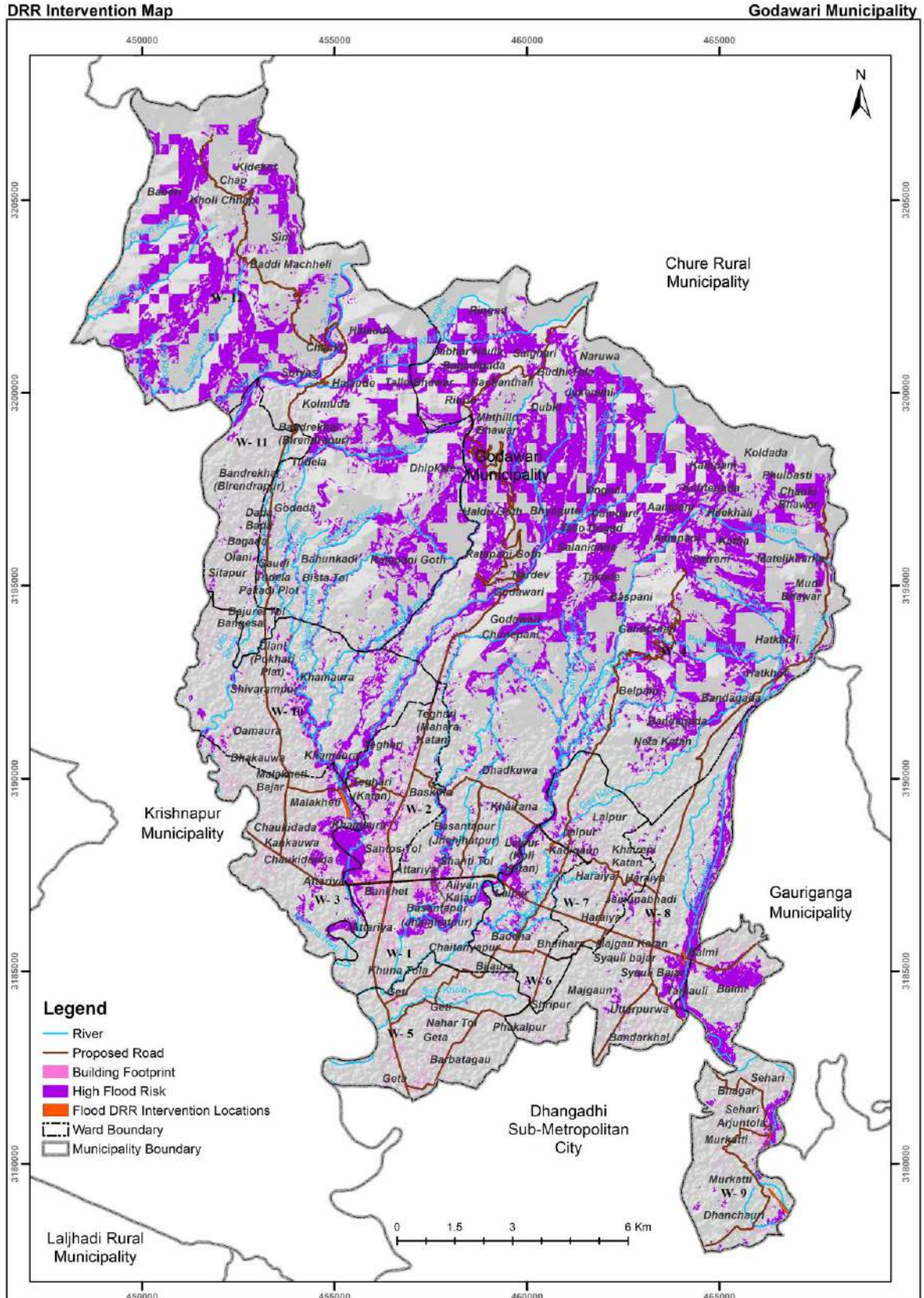


Fig. 1.6 Suggested major DRR interventions for Flood Hazard.