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URBAN VULNERABILITY ASSESSMENT REPORT

BANKE DISTRICT

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Prepared for Ministry of Science, Technology and Environment, Government of Nepal

Environment Natural Resources and Agriculture Department, South Asia Department, Asian Development Bank

Version A Draft for Comment

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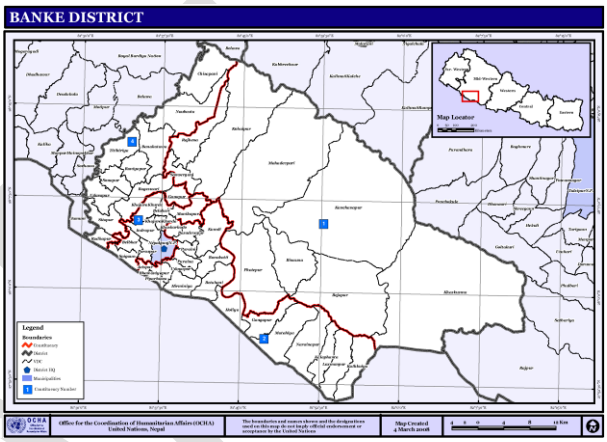
1 DISTRICT ASSETS/SYSTEM PRIORITIES

1.1 Urban Settlements and Infrastructure (USAI) in Banke District

The Banke district, located in the southern Terai plains of Nepal, is surrounded by Dang district in the east, Bardiya district in the west, Dang and Salyan districts in the north and Shravasti and Baharich districts of Indian UP state in the south (see the map). With Nepalgunj municipality, as its district headquarter, the district consists of two urban centers of municipal status - Nepalgunj & Kohalpur, and 43 VDCs, and covers an area of 2360 sq.km, and has a population of 493017 in 2011 (Banke District Case Study, 2013).

Figure 1.1: The Political division and road network of the district. **Figure 1.2 : Banke district map**



As discussed in the Banke district baseline study (2014), strategic infrastructure in the USAI sector in Banke district provides a basis for identifying the district assets/systems for vulnerability assessment (VA). The USAI strategic infrastructure in the district falls within : Nepalgunj Municipality (district headquarter), Kohalpur New Town (new municipality), and the other 8 settlements functioning as the market centres (Khajura, Ranjha, Chisapani, Puraini, Syauli Bazaar, Jaispur, Betahani and Kusum) located in densely populated western and southern parts of the district, and along the major highways. The constituent components of the USAI consists of the urban settlements (two municipalities and 8 market centres), urban spaces (residential and commercial areas, environmental sensitive areas, recreational areas, industrial and institutional areas etc.), the buildings (both public and private buildings) and the other infrastructure components – the road network, water and sanitation, storm drainage system, rain water harvesting and solid waste etc.

The major components of strategic infrastructure in the USAI sector fall under the jurisdiction of: the DUDBC within Ministry of Urban Development (MoUD); the local bodies (DDC and VDCs); the district line agencies related to roads, water supply and sanitation; and the town development committees (TDCs). Although the district baseline study is confined to those assets in the USAI sector created through the annual programs of DUDBC Banke Division and the TDCs limited to buildings, housing and urban planning & development, the program activities of the municipalities and the related VDCs are also included in the selection and prioritisation of USAI assets/systems.

The assets/systems in the urban sector within the district (total area 2360 sq. km., altitude 127 – 1236 meter) are very much influenced in terms of climate change by the following factors:

i. The characteristic geographic features of the district because of its location along the three belts: Churia range or Hills located in the northern and eastern part of the district; Bhabar Zone located between the Churia Hills and low flat plains of Terai; and Terai Plains with flat topography located in the south.

ii. The major river systems of the district – Rapti (one of the largest rivers in Nepal) and its tributaries (Man khola, Duduwa khola, Gethi nala, Rohini khola, Jhijhiri khola, Muguwa khola, Babai and Bheri *etc)* which defines the watershed areas for the urban and rural settlements within the district.

iii. Prevailance of the sub-tropical climate in the Terai plains, Bhavar zone and the Churia Hills implying that the district is relatively warm most of the time except in winter when the weather gets fairly cold with temperature as low as 10^{o}C with foggy days. The average maximum temperature in the district exceeds 40^{o}C, and thus this district is known to be the hottest in whole of Nepal.

iv. The characteristic land use features consisting of: the forest occupying a major chunk of the land use up to the extent of 71% followed by 25% of agriculture activities in the district, and the settlements taking up very small area with the urban settlement areas occupying only 0.06%.

v. The total annual precipitation recorded to be 2104 mm confined mainly in the monsoon season with the relative humidity varying from 87% in the morning to 73% in afternoon.

1.2 Criteria for Priority Assets

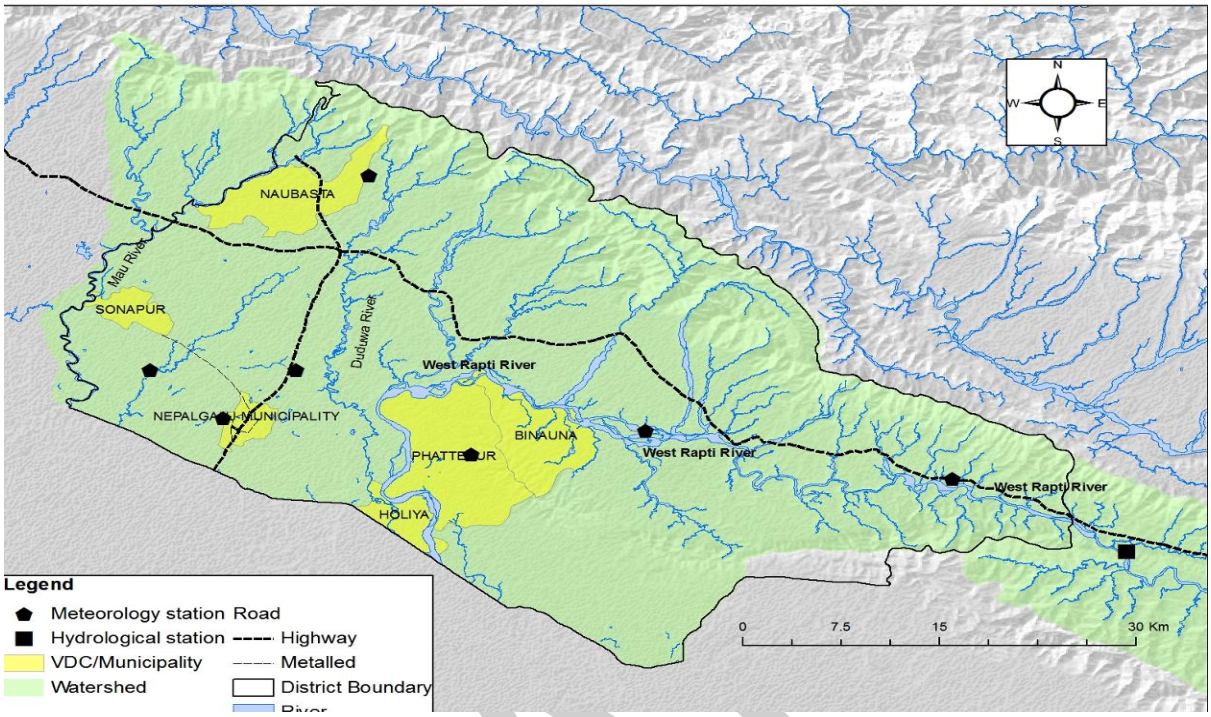
As stated in Banke Baseline report, the assets inventory undertaken to identify the assets/systems for VA consisted of 8 asset systems, and were confined within the four settlements areas: Nepalgunj municipal area, Kohalpur New town (junction of the national highways), Naubasta VDC and Holia VDC (Table 1 & Figure 3). Identification of the priority , Babaiassets were carried out on the basis of:

i. The field visits to the four areas - Nepalgunj, the seat of district headquarter; Kohalpur new town at a distance of 16 km and half hour drive from Nepalgunj along the Surkhet highway; Naubasta VDC at a distance of 30 km and 1 hour drive from Nepalgunj; and Holia VDC at a distance of around 10 km and half hour drive along the gravel road from Nepalgunj.

ii. Due consultation with the DUDBC officials at Nepalgunj office, the officials of the different district level government offices including the technical and administrative staff members of Nepalgunj and Kohalpur TDC, the officials of Nau Basta and Holia VDC, and the technical and administrative officials of Nepalgunj Municipality.

iii. Interaction sessions with the concerned local persons including the business persons, local political representatives and the individuals from the various walks of life at Nepalgunj Salyani Bagh neighbourhood, Kohalpur, Nau Bastga and Holia VDCs.

Figure 1 .3: The location of Assets in Banke district- Nepalgunj ,Kohalpur new town, Nau Basta and Holia VDCs.



The key criteria for the assets prioritization were:

- Infrastructure of national strategic importance
- Infrastructure of district strategic importance
- Infrastructure that has been impacted by past extreme events
- Infrastructure located in areas prone to past extreme events

In addition the other potential aspects contributing to vulnerability were considered. On the basis of the above criteria the following assets were short-listed:

Table 1 : The Priority Assets in Banke district

S.No.	Assets Selected	Geographical Location	Reason/s for inclusion
1	Gabar Village Settlement (Nau Basta VDC, Ward 7)	North western belt of the Churia Range or Hills in the Banke district	Past flood event
2	Kohalpur New Town (120 HA land)	Located in Bhabar Zone between the Churia Hills and low flat plains of Terai.	Possible damage to infrastructure due to heavy precipitation, or drought conditions, or temperature increase, or other climate induced events. District strategic importance.
	Salyani Bag Locality, (Nepalgunj Ward 5)	Terai Plains	Past extreme event in the form of water inundation

4	Holia VDC, Ward 7	Central belt of Terai Plains	Suffered heavy flood from Rapti River in the past.
5	Nepalgunj New Road development (Wards 2,4 & 5)	Terai Plains	Possible inundation and damage to infrastructure due to heavy precipitation, District strategic importance.
6	Water Park Land Pooling Project, Nepalgunj , Ward 1 .	Terai Plains	Possible inundation and damage to infrastructure due to heavy precipitation,
7	Government Buildings,in Nepalgunj City (district headquarter)	Terai Plains	Possible inundation and damage to infrastructure due to heavy precipitation,
8	Shelter Units under Peoples Housing Program	Bhabar Zone, the Churia Hills and low flat plains of Terai	Possible inundation and damage to infrastructure due to heavy precipitation,

Two assets out of 8 -listed USAI assets as listed above drawn from Banke Baseline Report (Section 2.2.1) - Gabar village settlement (Nau Basta VDC, Ward 7) and Salyani Bag Locality, (Nepalgunj Ward 5) - were selected as priority assets for vulnerability assessments and adaptation planning in Banke District. The detailed information on each asset is outlined in the baseline report for Banke district. Brief discussion on those two assets and its components are outlined below.

1.3 Priority Assets

1.3.1 Gabar Village Settlement – Churia Hills

The Gaver village is an agglomerated rural settlement with a population of 880 and with around 150 households, and is served by Chisapani market Centre towards the north. It is located in Ward 7 of Nau Basta VDC, and is accessible from Kohalpur Surkhet Highway which cuts through the VDC (see Map 3). The Nau Basta VDC itself is located in the northern western belt of the Churia Range or Hills of the district, and lies at a distance of 7 km and 22 km from Kohalpur new town and Nepalgunj respectively. The VDC, where the asset is located, is reported to be susceptible to flood followed by fire. Increasing trend of temperature rise resulting into the incidence of the malarial diseases is also being reported. The settlement did experience past extreme events in the form of excessive precipitation on the month of October 1997 resulting into the flooding of the area, and the damages to the agricultural production and to the physical infrastructure – irrigation canals, bridges etc.

1.3.2 Nepalgunj City – Salyani Bag Locality

The selected asset - Salyani Bag – is a sub-urban community located in Ward 5 of Nepalgunj Municipality (see Map 6). As a growing urban area, it is well connected to Fultegra road which leads to Dang district on the west. It is accessible from Nepalgunj new road and the old city core through the various road networks. As a sub-ward of Ward 5, it is a medium

density area (200 persons per ha) of the city. The Ward 5 itself constitutes 11 % of total city population in 2010 which figures out to be around 6000. As a spontaneously developed area, the asset is not planned properly, and is a sort of organic growth very common in a majority of urban areas of the country.

As per the DUDBC Periodic Plan report 2010, Nepalgunj city, where the asset is located, is highly susceptible to flood and inundation. It has also been reported that in the year 2008 flood level in the majority of flood prone areas with ground slopes (1-1000 to 1-1500) did rise from to 3 to 7 ft. and remained for 7 days affecting 705 city population. As reported, the situation was more severe in the Salyani Bagh area.

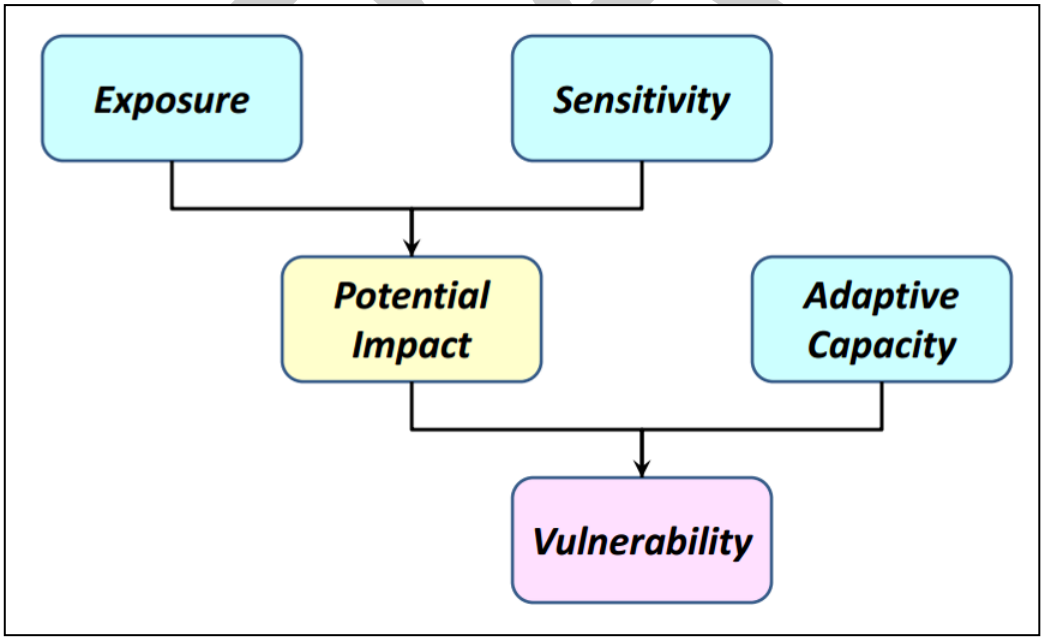
2 VULNERABILITY ASSESSMENT METHOD

2.1 VA Method

Climate change vulnerability in the urban sector context is a function of a USAI asset system's exposure to climate effects, sensitivity to climate effects, and adaptive capacity. Adaptive capacity refers to the systems' ability to adjust to cope with existing climate variability or future climate impacts

The VA method followed to assess the vulnerability of water and sanitation asset is widely used technique and tested in several parts of the world:

Figure 2.1: VA Process



Exposure refers to the extent to which an asset comes into contact with climate conditions or specific climate impacts. The greater the exposure, the higher the sensitivity to climate change. For example, assets located in historic landslide zones are more exposed and therefore more sensitive to increased rainfall and localized flood waters. The exposure also takes in to account the critical aspects such as the location of asset, intensity and duration of the climate threat towards the asset and the magnitude of the event.

Sensitivity is the degree to which an asset is directly or indirectly affected by changes in climate conditions (e.g., temperature and precipitation) or specific climate change impacts (e.g., increases in flood water levels). If a system is likely to be affected as a result of projected climate change, it should be considered sensitive to climate change. It takes in to account the age of the asset, materials used in the construction and its quality, levels of maintenance, any design considerations that protects the asset from any extreme climatic events.

Impact: Once the exposure and sensitivity assessment are performed, based on the assessment the severity of the impact is estimated using the guiding matrix as shown below:

Figure 2.2: Determining Impact

		Exposure of system to climate threat				
Sensitivity of system to climate threat		*Very Low*	*Low*	*Medium*	*High*	*Very High*
	Very High	*Medium*	*Medium*	*High*	*Very High*	*Very High*
	High	*Low*	*Medium*	*Medium*	*High*	*Very High*
	Medium	*Low*	*Medium*	*Medium*	*High*	*Very High*
	Low	*Low*	*Low*	*Medium*	*Medium*	*High*
	Very Low	*Very Low*	*Low*	*Low*	*Medium*	*High*

Adaptive Capacity refers to the availability of a system to accommodate or cope with climate change impacts with minimal disruption. This takes into account the range of available adaptation technologies and the funds that are available to meet such technologies, local skills and knowledge base, management responsiveness and relevant polices that make such adaptation to happen and the locally available materials to address such adaptation.

Vulnerability Scoring: Based on the impact and adaptive capacity assessments, the vulnerability of the asset against the CC threats is estimated using the guiding matrix as shown below:

Figure 2.3: Determining Vulnerability

		Impact				
		Very Low *Inconvenience (days)*	*Low* *Short disruption to system function (weeks)*	*Medium* *Medium term disruption to system function (months)*	*High* *Long term damage to system property or function (years)*	*Very High* *Loss of life, livelihood or system integrity*
Adaptive Capacity	*Very Low* *Very limited institutional capacity and no access to technical or financial resources*	*Medium*	*Medium*	*High*	*Very High*	*Very High*
	Low *Limited institutional capacity and limited access to technical and financial resources*	*Low*	*Medium*	*Medium*	*High*	*Very High*
	Medium *Growing institutional capacity and access to technical or financial resources*	*Low*	*Medium*	*Medium*	*High*	*Very High*
	High *Sound institutional capacity and good access to technical and financial resources*	*Low*	*Low*	*Medium*	*Medium*	*High*
	Very High *Exceptional institutional capacity and abundant access to technical and financial resources*	*Very Low*	*Low*	*Low*	*Medium*	*High*

2.2 Suitability of VA Method to URBAN Sector

The approach used for this vulnerability assessment is based on the methodological guidelines prepared by UNEP and Peking University (UNEP, 2009) and are in line with the international VA processes that are widely used in several projects across the globe. The current vulnerability assessment process followed for the USAI sector is to better understand the existing status of urban settlements system under the prevailing conditions and to ascertain the most dominant factors that influence vulnerability.

Vulnerability assessment is a tool for identifying potential risks to urban settlements and infrastructure facilities due to climate change (CC), and to ascertain the CC impacts on development options, human well-being and urban environment. In general, the VA assessment helps to enhance resilience of the USAI assets through improved understanding of vulnerabilities, opportunities and potentials for adaptation. It would also help the decision-makers with options to evaluate and modify existing policies, and to implement measures to improve urban settlements management and infrastructure services. Specifically, the VA assessment would help to:

- Assess the vulnerability of existing urban settlements (market towns/service centres) and their constituent components to CC threats, and formulate and implement measures to reduce negative impacts.
- Enhances public awareness about potential CC threats.
- Identify the potential impacts of climate change on the urban ecosystems including the USAI components, assess the current adaptive capacity of the urban sector, and identify management challenges;

- Examine urban sector issues and develop the policy options to respond to the CC threats;
- Create a knowledge base of scientific data and information on urban sector including urban settlements and infrastructure components;
- Identify gaps in existing information, data and research, and recommend needs for further studies.

2.3 Climate Change Threat Profiles

The climate change threat profiles for Banke District were prepared by the Hydrological Modeling teams and the information had been passed on to all the experts prior to the field visit. The threat profile is annexed in Annexure 1. The climate change threat profiles for Banke were studied and their relevance to the URBAN sector is outlined below:

2.3.1 Increase/decrease in precipitation

Looking in to the threat profile for precipitation the following conclusions can be drawn:

- Increasing number of extreme rainfall events – events that now occur every 50 years are projected to occur every 35 years
- Duration of extreme rainfall events with high intensity will occur more often than before.
- Increase in precipitation frequency and volume can be foreseen in future, this may trigger more landslides. Precipitation vs annual recurrence interval curve shows an increase in precipitation occurs more frequently

2.3.2 Increase in temperature

Looking in to the threat profile for temperature the following conclusions can be drawn:

- Increase in average maximum temperature of up to 2.15^{0}C in the summer.

2.3.3 Increase in flows

Looking into the threat profile for hydrology the following conclusions can be drawn:

- Increased flows in Rapti River due to increase in rainfall is expected.
- Increasing wet season flow on the West Rapti River and earlier peak flow – at Kusum peak monthly average flow will occur one month earlier in July and increase by up to 5%
- Increasing risk and severity of flash floods and increase flood duration during wet season.

3 VULNERABILITY ASSESSMENT RESULTS

The results of the vulnerability assessment are outlined in Annexure 2 of this report. However, a brief vulnerability assessment of two assets within Banke District is outlined below:

3.1 Gabar Village Settlement

3.1.1 Asset Description

The photos as presented below present the physical conditions of the Gabar village settlement. Being located in the Churia Belt, the settlement area is composed of sandstone, limestone and conglomerate.

Fig. 3.1: A View of housing cluster with open spaces.

Figure 3.2: Typical building types in the village

Figure 3.3: A view of the houses with the farm lands on the foreground

Figure 3.4: Stream west of the Gaber village which overflowed during the excessive rain on October 1997

3.1.2 Vulnerability assessment on Gabar village settlement

The following section outlines the decisions undertaken in setting the levels of threat, exposure, sensitivity and adaptive capacity for the village and its settlement.

3.1.2.1 Threat – Increased Intensity of Rainfall

Threat: Increased Intensity of Rainfall

The following threats have been identified as likely to impact on the village settlements:

- As per the threat profile (see Annexure 1), on an average rainfall intensities will increase by 65%
- Rainfall events occur more frequently than before.
- 50 years events now occur at every 35 years
- Triggers more flood events that might damage the settlements.

Exposure: HIGH

The exposure is ranked as high for the following reasons:

- Since there is no positive drainage system within the settlement, the communities are exposed to frequent floods.
- Assets (buildings) are made of clay mud and CGI type, which are vulnerable to frequent rainfall runoff under each rainfall event.
- Duration: Longer duration rainfall events and causing more frequent floods prolonged duration throughout the year.
- Intensity: High intensity occurs more frequently this will enhance more frequent flood events.

Sensitivity: HIGH

Impact: HIGH

From the guiding matrix, it can be seen that the impact is HIGH as well. The justification for high impact is given below:

- More rain will lead to more flood events that trigger street flooding, and to the collapse of those buildings that are made of clay mud type.
- Flooding of the area will cause the damages to the agricultural production and to the physical infrastructure – irrigation canals, bridges causing adverse economic impacts.
- More rain means, more cross-contamination and local pooling that might attract mosquito breeding.
- The perceived changes in precipitation intensity and events could cause adverse impacts on the village eco-system in general.

Adaptive Capacity: MEDIUM

The adaptive capacity was ranked as medium for the following reasons:

- Limited funds available for maintenance and emergency management.
- Additional manpower and technical support needs attention from the district.
- Material, equipment and spare-parts are not locally available.
- Technical capabilities are not readily available within the VDC.

Vulnerability Scoring: HIGH

As per the below guiding matrix, the vulnerability for the Gabar village settlement is HIGH.

		Impact				
		Very Low Inconvenience (days)	Low Short disruption to system function (weeks)	Medium Medium term disruption to system function (months)	High Long term damage to system property or function (years)	Very High Loss of life, livelihood or system integrity
Adaptive Capacity	Very Low Very limited institutional capacity and no access to technical or financial resources	Medium	Medium	High	Very High	Very High
	Low Limited institutional capacity and limited access to technical and financial resources	Low	Medium	Medium	High	Very High
	Medium Growing institutional capacity and access to technical or financial resources	Low	Medium	Medium	High	Very High
	High Sound institutional capacity and good access to technical and financial resources	Low	Low	Medium	Medium	High
	Very High Exceptional institutional capacity and abundant access to technical and financial resources	Very Low	Low	Low	Medium	High

3.1.2.2 Threat – Increased Temperature

The following section outlines the decisions undertaken in setting the levels of threat, exposure, sensitivity and adaptive capacity for the village settlement.

Threat: Increased temperature

The following threats have been identified as likely to impact on the village settlement.

- Increase in average maximum temperature of up 2.15 °C in the summer

Exposure: HIGH

The exposure is ranked as high for the following reasons:

- Duration: Increased temperature (up to 2.15^{o}C) with longer duration and more frequency is a threat to the settlement and its inhabitants.
- Increase in temperature will have an impact on housing material and causes cracks that might attract more damages to the integrity of the structure which eventually reduces the life span of the structure.

Sensitivity: MEDIUM

The sensitivity is ranked as medium for the following reasons:

- The material, design and construction of the buildings have impact on the design life period of the structures.

Impact: HIGH

From the guiding matrix, it can be seen that the impact is HIGH as well. The justification for high impact is given below:

- Due to the increased temperature, the residents will feel discomfort during summer especially the children and women.

Adaptive Capacity: MEDIUM

The adaptive capacity was ranked as medium for the following reasons:

- Limited funds available for maintenance and emergency management.
- Additional manpower and technical support needs attention from the district.
- Material, equipment and spare-parts are not locally available.
- Technical capabilities are not readily available within the municipality.

Vulnerability Scoring: HIGH

As per the below guiding matrix, the vulnerability for the Gabar village settlement under increased temperature event is HIGH.

Adaptive Capacity	Impact					
		Very Low Inconvenience (days)	Low Short disruption to system function (weeks)	Medium Medium term disruption to system function (months)	High Long term damage to system property or function (years)	Very High Loss of life, livelihood or system integrity
	Very Low Very limited institutional capacity and no access to technical or financial resources	Medium	Medium	High	Very High	Very High
	Low Limited institutional capacity and limited access to technical and financial resources	Low	Medium	Medium	High	Very High
	Medium Growing institutional capacity and access to technical or financial resources	Low	Medium	Medium	High	Very High
	High Sound institutional capacity and good access to technical and financial resources	Low	Low	Medium	Medium	High
	Very High Exceptional institutional capacity and abundant access to technical and financial resources	Very Low	Low	Low	Medium	High

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3.2 Nepalgunj City – Salyani Bag Locality

3.2.1 Asset Description

As per Salyani Bagh Tol Sudhar Samiti, (community organisation of Nepalgunj, Ward 5) has clearly put forward the clogging of existing drains by solid waste and the water inundation as the critical problems of the Asset area. It further stresses that if the above issues are not addressed timely; it could cause not only the mobility problems for the residents, but also could cause diseases like typhoid, malaria, cholera of epidemic proportions. The photos below show the existing situation of the Asset area. Erratic rainfall pattern, particularly high intensity of precipitation within a short period observed as a result of climate change in Nepal would further exacerbate the situation in the Asset area.

Figure 2.4: Water-logged areas within the community

Figure 3.5: A view of water logged area in other sections of the Salyani Bagh area.

Figure 3.6: A general situation of the city including the Salyani Bagh locality during the flood.

3.2.2 Vulnerability Assessment on Salyani Bag Locality

The following sections outline the decisions undertaken in setting the levels of threat, exposure, sensitivity and adaptive capacity for the above locality.

3.2.2.1 Threat – Increased Intensity of Rainfall

Threat: Increased Intensity of Rainfall

The following threats have been identified as likely to impact on the water supply system:

- Rainfall events occur more frequently than before.
- 50 years events now occur at every 35 years
- Increased risk of flooding, water logging and mosquito breeding

Exposure: VERY HIGH

The exposure is ranked as high for the following reasons:

- The locality is exposed to frequent flooding and water logging.
- Assets are exposed in the event of increased flow due to increased rainfall.
- Duration: Longer duration rainfall events will cause long-term damage to the assets.
- Intensity: High intensity occurs more frequently.

Sensitivity: HIGH

The sensitivity is ranked as high for the following reasons:

- No good protective measures were in place such as positive drainage system that can remove flooding, inundation and pooling.
- Design & Construction: Poorly laid drainage system
- Levels of Maintenance: Poorly maintained drainage system

Impact: VERY HIGH

From the guiding matrix, it can be seen that the impact is VERY HIGH as well. The justification for high impact is given below:

- More rain will lead to more flooding with water entering the houses and causing considerable damages, particularly more severe in those properties with low plinth heights.
- Water inundation trigger public health issues, in some cases threat to life and disruption to public movements related to jobs, shopping, school and other activities..
- Continued inundation of the locality would cause disruption to vital urban services - water supply, sanitation, transportation; and general disruption of other household functions and public services resulting into social disruption and environmental degradation.
- Impeding of services delivery resulting to economic loss and livelihood opportunities.

Adaptive Capacity: MEDIUM

The adaptive capacity was ranked as medium for the following reasons:

- Limited funds available for repairs of assets and emergency management works.
- Additional manpower and technical support can be achieved through the municipality.
- Material, equipment and spare-parts are locally available.
- Technical capabilities are readily available within the municipality.

Vulnerability Scoring: VERY HIGH

As per the below guiding matrix, the vulnerability for the above system is VERY HIGH.

		Impact				
		Very Low Inconvenience (days)	Low Short disruption to system function (weeks)	Medium Medium term disruption to system function (months)	High Long term damage to system property or function (years)	Very High Loss of life, livelihood or system integrity
Adaptive Capacity	Very Low Very limited institutional capacity and no access to technical or financial resources	Medium	Medium	High	Very High	Very High
	Low Limited institutional capacity and limited access to technical and financial resources	Low	Medium	Medium	High	Very High
	Medium Growing institutional capacity and access to technical or financial resources	Low	Medium	Medium	High	Very High
	High Sound institutional capacity and good access to technical and financial resources	Low	Low	Medium	Medium	High
	Very High Exceptional institutional capacity and abundant access to technical and financial resources	Very Low	Low	Low	Medium	High

4 BANKE DISTRICT VULNERABILITY SUMMARY

4.1 Summary of VA Results

4.1.1 Gabar Village Settlement

The table below summarises the vulnerability assessment of the Gabar village settlement. The analysis shows that the most vulnerable components of the settlements are ranked as high for various climate change threats.

GABAR VILLAGE SETTLEMENT					
THREAT	**EXPOSURE**	**SENSITIVITY**	**IMPACT**	**ADAPTATION CAPCITY**	**VULNERABILITY**
INCREASED RAINFALL	HIGH	HIGH	HIGH	MEDIUM	**HIGH**
INCREASED TEMPERATURE	HIGH	MEDIUM	HIGH	MEDIUM	**HIGH**

4.1.2 Nepalgunj City - Saliya Bag Locality

The table below summarises the vulnerability assessment of the Saliya Bag Locality. The analysis shows that the current sanitation practice is ranked as very high vulnerability to increased rainfall scenario.

SALIYA BAG LOCALITY					
THREAT	**EXPOSURE**	**SENSITIVITY**	**IMPACT**	**ADAPTATION CAPCITY**	**VULNERABILITY**
INCREASED RAINFALL	VERY HIGH	HIGH	VERY HIGH	MEDIUM	**VERY HIGH**

4.2 Most Vulnerable Assets and its Components

Based on the VA performed within Banke District, the following conclusions can be made on the assets and their components:

Gabar Village Settlement

THREAT	DESCRIPTION	IMPACT	WHY IT IS VULNERABLE
Increased Rainfall and Increased temperature	More rainfall and frequent	More rain will lead to more flood events that trigger street flooding, collapse of buildings that are made of clay mud type.	Floods will cause collapse of existing clay-mud type buildings threating human life.
		More rain means, more cross-contamination and local pooling that might attract mosquito breeding.	Mosquito breeding is a common issue in Banke which is triggered by both increased rainfall and temperature causing public health issues.
		Flooding of the area will cause the damages to the agricultural production and to the physical	Adverse economic and environmental consequences will follow from the

		infrastructure – irrigation canals, bridges causing adverse economic impacts. The perceived changes in precipitation intensity and events could cause adverse impacts on the village eco-system in general.	flood damages to the crops and physical infrastructures with negative implications for the village eco-system.
	High temperatures occur more frequently and for longer durations	Due to the increased temperature, the residents will feel discomfort during summer especially the children and women.	

Saliya Bag Locality

THREAT	DESCRIPTION	IMPACT	WHY IT IS VULNERABLE
Increased Rainfall	On an average rainfall intensities will increase. Rainfall events occur more frequently	More rain will lead to more flooding with water entering the houses and causing considerable damages, to the building properties.	A majority of the buildings have low plinth heights not designed for the floods.
		Water inundation trigger public health issues, in some cases threat to life and disruption to public movements related to jobs, shopping, school and other activities.	It causes serous public health and hygiene issues and accelerates the spreading of diseases due to bad sanitation facilities.
		Continued inundation of the locality would causing disruption to vital urban services - resulting into social disruption and environmental degradation.	Frequent overflows from septic tank causes public health and hygiene issues.
		Impeding of services delivery resulting to economic loss and livelihood opportunities.	Resulting economic disruption will affect the residents financially.

4.3 Lessons and Application to Other Assets

- The VA process aims to address the main issue – achieving increased resiliency of Banke district's urban assets to climate variability and climate change – through identification of vulnerability levels based on the CC impacts assessment and adaptive capacity. The district has both rural and urban settlements that give an opportunity to understand the impacts of CC threats on the rural assets as well.
- The two prioritized short-listed assets – Nepalgunj City Salyani Bagh Locality and Gaber Village Settlement - represent the vulnerable assets in the urban and rural settings within the Banke district. Since the similar type of assets can be seen across the district, this means, the same impacts, vulnerability and adaptation plans can be applied to wider urban and rural areas within the district.
- A large majority of urban and rural settlements in the Terai region of Nepal are in the similar situation as illustrated by the two short-listed assets. The lessons can be applied to a majority of similar urban and rural settlements located at the flood prone areas of the Terai Plains, and at the the Churia Hills of the Terai belt representing 12% of the total land mass of Nepal.
- If the Salyani Bagh reflect the climate vulnerability arising out of flooding and inundation problem within the low lying settlements of the Terai region, Gabar represent the vulnerability issues and problems related to increased precipitation and temperature in the urban and rural settlements located at the ecologically fragile Churia belt of the country.
- The VA of the two selected urban assets highlight a need for linking with other sectors – particularly, road & bridge, water supply and sanitation (WATSAN) sectors, for an integrated strategy, plans and programs to achieve the goals of climate resiliency.

ANNEXES

ANNEXURE 1: BANKE DISTRICT CLIMATE CHANGE THREAT PROFILE

ANNEXURE 2: VA MATRICES OF TWO ASSETS: SALYANI BAGH AND GABAR VILLAGE SETTLEMENT