

Nepalgunj

Heat Action Plan

2023



Nepalgunj Sub-Metropolitan City
Office of Municipal Executive
Nepalgunj, Banke



Nepal Red Cross Society

+CIFRC



Climate
Centre

Finnish Red Cross



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Acknowledgements:

Authors:

Ashma Subedi, Red Cross Red Crescent Climate Centre

Ramiz Khan, Red Cross Red Crescent Climate Centre

Roop Singh, Red Cross Red Crescent Climate Centre

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Sushma Shrestha, Finnish Red Cross

Copy-edited by: Sarah Tempest

Designed by: Eszter Sarody

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Background

With the increase in global temperatures, the frequency and intensity of hot extremes (including heatwaves) have risen across most of the world. Extreme heat events already have a significant impact on Nepal and have led to dangerous, even deadly, health consequences,

including heat stress and heatstroke. According to the country's Ministry of Home Affairs, 25 heatwaves occurred in 2002–2010, with the most significant occurring in 2009 and 2010, mainly in the Terai region of Nepal.

Purpose

The Heat Action Plan (HAP) provides a framework for implementing, coordinating and evaluating extreme heat action across different timescales in Nepalgunj to minimize the negative impacts of extreme heat on the health and livelihood of the city's residents. Some of the specific objectives of the HAP for Nepalgunj are to:

1. provide a roadmap for the local government and other stakeholders associated with providing emergency services such as the Banke District Chapter (DC) of the Nepal Red Cross Society (NRCS) on how to act before, during and after a heat season
2. build capacity of key city and non-governmental organization (NGO) stakeholders on heatwave impacts and preventive measures
3. define long-term planning measures to make the city more heat resilient
4. suggest a mechanism for effective coordination between all the relevant stakeholders to improve the perception of risk at the individual and community levels in order to strengthen Early Warning Early Action and long-term urban planning measures
5. highlight heat adaptation and mitigation tools to reduce the risk and make urban systems resilient.

The HAP is organized into two sections: 1. seasonal heat risk reduction – focuses on action before, during and after the heat season; and 2. longer term urban planning

– includes heat reduction measures, such as urban greenery, cool roofs and others. A more detailed plan, including the underpinning research, ways to improve the Heat Action Plan for the future, and more details of the activities listed below is available on request.

Approach to developing the HAP: The Nepalgunj HAP report follows the [Identification of Heat Threshold and Heat Hotspots in Nepalgunj, Nepal](#) study conducted in 2021. It guides extreme heat planning in Nepalgunj city. Its approach is based on an investigation of secondary information related to health and other urban systems such as water supply, electricity and urban greening as well as primary data collected through structural household surveys and participatory exercises such as focus group discussions (FGDs) with vulnerable communities. This was done to corroborate the secondary data analysis findings and gain a better understanding of local knowledge on heat risks, their impacts on people's health and livelihoods, and existing local adaptive practices. A workshop was conducted with stakeholders from various government organizations to integrate their knowledge and objectives within the HAP. Finally, key informant interviews (KIIs) were undertaken with selected stakeholders for an in-depth understanding of the systems, and their suggestions and feedback on adaptation strategies to reduce the heat risks and make the city more heat resilient.



Figure 1: HAP approach

Source: Author's illustration



Heat Action Plan (HAP)

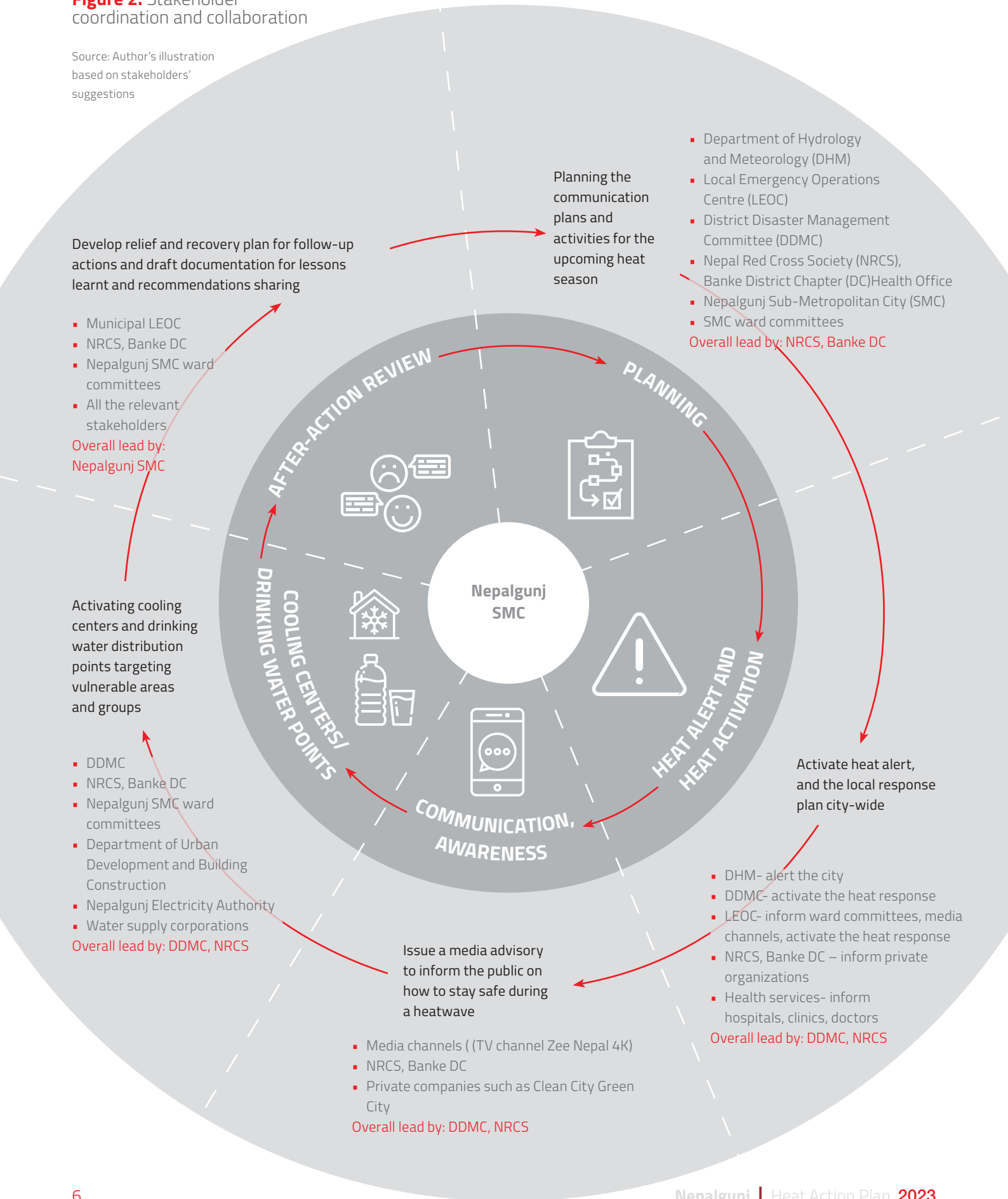
1. Seasonal heat-risk reduction

1.1 Preparing for heat season

It is essential to divide activities and responsibilities into pre-, during- and post-event categories, detailing the preparation needed for the heat season and any heatwave events that may occur; steps to be taken to reduce heat stress; and measures to incorporate lessons learned and fill gaps found in the management of heat stress. Before activating any heat response plan, the first step is to identify key stakeholders, define and assign their roles, and collaborate among them. All stakeholders must share a common vision and establish clear objectives for combating the heat. The roles and responsibilities of stakeholders should be clearly defined, with no overlapping duties. They should also be involved in the updates of heat response plans. Regular communication, including an agreement on the frequency and format, should be established (i.e., via in-person meetings, phone calls, emails etc.). The following figure shows how various stakeholders will coordinate and collaborate in various heat action activities (before, during and after a heatwave).

Figure 2: Stakeholder coordination and collaboration

Source: Author's illustration based on stakeholders' suggestions



Phase 1: Pre-heat season actions (annually from January to March)

The pre-heat season focuses on a strategy for alerts to be sent to the public, medical professionals and volunteer groups (caregivers), with a focus on the training and capacity building of these groups. These allow for the preparedness of individuals exposed to heat to take action to avoid or reduce their risk and prepare for an effective response. The NRCS, Banke DC, in coordination with Nepalgunj Sub-Metropolitan City (SMC), will take the overall lead for pre-heat season preparedness. Before a heat season, the following activities will be performed (Table 1).

Heat early warning system

The city currently has no heat early warning system. If such a system was developed, it would be easier for authorities to prepare for and respond to an acute heatwave event. A heat early warning system could be included in the next HAP for Nepalgunj city.

However, maximum temperature and humidity forecasts are available from the Nepalgunj Department of Hydrology and Meteorology (DHM). At the moment, the Nepalgunj DHM sends daily maximum and minimum temperature readings to a station in Kathmandu for recording. In return, the Kathmandu station provides a three-day temperature forecast for Nepalgunj, along with information on mean wind speed, precipitation and cloud cover. To develop a heat early warning system, some key steps need to be taken. For example, once the Kathmandu station has provided the three-day forecast of temperature and humidity, Nepalgunj DHM can alert city residents of the predicted temperatures. This would involve Nepalgunj DHM establishing formal communication channels and working with other stakeholders, including government organizations, the District Disaster Management Committee (DDMC), health officials and hospitals, local community groups, construction companies, and media outlets to issue alerts.

Table 1: Key activities **before** the heat season¹

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Communication				
Developing a plan for heat response/action activities	<ul style="list-style-type: none"> ▪ DDMC ▪ NRCS Banke ▪ DHM, Nepalgunj ▪ Nepalgunj SMC ward committees ▪ Government organizations ▪ Health Office ▪ Ministry of Water Supply ▪ Nepal Electricity Authority, Nepalgunj 	Nepalgunj SMC	<ul style="list-style-type: none"> ▪ NRCS, Banke DC ▪ Municipal Local Emergency Operations Centre (LEOC) ▪ DDMC 	Nepalgunj SMC will coordinate with NRCS, Banke DC, DDMC and Municipal LEOC to develop the heat action plan for the upcoming heatwave. The heat response plan will contain information on what heat activities to initiate after the heat alert (for example, public awareness, activating cooling centres, providing drinking water etc.). NRCS, Banke DC, DDMC and Municipal LEOC will coordinate and collaborate with targeted groups to prepare and lead the planned activities for the upcoming heat season.

¹ Constraint: Some of the activities listed in Tables 1 and 2 require assistance from an external source and will not be carried out if funds are insufficient.

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Awareness generation				
Raising awareness through mobile public address systems; distributing pamphlets; TV and radio broadcasts; and social media postings (Facebook, Twitter)	<ul style="list-style-type: none"> All the residents of Nepalgunj (especially vulnerable communities and groups) 	<ul style="list-style-type: none"> NRCS, Banke DC Nepalgunj SMC 	<ul style="list-style-type: none"> Health Office, Banke Media channels Municipal LEOC DDMC 	The awareness campaign will help city residents to recognize that extreme heat can be dangerous along with the simple actions they can take to reduce their risk of heat-related illnesses. In this context, NRCS, Banke DC and DDMC will coordinate with media outlets, the District Public Health Office and Nepalgunj SMC to inform the public about the upcoming heat season, heatwave risk and the potential impacts. The alert messages will be shared via social media platforms such as Facebook and Viber.
Raising awareness of energy conservation to reduce the risk of power cuts during the peak heat time	<ul style="list-style-type: none"> Schools, residents of Nepalgunj city Civil society organizations 	<ul style="list-style-type: none"> Nepal Electricity Authority, Nepalgunj NRCS, Banke DC Health Office 	<ul style="list-style-type: none"> NRCS, Banke DC Academic institutions Nepalgunj SMC Municipal LEOC 	Nepal Electricity Authority, Nepalgunj, in coordination with NRCS, Banke DC will organize an awareness-raising campaign on energy conservation in schools and homes as well as in government and commercial offices. The Authority will use different tools such as posters, mobile public address systems or social media platforms such as Facebook and Viber to generate awareness. The messages will contain information on the importance of reducing energy consumption, using energy-efficient appliances, and adopting renewable energy wherever there are opportunities. This should reduce the risk of power cuts during the peak heat days.
Arranging workshops for occupationally exposed groups	<ul style="list-style-type: none"> Traffic police, hawkers, street vendors, auto drivers, rickshaw pullers, outside workers 	<ul style="list-style-type: none"> NRCS, Banke DC Health Office 	<ul style="list-style-type: none"> Nepalgunj SMC Municipal LEOC 	NRCS, Banke DC and the District Public Health Office will organize an educational workshop on heat-related illnesses targeting traffic police, hawkers, street vendors, auto drivers, rickshaw pullers and outside workers. The workshop will provide information on keeping hydrated and cool during a heatwave and how to seek help in case of any adverse effects of heat on health. Workshop participants will also be made aware of the warning signs of heat stress/ heatstroke and how to provide basic first aid.
Conducting a community awareness campaign for women on heat education	<ul style="list-style-type: none"> Women community members Vulnerable groups 	<ul style="list-style-type: none"> NRCS, Banke DC 	<ul style="list-style-type: none"> Ward committees 	NRCS, Banke DC will organize heat education campaigns targeting women in Nepalgunj. The campaign will focus on raising awareness of heat and climate change, and share information on water management practices, using energy-efficient appliances etc. The campaign will also provide information on keeping hydrated and cool during a heatwave and how to seek help in case of any adverse effects of heat on health. This will be done in collaboration with Nepalgunj SMC and the ward committees.

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Capacity building				
Organizing heat-risk management training workshops	<ul style="list-style-type: none"> ▪ Schoolchildren ▪ Vulnerable communities ▪ Government organizations ▪ Civil Society Organizations 	<ul style="list-style-type: none"> ▪ NRCS, Banke DC ▪ Health Office, Banke ▪ Nepalgunj SMC 	<ul style="list-style-type: none"> ▪ Ward committees ▪ Academic institutions 	NRCS, Banke DC, in coordination with the District Public Health Office, will organize heat-risk management training for schoolchildren and vulnerable communities. They will also engage the ward communities and academic institutions for these exercises. The training will cover what to do (for example, how to prevent heat-related illness); the symptoms of heat-related disease; who to call in a heat emergency; and first-aid protocols. This training will be arranged at the community level using participatory exercises such as FGDs in different wards and schools.
Arranging capacity-building programmes for healthcare professionals	<ul style="list-style-type: none"> ▪ Medical staff at Bheri Hospital, Nepalgunj Nursing Hospital, Siddhartha Hospital, Western Hospital and other private clinics such as Ujjawal Clinic, Yasodha Clinic etc. ▪ Nursing staff, paramedics, field staff, family physicians, paramedics, volunteers of NRCS, Banke DC and future healthcare and public health professionals. 	<ul style="list-style-type: none"> ▪ NRCS, Banke DC ▪ Health Office, Banke 	<ul style="list-style-type: none"> ▪ NRCS, Banke DC ▪ Nepalgunj SMC 	The District Public Health Office, in coordination with NRCS, Banke DC, will organize education and training for health personnel and other related staff. The training will focus on how to prevent heat impacting the health of vulnerable people at particular risk. Objectives of the training could include updating knowledge on heat pathologies; identifying at-risk people; treatment methods for heat-related diseases, such as heatstroke; and first-aid protocols. The training could also focus on potential drug side-effects and the medication that vulnerable patients take during hot weather. Patients with diabetes, for example, are advised to drink plenty of fluids, particularly water, to avoid dehydration and to check their glucose monitor during high heat and humidity. Older people and their caregivers are advised to cool themselves with tepid water and fans rather than cold water.

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Database management				
Updating existing databases regularly, including hospital admissions and emergency case records to track heat-related cases	<ul style="list-style-type: none"> Hospitals: Bheri Hospital, Nepalgunj Nursing Hospital, Siddhartha Hospital, Western Hospital, etc. Private clinics: Ujjawal Clinic, Yasodha Clinic etc. 	<ul style="list-style-type: none"> NRCS, Banke DC Health Office, Banke 	<ul style="list-style-type: none"> Nepalgunj SMC NRCS, Banke DC 	All hospitals and clinics in Nepalgunj city must keep a record of admissions and emergency cases of heat-related illnesses. Health Office, Banke can make it mandatory for all hospitals and clinics to have a proper database system for all heat-related cases. The Health Office, in coordination with NRCS, Banke DC and Nepalgunj SMC, will regularly monitor the hospitals and clinics to ensure that all heat-related illness data is being recorded.
Workers' safety				
Changing workers' schedules and shifts	<ul style="list-style-type: none"> Vulnerable groups who work outside during extreme heat 	<ul style="list-style-type: none"> Nepalgunj Chamber of Commerce and Industry 	<ul style="list-style-type: none"> Nepalgunj SMC DDMC 	The Nepalgunj Chamber of Commerce and Industry will plan for changes to the work schedules of outside workers in coordination with the respective industrial/construction companies' managers and Nepalgunj SMC and DDMC.
Adding cooling measures to workplaces	<ul style="list-style-type: none"> Factories, industries, government offices, etc 	<ul style="list-style-type: none"> Nepalgunj Chamber of Commerce and Industry 	<ul style="list-style-type: none"> Nepalgunj SMC 	The Nepalgunj Chamber of Commerce and Industry and Nepalgunj SMC will add cooling measures to workplaces such as shady areas, fans and air conditioning units, or by creating cool resting spaces within factories and government offices.
Management of utilities				
Adding additional hospital beds and managing fans and coolers	<ul style="list-style-type: none"> All hospitals and clinics of Nepalgunj 	<ul style="list-style-type: none"> Health Office, Banke 	<ul style="list-style-type: none"> Nepalgunj SMC DDMC 	Health Office, Banke will collaborate with Nepalgunj SMC and DDMC to check if there are enough hospital beds to accommodate the expected increase in patients during the heatwave. Before the heatwave, all hospitals and clinics in Nepalgunj will inspect their refrigerators, freezers, fans and air conditioning units, repairing or replacing any that are broken. In busy hospitals where there is often a shortage of beds (such as Bheri Hospital), there may be capacity for temporary beds to be added. Fans and coolers should be added to hospital and clinics' waiting rooms.
Developing a plan to avoid power cuts	<ul style="list-style-type: none"> All the hospitals of Nepalgunj and cooling centres 	<ul style="list-style-type: none"> Nepal Electricity Authority, Nepalgunj 	<ul style="list-style-type: none"> Nepalgunj SMC 	Nepal Electricity Authority, Nepalgunj, will develop a plan to ensure the continuous supply of power by managing the availability of backup energy sources for critical infrastructure such as hospitals and cooling centres in coordination with Nepalgunj SMC.

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Cooling centres				
Setting up cooling centres	<ul style="list-style-type: none"> Vulnerable populations, namely outdoor workers and auto drivers 	<ul style="list-style-type: none"> Nepalgunj SMC NRCS, Banke DC 	<ul style="list-style-type: none"> Nepal Electricity Authority Water Supply Corporation, Nepalgunj 	<p>The cooling centre will have the capacity to accommodate at least 75 people at a time. It will be open from 10 a.m. to 4 p.m. during the peak summer season (April to June). The first cooling centre will be set up in Ward 13 near the daily wage labour market in Ramlila Maidan (a place where informal workers labour for a daily wage) (Annex, Figure 3). Another two potential locations for cooling centres are near Bageshwori Temple (Ward 2) and the bus station (Ward 4) (Annex, Figure 4).</p>
Provision of drinking water				
Installing water ATMs	<ul style="list-style-type: none"> Daily workers such as labourers, street vendors and auto drivers 	<ul style="list-style-type: none"> Ward members Nepalgunj SMC 	<ul style="list-style-type: none"> Drinking Water Cooperation 	<p>Nepalgunj SMC will install two water ATMs before the upcoming heat season in Rajha Chok of Ward 20 near Nepalgunj Airport as well as in Ward 15 near Jamuna (Nepal–India border) (Annex, Figure 5). Representatives of Wards 15 and 20 will implement the water ATMs in collaboration with Nepalgunj SMC and Drinking Water Cooperation. Ward members will oversee the monitoring and management of these water ATMs.</p>
Cool roof initiative				
Changing roof-colour coatings	<ul style="list-style-type: none"> Vulnerable communities with tin roofs from wards 18–22 	<ul style="list-style-type: none"> Nepalgunj SMC 	<ul style="list-style-type: none"> Department of Urban Development and Building Construction NRCS, Banke DC 	<p>An SMC target is to paint 50 households' roofs with white paint. Vulnerable communities with tin roofs in Wards 18–22 will be considered when choosing households. Nepalgunj SMC, in collaboration with the Department of Urban Development and Building Construction along with NRCS, Banke DC, will work on the cool roof initiative programmes.</p>

2

Phase 2: During heat season actions (annually from April to June)

The heat season is the time when heatwaves are most likely to occur. To stay ahead, there must be high awareness, constant situational monitoring, and collaboration between government departments, the media and the public to warn people of an impending heatwave and minimize heat impacts. It is critical to deliver targeted information to health and social care providers as well as to the community’s most vulnerable people. This information should include what to do (for example, how to prevent heat-related disease), symptoms of heat-related illnesses, and the location of services such as cooling centres and drinking water distribution points. Television, radio, bulk SMS messaging, newspapers, social media, emails and websites should all be used for communication. The DDMC and NRCS, in coordination with Nepalgunj SMC, will take the overall lead during the heat season to activate the response plan and mitigate the impacts of heat. During the heat season, the following activities will be performed (Table 2).

Table 2: Key activities **during** the heat season

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Alert messages				
Providing alert messages	<ul style="list-style-type: none"> Nepalgunj SMC Department of Water Supply Nepal Electricity Authority, Nepalgunj Nepalgunj Chamber of Commerce and Industry Department of Health Services, Nepalgunj DDMC, NRCS Health officials and hospitals 	<ul style="list-style-type: none"> DHM, Nepalgunj 	<ul style="list-style-type: none"> NRCS, Banke DC Media outlets such as News channels (TV channel Zee Nepal 4K) 	During the heat season, the targeted groups will coordinate with NRCS, Banke DC and news channels (TV channel Zee Nepal 4K) to reach out to the vulnerable groups through different communication channels and take necessary action.
Activating heat alerts and heat response plans city-wide	<ul style="list-style-type: none"> All the stakeholders 	<ul style="list-style-type: none"> Nepalgunj SMC 	<ul style="list-style-type: none"> DDMC NRCS, Banke DC Health Office, Banke 	The Nepalgunj SMC, in coordination with the DDMC, NRCS, Banke DC and Health Office, Banke, will activate all the heat response plans (such as opening the cooling centres, increasing access to drinking water etc.).

2

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Communication				
Messaging via SMS and Viber	<ul style="list-style-type: none"> Nepalgunj citizens NGOs Citizen welfare groups Construction contractors 	<ul style="list-style-type: none"> DDMC, NRCS Banke Nepalgunj Chamber of Commerce and Industry 	<ul style="list-style-type: none"> Municipal LEOC NRCS, Banke DC 	DDMC and the Nepalgunj Chamber of Commerce and Industry will start sending pre-agreed messages to the targeted groups regarding the heatwave alert and the preventative measures to take during the heatwave, with help from the Municipal LEOC and NRCS, Banke DC.
Holding a conference call among stakeholders	<ul style="list-style-type: none"> All stakeholders 	<ul style="list-style-type: none"> Nepalgunj SMC 	<ul style="list-style-type: none"> Municipal LEOC NRCS, Banke DC 	Following activation of the heat response plan, stakeholders will obtain up-to-date information on the ongoing heat season activities. With the cooperation of the Municipal LEOC and NRCS, Banke DC, Nepalgunj SMC will lead a frequent (possibly bi-weekly) conference call targeting all relevant stakeholders to discuss developments or issues addressed during the heatwave.
Cooling centres and drinking water				
Activating cooling centres	<ul style="list-style-type: none"> Vulnerable groups such as street vendors, auto drivers, outside workers etc. 	<ul style="list-style-type: none"> Nepalgunj SMC DDMC 	<ul style="list-style-type: none"> NRCS, Banke DC Nepal Electricity Authority, Nepalgunj Department of Water Supply 	The cooling centres will be activated by DDMC in collaboration with the NRCS, Banke DC, after Nepalgunj SMC initiates the heat response plan. Volunteers of NRCS, Banke DC with support from DDMC will monitor and manage the cooling centres. The Nepal Electricity Authority, Nepalgunj, will regulate and assure the availability of electricity. Likewise, the Water Supply Corporation, Nepalgunj, will ensure the availability of drinking water in cooling centres.
Increasing efforts to distribute fresh drinking water to the public through tankers	<ul style="list-style-type: none"> Water stress areas Wards 4, 5, 10, 12 etc. Construction sites, industrial areas (such as Wards 13, 19, 21 etc.) and vulnerable regions such as Wards 6, 15, 18, 19, 20 and 22 	<ul style="list-style-type: none"> Drinking Water Cooperation 	<ul style="list-style-type: none"> Nepalgunj SMC NRCS, Banke DC 	During periods of extreme heat, Nepalgunj SMC will distribute drinking water through water tankers in water-stressed areas such as the bus park (Ward 4), Surajigaun (Ward 4), Ram Nagar (Ward 5), Adarsh Nagar (Ward 10), Bhrikuti Nagar (Ward 10), Belaspur (Ward 12), the southern side of the District Police Office (Ward 12) and Koreanpur (Ward 12) (Annex, Figure 22). Nepalgunj SMC will also consider distributing drinking water via water tankers on construction sites and in industrial areas (such as Wards 13, 19, 21 etc.) as well as to vulnerable regions such as Wards 6, 15, 18, 19, 20 and 22. This will be done in collaboration with Nepalgunj SMC and Drinking Water Cooperation.

2

Key activities	Targeted group/ areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Public awareness				
Setting up public displays of temperature such as LED boards	<ul style="list-style-type: none"> Residents of Nepalgunj city 	<ul style="list-style-type: none"> Nepalgunj SMC 	<ul style="list-style-type: none"> NRCS, Banke DC Clean City Green City 	During the peak summer season (April to June), Nepalgunj SMC, in coordination with NRCS, Banke DC, will set up LED electronic boards to display maximum temperature and heatwave messages. The locations of the LED boards will be public places such as bus parks, hospitals and municipal offices etc.
Putting up heatwave awareness posters and banners	<ul style="list-style-type: none"> All the residents of Nepalgunj (especially vulnerable communities and groups as well as schoolchildren) 	<ul style="list-style-type: none"> NRCS, Banke DC 	<ul style="list-style-type: none"> Academic institutions Ward representatives from all 23 wards 	<p>The materials needed for awareness campaigns, such as banners and posters, are all pre-prepared (https://preparecenter.org/toolkit/heat/heat-action-posters/).</p> <p>NRCS, Banke DC will print these materials in February – two months before the start of the heat season. During the heat season, the NRCS, Banke DC, in collaboration with academic institutions and Nepalgunj SMC, will place awareness posters and banners in strategic locations such as in front of schools, the municipal office, Bheri Hospital, the bus park, the airport, etc.</p>
Raising awareness through mobile public address systems; distributing pamphlets; TV and radio broadcasts; and social media postings	<ul style="list-style-type: none"> All the residents of Nepalgunj (especially vulnerable communities and groups) 	<ul style="list-style-type: none"> NRCS, Banke DC 	<ul style="list-style-type: none"> News channels (TV channel Zee Nepal 4K) Bheri Environmental Excellence Group (BEE-Group) Clean City Green City 	NRCS, Banke DC, will coordinate with media outlets to warn the public of an impending heatwave and its potential impacts. Heat awareness messages that have already been developed (https://vimeo.com/showcase/9459591) will be played on TV channels such as Zee Nepal 4K. Messages will also be relayed via radio in two different languages (Nepali and Awadhi). All messages will provide information on how extreme heat can be dangerous to health while raising city residents' awareness of how simple actions can reduce their risk of heat-related illness and where to seek help in case of adverse effects of heat on health. Pamphlets will be distributed to people backed up by messages communicated through a mobile public address system. The NRCS, Banke DC, in collaboration with media outlets, will roll out all of these activities simultaneously. At the same time, private organizations such as BEE-Group and Clean City Green City will support NRCS, Banke DC to warn the public through social media channels such as Twitter, Facebook, WhatsApp and TikTok.

Phase 3: Post-heat season actions (annually in July to September)

After the heat season has ended, a relief and recovery plan will be activated to assign responsibility for follow-up action to various stakeholders. The Nepalgunj SMC will take the overall lead for post-heat season activities. During the post-heat season, the following activities will be performed (Table 3).

Table 3: Key activities **after** the heat season

Key activities	Targeted group/areas	Lead organization	Stakeholders to coordinate with	How to carry out the activities
Heat Action Plan				
Organizing an after-action review of the Heat Action Plan	<ul style="list-style-type: none"> ▪ DDMC ▪ Health Office ▪ NRCS, Banke DC ▪ DHM, Nepalgunj ▪ News channels (TV channel Zee Nepal 4K) ▪ Department of Water Supply Nepal ▪ Electricity Authority, Nepalgunj ▪ Nepalgunj Chamber of Commerce and Industry ▪ Department of Urban Development and Building Construction 	<ul style="list-style-type: none"> ▪ Nepalgunj SMC 		<p>Within one month after the end of the heat season, Nepalgunj SMC will conduct an after-action review. A review meeting will be held at the Nepalgunj SMC office in the presence of all key stakeholders. Nepalgunj SMC will initiate an evaluation of the Heat Action Plan by discussing four primary questions for the after-action review:</p> <ul style="list-style-type: none"> i) what was in the plan? ii) what happened? iii) what worked well, what did not work well, and why? iv) what could be improved and how?
Communication				
Engaging with city residents by creating opportunities to provide feedback	<ul style="list-style-type: none"> ▪ Nepalgunj residents 	<ul style="list-style-type: none"> ▪ Nepalgunj SMC 	<ul style="list-style-type: none"> ▪ NRCS, Banke DC ▪ Private organizations 	<p>After the heat alert is over, Nepalgunj SMC in coordination with the NRCS, Banke DC and private organizations will engage with city residents by developing community- or household-level surveys involving the most vulnerable groups. The following questions could be included in the survey:</p> <ul style="list-style-type: none"> ▪ <i>Did you receive any messages about the heatwave and what to do during it?</i> ▪ <i>Which group(s) of people need to be reached more effectively in the future?</i>
Documentation				
Drafting a report documenting lessons and recommendations	<ul style="list-style-type: none"> ▪ Nepalgunj SMC 	<ul style="list-style-type: none"> ▪ Municipal LEOC ▪ NRCS, Banke DC 	<ul style="list-style-type: none"> ▪ Relevant stakeholders 	<p>Following the after-action review, Municipal LEOC and NRCS, Banke DC will organize the drafting of a report itemizing lessons learned from the heat response activities alongside suggested improvements for the future. After the report has been compiled, it will be presented to the Nepalgunj SMC in the presence of all the stakeholders before being formally submitted to Nepalgunj SMC.</p>

2. Long-term urban planning measures

All the measures listed below have been suggested by the stakeholders of Nepalgunj.

Energy management plans

Heat seasons are putting extra stress on the supply of electricity as more and more people use cooling systems, increasing demand. Already, there are regular cut-offs during the summer due to transmission line disturbances caused by heat, wind, rain and resulting system failure. This energy shutdown occurs six to seven times a day for 20 minutes at a time (on average) and occurs most often in June. Some of the measures that will be incorporated to make the system more resilient to heatwaves are:

- **maintaining transmission lines:** Regularly checking and maintaining the transmission lines reduces the risk of frequent cut-offs during heatwaves.
- **installing renewable sources:** Using alternative energy sources, such as solar panels, can help to support vulnerable communities that do not have access to electricity, such as Futaha Gau of Ward 19.
- **raising awareness of energy-efficient appliances:** Some energy efficiency examples include LED (light-emitting diode) bulbs or CFL (compact fluorescent light) bulbs. LED bulbs use up to 80 per cent less energy than incandescent bulbs.

Healthcare system

Hospitals in Nepalgunj are not adequately equipped for a surge in patients due to heatwaves. Some of the measures that will be incorporated to make the healthcare system more resilient to heatwaves are:

- **issuing heat-health information:** Advising city residents on how to protect themselves and others, how to recognize heat-related symptoms and who to call for help.
- **training health volunteers and workers:** Training health personnel, such as volunteers of NRCS, Banke DC, nurses and emergency medical personnel, to help them recognize the signs and symptoms of heat-related illnesses.
- **quantifying heat-related data:** All the hospitals and clinics in Nepalgunj need to keep a record of heat-related illnesses.
- **preparing for a large influx of patients:** Hospitals can prepare for a large influx of patients; temporarily increasing capacity by adding more beds and installing fans and coolers in waiting rooms and hospital wards.

Building construction

The Nepalgunj SMC follows the national building code; but this does not address issues related to climate change or heat-resilient measures, including how extreme heat can affect infrastructure. Some of the measures that will be incorporated to make the system more resilient to heatwaves are:

- **introducing passive cooling strategies:** External shade, such as an awning or canopy, along with window blinds can help to protect homes from direct sunlight and heat build-up.
- **using materials such as straw:** Spreading straw over the tops of houses with cement roofs can help to reduce heat absorption. Thatched roofs (straw) work as natural insulators, keeping homes cool when it's hot outside.
- **using sandwich panels or insulation foam:** Both measures offer better thermal insulation, so hospitals (e.g., Bheri Hospital, Siddhartha Hospital), hotels (e.g., Hotel Siddhartha, Hotel Sneha) and government offices (e.g., Nepalgunj SMC) can have them installed to reduce the impact of heat.

Water supply system

Water demand is high during the summer, when the water requirement in Nepalgunj rises to 6–8 million litres per day. Since only 12 per cent of the population uses tap water, Water Supply Corporation, Nepalgunj has stepped in to provide enough drinking water to meet demand in the heat season. Some of the measures that will be incorporated to make the system more resilient to heatwaves are:

- **installing and regularly maintaining deep tube wells/ hand pumps:** Hand pumps will be installed and regularly maintained so that water can be extracted in various public places, such as near the Bageshwori Temple, bus parks, mosques and industrial areas.
- **harvesting rainwater at household/community level:** Each ward committee and Nepalgunj SMC will encourage the use of rainwater harvesting. Using government subsidies to install more rainwater harvesting systems will lead to more users, especially among vulnerable communities.

Urban greenery and water bodies

At present, there are no policies regarding the protection of natural water bodies and the preservation of open spaces. Some of the measures that will be incorporated to make the system more resilient to heatwaves are:

- **establishing parks:** Individual wards will create parks in advance of the heatwave in coordination with Nepalgunj SMC and the Department of Urban Development and Building Construction.
- **planting trees along streets and walkways, and between buildings:** The planting of trees will be organized in the open areas of the city, along streets and walkways, and between buildings.
- **re-establishing green vegetation:** Unnecessary paving slabs, concrete tiles and asphalt surfaces can be replaced with patches of lush green vegetation along with trees and permeable pavements.
- **spraying pavements:** During the summer months, water will be sprinkled on to the busy roads and highways of the city every day to cool these heat-retaining surfaces and keep dust at bay.

- **building ponds:** Ponds will be established in the areas/wards that have a very low Normalized Difference Water Index (NDWI) value (e.g., Wards 13, 14, 17, 21, etc). The NDWI monitors changes in water bodies so that water stress areas can be detected early, and action can be taken – such as building ponds – to mitigate the impacts.



Conclusion

Heat Action Plans are critical components of cities' climate adaptation strategies. With the frequency and intensity of heatwaves expected to increase in the coming years, this climate-adaptive Heat Action Plan for Nepalgunj will help the city to prepare, act, mitigate and adapt to the greater risk of heatwaves. The HAP also

supports Nepalgunj's long-term development; particularly in prioritizing and integrating adaptive measures into the planning of a climate-resilient city. The HAP is a living document that will be updated on an annual basis, based on the after-action review and increasing capacity of the Nepalgunj stakeholders.

ANNEX

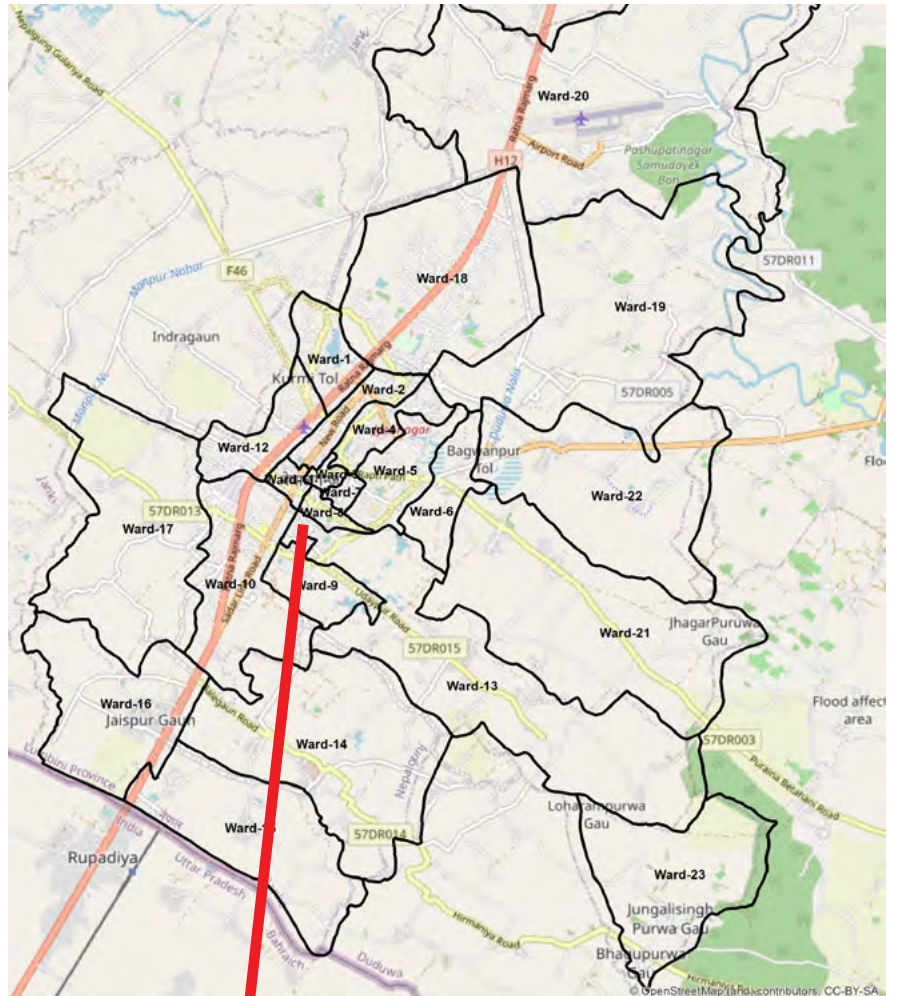
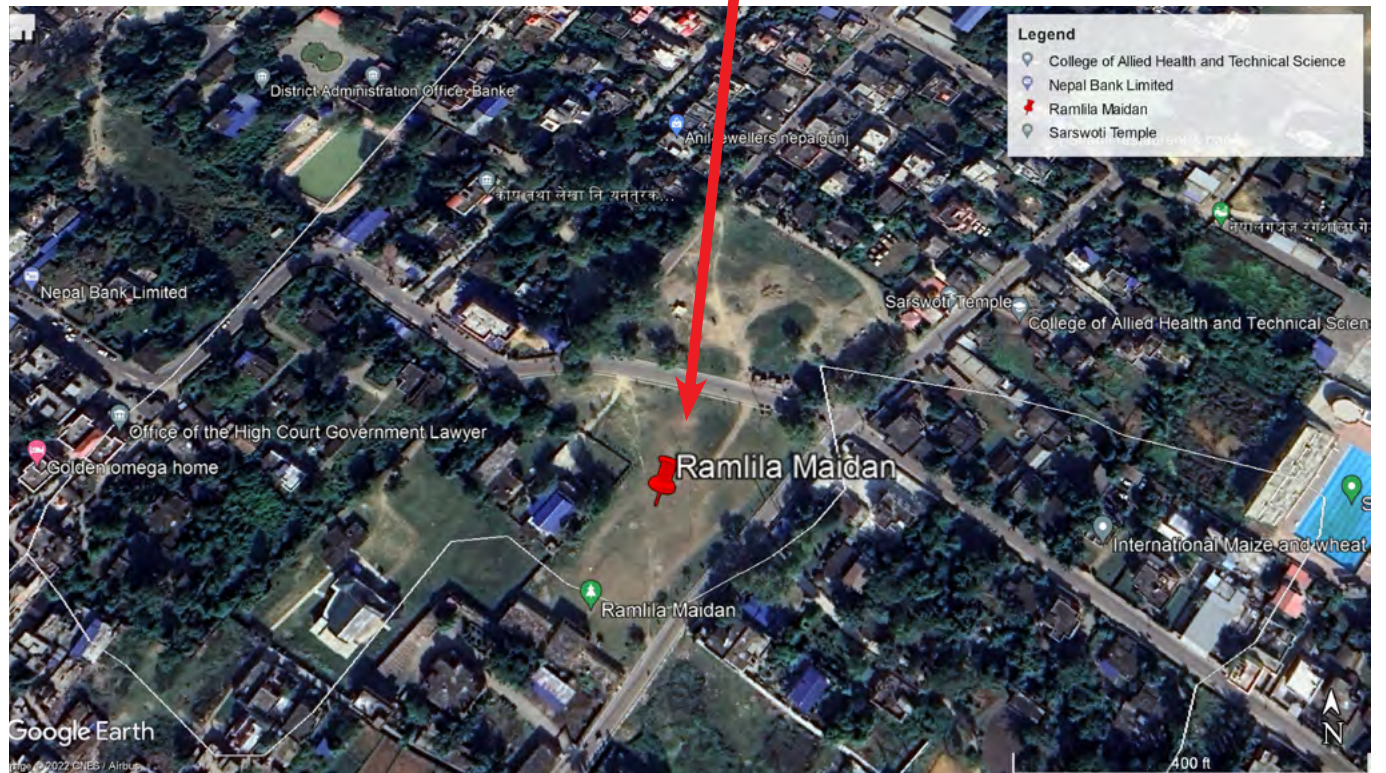


Figure 3: Possible location of a cooling centre in Nepalgunj

Source: Author's illustration based on data obtained from Google Earth



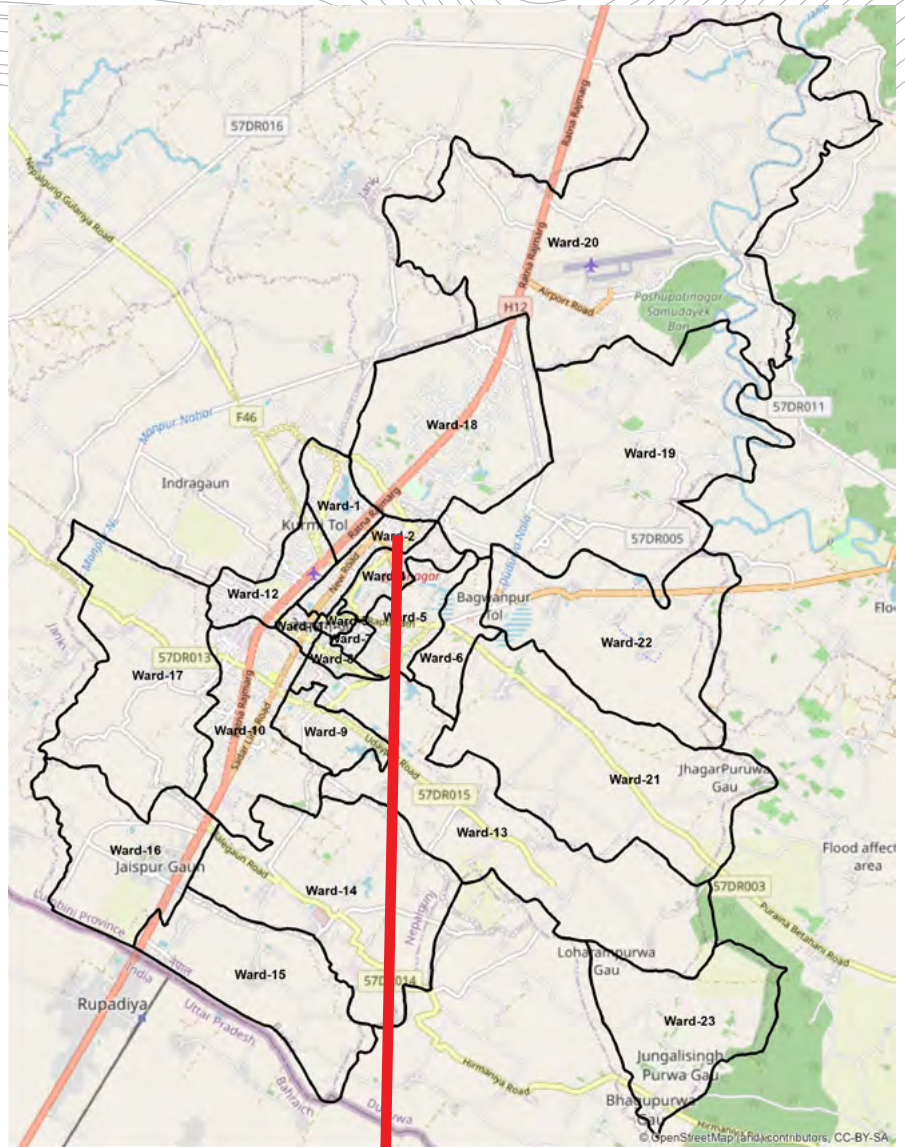


Figure 4a: Another two possible locations for cooling centres

Source: Author's illustration based on data obtained from Google Earth



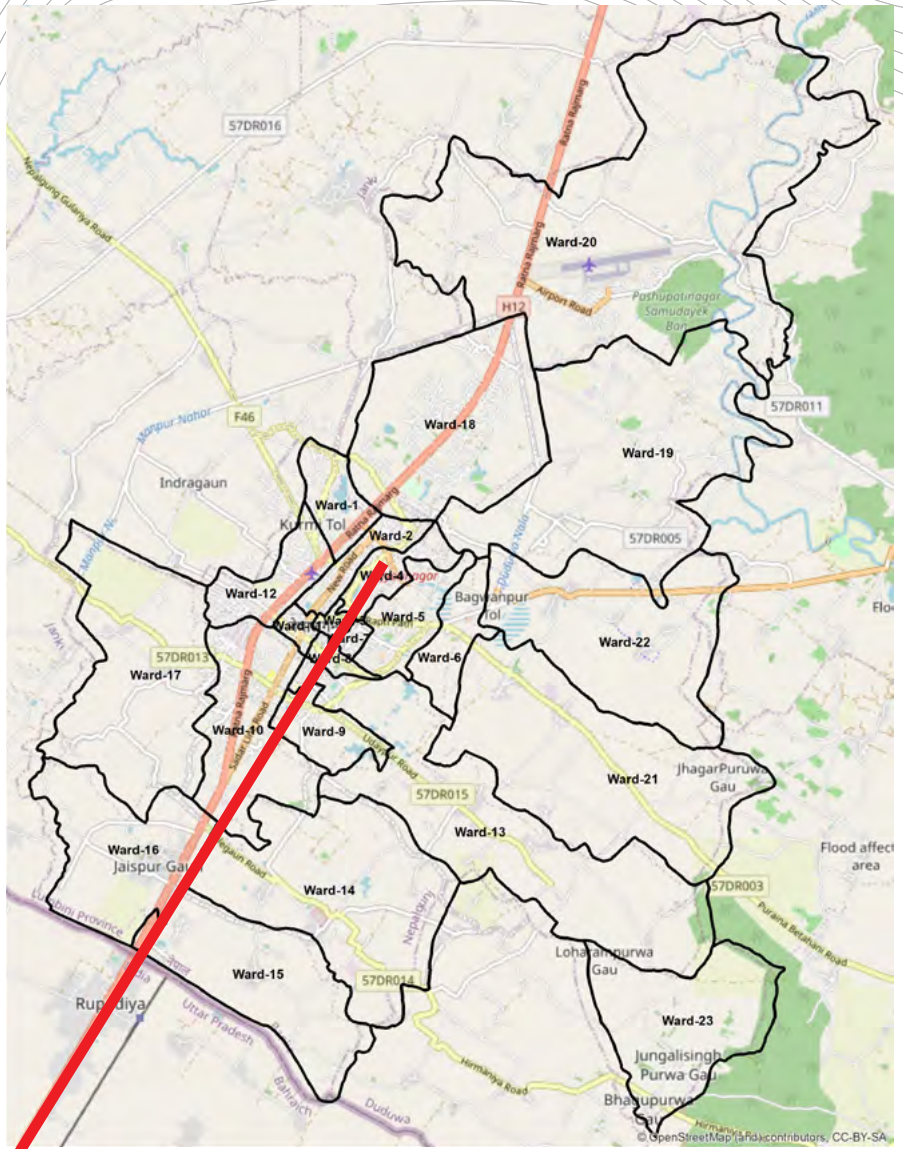


Figure 4b. Another two possible locations for cooling centres

Source: Author's illustration based on data obtained from Google Earth



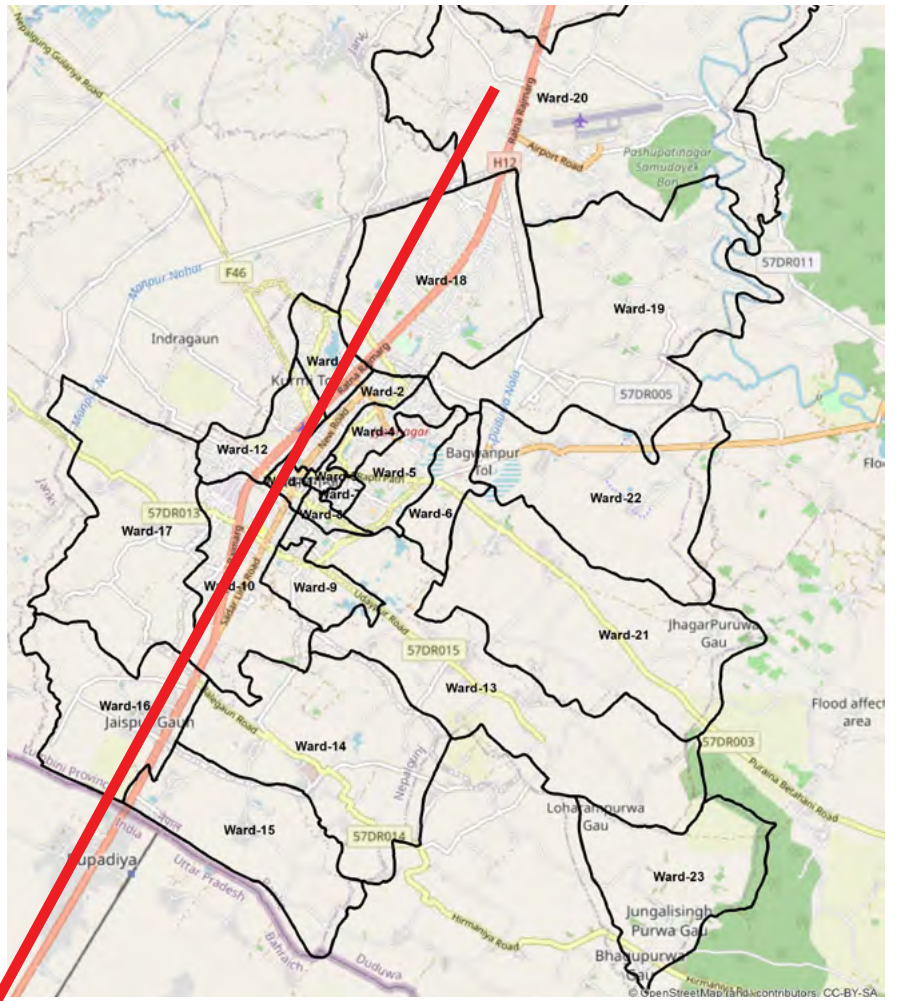
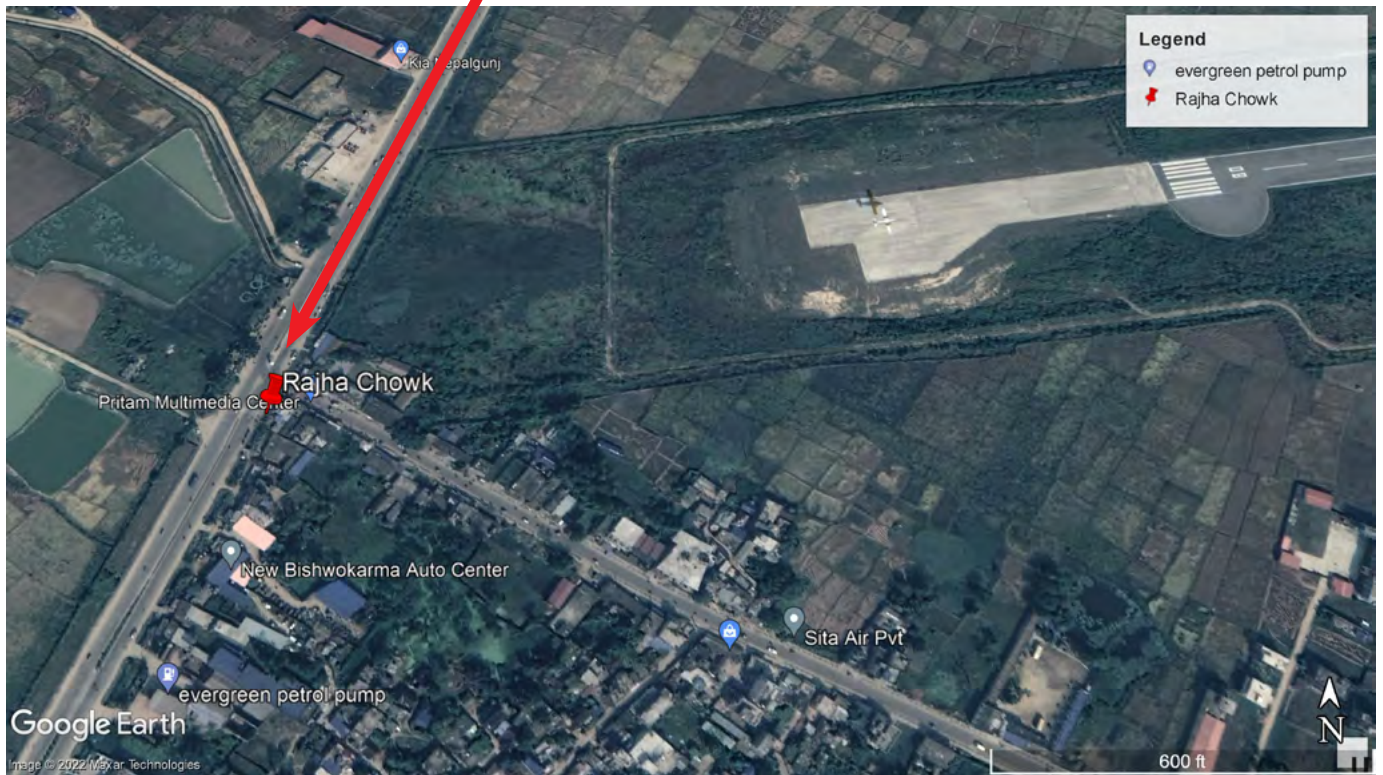


Figure 5a: Location of water ATM

Source: Author's illustration based on data obtained from Google Earth



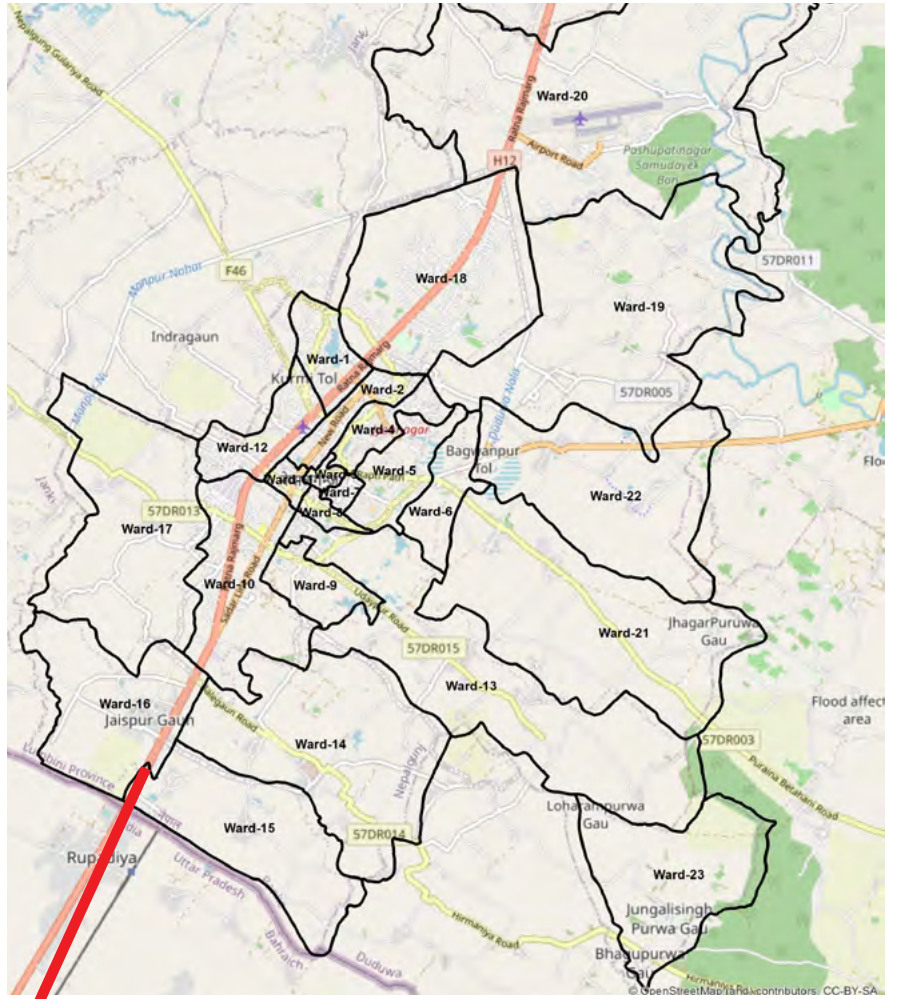
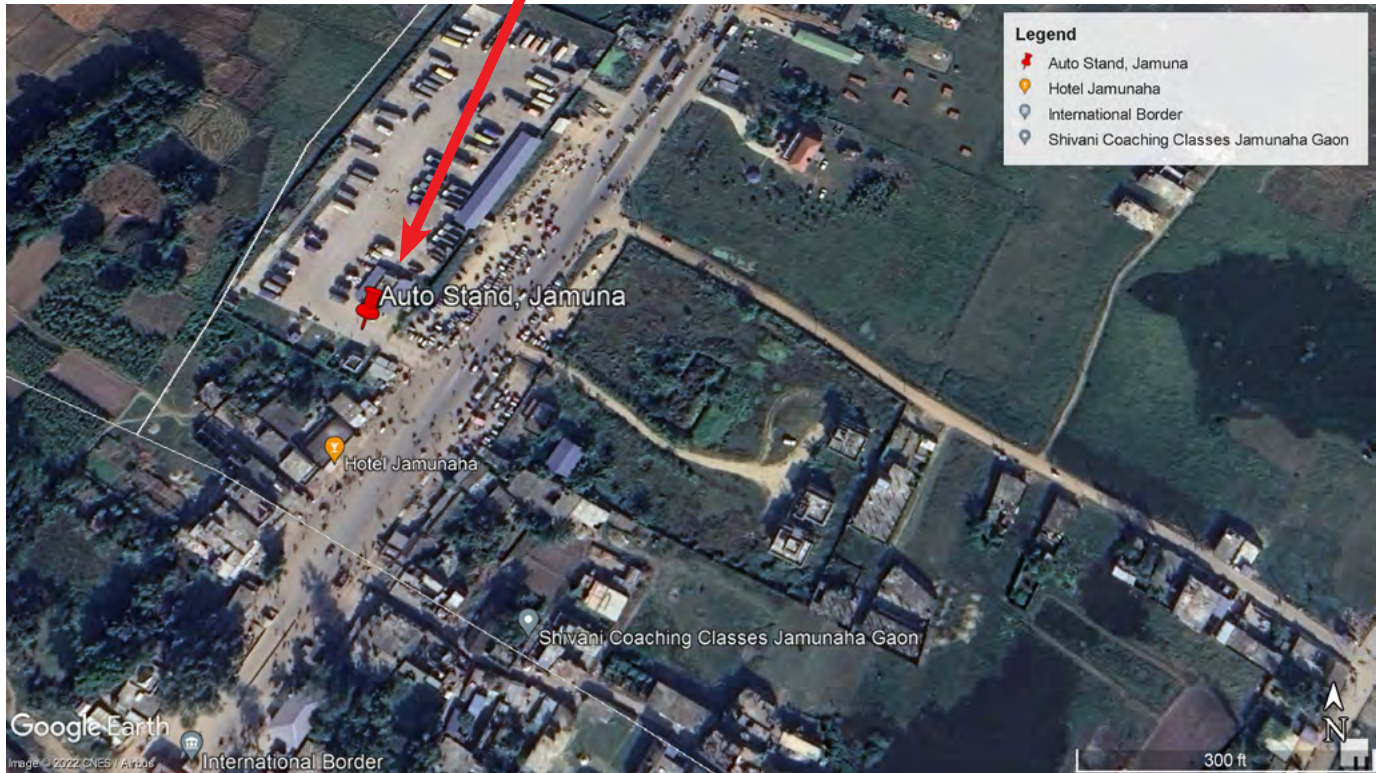


Figure 5b: Location of water ATM

Source: Author's illustration based on data obtained from Google Earth



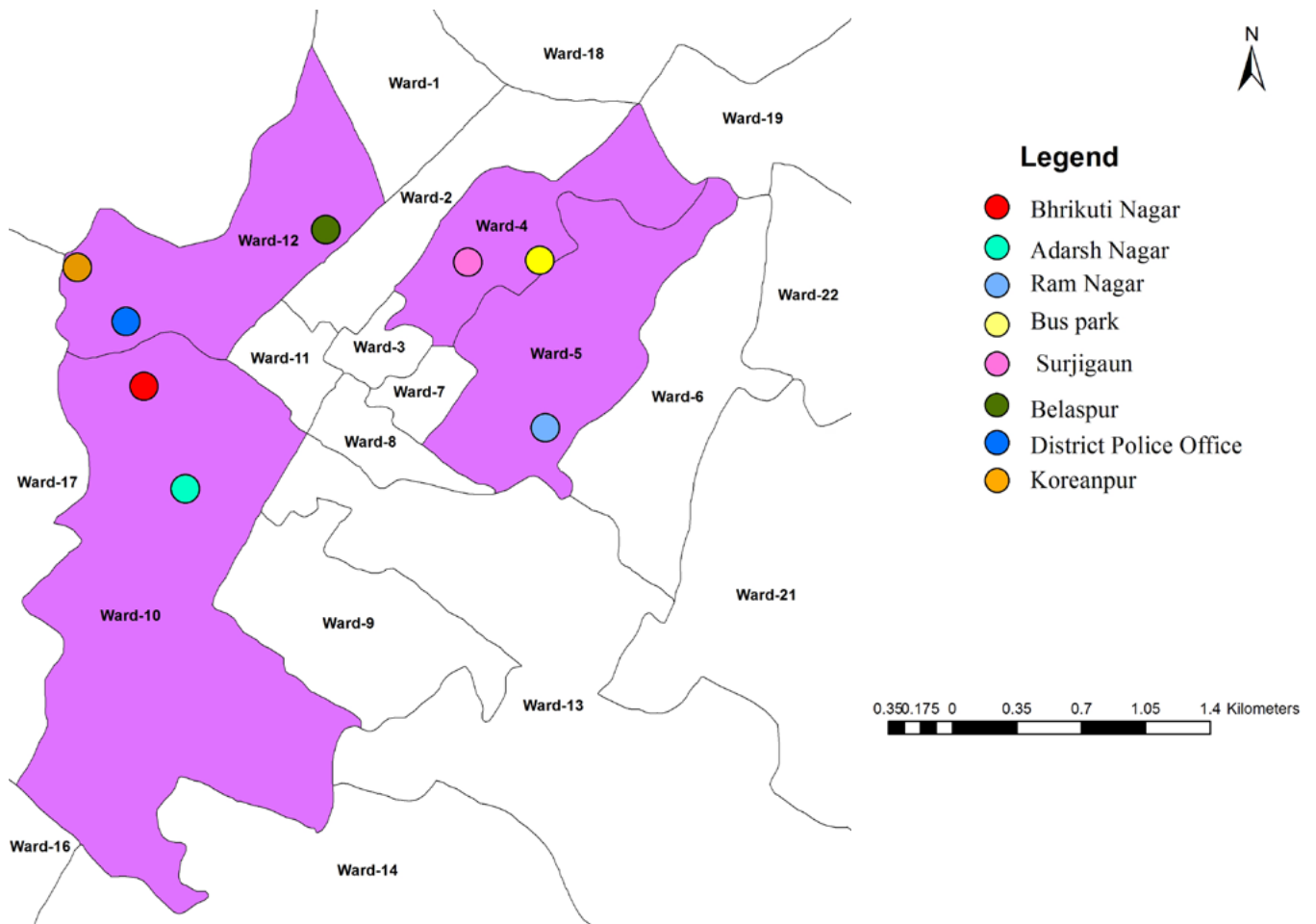


Figure 6: Water stressed areas of Nepalgunj

Source: Author's illustration



