



POPULATION MOBILITY AND PUBLIC HEALTH RISK MAPPING

COVID-19 Preparedness and Response Plan in Nepal (2020)

Dasharathchanda Municipality

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I. INTRODUCTION

The Coronavirus disease, hereinafter referred to as COVID-19, is caused by SARS CoV-2Virus and is the third recorded animal-to-animal transmission of a Coronavirus, after Severe Acute Respiratory Syndrome (SARS, 2002), and Middle East Respiratory Syndrome (MERS, 2012). The first COVID-19 case was detected in Hubei Province, China, on 17 November 2019. Since then, the disease has spread throughout the globe to the extent to be declared as a pandemic by the World Health Organization (WHO), on 11 March 2020. As of 4 November 2020, the number of cases stands at 47,059,867, including 1,207,327 deaths worldwide.¹

In Nepal, the first case of COVID-19 was reported on 23 January 2020. As of 4 November 2020, the total number of confirmed cases in Nepal stands at 179,614 with over 100,000 newly detected cases in five weeks, and 1,004 deaths.² Since the detection of the second positive case on 24 March 2020, the Government of Nepal (GoN) has taken several steps to control transmission and mitigate the impact of COVID-19 on the society, including enforcement of nationwide lockdown, closure of international border, testing of suspected cases, isolation, treatment, contact tracing, and management of quarantine centres.

I.1 POPULATION MOBILITY MAPPING (PMM)

The Population Mobility Mapping was developed through an adaptation of IOM's Displacement Tracking Matrix (DTM) and has been implemented as part of the response and preparedness plan to several outbreaks, specifically the Ebola Virus Disease (EVD) in West Africa (2014-2016), the Democratic Republic of Congo (2017, 2018-2020), Burundi, South Sudan and Uganda (2019), as well as the plague outbreak in Madagascar (2018). The aim of PMM is to understand the dynamics of human mobility and identify the most vulnerable, priority locations within and outside the border. The findings enable the Government, communities and various actors to prevent the introduction or to limit the spread of infectious diseases and other public health threats, directly affected by human mobility. The Population Mobility Mapping was selected by the Ministry of Health and Population (MoHP) as part of the national COVID-19 Response and Preparedness Plan.

Specific locations to conduct the PMM activities were selected. The selection was based on three main criteria; a) existing knowledge on health risks and general epidemiological information, b) population mobility dynamics based on local available information, and c) accessibility and resources availability. Based on this, nine (9) Municipalities were identified in three (3) Provinces in Nepal:

I. Sudurpashchim Province

1. Dhangadhi Sub-Metropolitan City (Kailali District)
2. Bheemdatta Municipality (Kanchanpur District)
3. Dasharathchanda Municipality (Baitadi District)

¹ https://covid19.who.int/?gclid=EAlalQobChMIpu2y9aym6wIVjx0rCh2zNgN6EAAAYASAAEglIzvD_BwE

² Ibid

II. Lumbini Province

4. Nepalgunj Sub-Metropolitan City (Banke District)
5. Krishnanagar Municipality (Kapilvastu District)
6. Siddharthanagar Municipality (Rupandehi District)

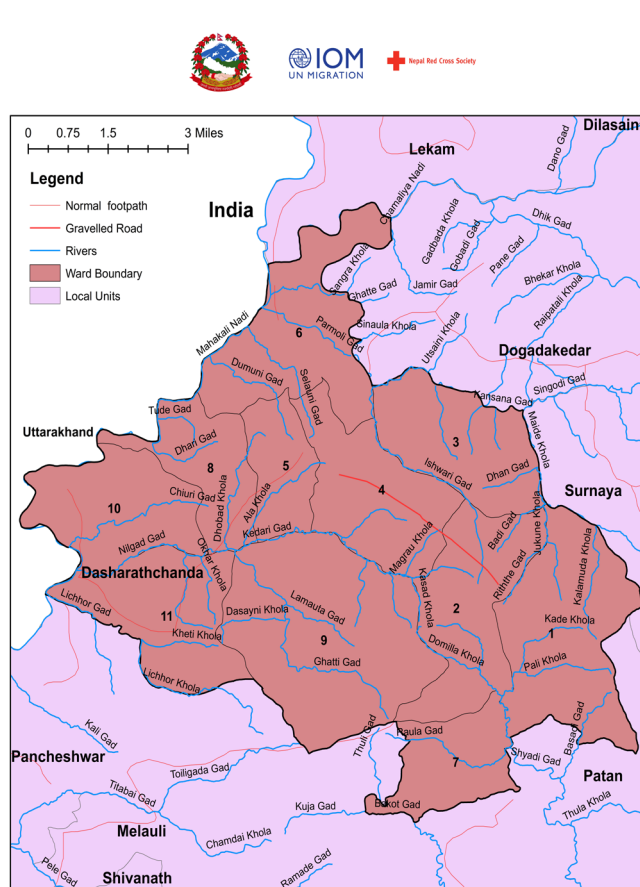
III. Province I

7. Biratnagar Metropolitan City (Morang District)
8. Mechinagar Municipality (Jhapa District)
9. Suryodaya Municipality (Ilam District)

This report will present the PMM results conducted in Dasharathchanda Municipality, Sudurpashchim Province, between 30 August and 6 September 2020.

1.2 MUNICIPALITY PROFILE

Dasharathchanda Municipality is located in the Baitadi District, in the western part of Nepal. Situated in the hilly area (1445 meters above sea level, on average), the municipality is over 850 Km away from Kathmandu, the capital city. It covers a total of 135.15 sq. Km (see Map 1), and borders with Surnaya Municipality and Patan Municipality in the east, India in the west, Dogadakedar Municipality in the north, Melauli Municipality and Pancheshwar Municipality in the south. According to the census in 2011, the population living in the area is 35,211 (16,327 men and 18,884 women).



Map 1: Boundaries of Dasharathchanda Municipality, rivers and roads/paths. The map was used for the focus group discussions conducted as part of the PMM

The main sources of income, in order of relevance, are foreign employment, government services, and agriculture. In Dasharathchanda Municipality there are a total of 10 urban health centres, including one (1) district hospital and nine (9) health posts, for a total capacity of 25 beds. Registered health workers are 49, with 3 doctors, 4 nurses, 20 auxiliary nursing midwiferies, and 22 auxiliary health workers.

I.3 OBJECTIVES

The PMM has four main objectives:

1. Identify travellers' profiles and mobility patterns which have health related impacts both within and/or outside the country.
2. Identify vulnerable places where travellers or mobile populations gather and interact with each other or with local communities, which are at risk of both contracting and spreading infectious diseases and other health threats.
3. Identify priority sites with limited capacities to prepare and respond to public health emergencies.
4. Identify priority public health actions and resource allocations, in order to develop action plans aimed at strengthening public health emergency preparedness and response capacities.

2. METHODOLOGY

Nine (9) Municipalities were identified in three (3) Provinces in Nepal as mentioned above. At the initial stage, data collection tools were developed and contextualized to the case of Nepal. Special attention was given to the guides to be used during Phase I and the questionnaires for Phase II. Furthermore, maps of the selected municipalities were created using GIS software (see Map 1), based on available geographical and administrative data, to be later used during the focus group discussions (FGDs).

2.1 PREPARATION AND COORDINATION FOR THE PMM

A two-fold coordination was initiated in June 2020 with the MoHP and the Nepal Red Cross Society (NRCS), the implementing partner. This culminated in the signing of the IOM-NRCS agreement on 30 July 2020 and the obtaining of the official approval from the MoHP on 10 August 2020. Several meetings with NRCS were held to discuss and explore the implementation plan on the ground. Simultaneous coordination was undertaken at the provincial and municipality level to engage with relevant stakeholders and finalise the workplan. Similarly, parallel meetings were conducted with the IOM PMM team to analyse the data collection tools and select the categories of key informants (KIs) according to the local context.

On 3 August 2020, a 1-day training was conducted for the IOM PMM team at IOM premises in Kathmandu (Picture 1 and 2). The training had three key objectives:

1. Learn about the concepts at the basis of the PMM, such as human mobility, and its relationship with the Displacement Tracking Matrix (DTM) and the Health, Border, and Mobility Management (HBMM) framework.
2. Understand the structure of the PMM methodology, and its key components.
3. Learn about the implementation of the PMM activities on the ground through a practical simulation of the PMM Exercise and examination of questionnaires in KoBo Collect, to be used during Phase II.

The same training was conducted in Dhangadhi Sub-Metropolitan Municipality on 14 and 15 August 2020 for the NRCS staff (15 people), who have supported the IOM PMM staff in the implementation of field activities (Picture 3 and 4). Standard Operating Procedures (SOPs) and Infection Prevention and Control (IPC) measures were observed by all participants and trainers throughout the sessions, which were also attended by Government representatives.



PMM Training: The PMM expert explaining the methodology (left) and the PMM team listening to the training (right)



GPS & KoBo Training: GPS coordinate training (left) and trainer translating in Nepali (right)

2.2 DATA COLLECTION

The method implemented in Dasharathchanda Municipality involves two different phases.

2.2.a PHASE I

Phase I is referred to as 'Participatory Mapping Exercise' and includes facilitated focus group discussions (FGDs) with key informants (KIs), who are knowledgeable of patterns of people's movement in the specific area under consideration. Through this exercise, information is collected on the type and exact locations where people gather and travel to/from, as well as the most used routes, reasons to travel, and size of people's flow.

The PMM Exercise in Dasharathchanda Municipality was conducted between 31 August and 2 September 2020 and was comprised of 5 FGDs. A total of 25 KIs participated in the discussions, according to their respective category; 1) government representatives, 2) agency (specifically NGOs/INGOs) representatives, 3) community workers, 4) drivers, and 5) vendors.

The discussions were facilitated in Nepali by trained moderators, whereas the information was entered in English by the trained note takers. Prior to the start of the FGDs, KIs were informed about IOM's mandate, the scope of the project and the partnership with GoN and NRCS, as well as IOM's experience in the PMM acquired in other countries. All participants were asked to sign a consent form if they agreed to participate in the PMM study. The information was collected using two main tools – the note taker's guide and a map of the municipality (see Map 1). In terms of the process, the note taker would write down the answers provided by the interviewees, while simultaneously the mapper would locate on the map the exact locations of the mentioned sites (Picture 5 and 6).



PMM Exercise: Participatory mapping exercises during the FGDs in Dasharathchanda Municipality

The collected data from the FGDs is later entered in a matrix. The matrix is a set of questions with parameters highlighted by medical officers in IOM to determine places that are more vulnerable. Specific scores are allocated to different sites, such as points of entry (POEs), border crossing points (BCPs), health centres, traditional healers, market centres, migrant worksites, entertainment centres, schools and colleges. The weight scores are selected according to the potential risk of transmission and infection during an emergency or disease outbreaks of international concern (see Annex I). The matrix analysis allows to identify the sites with the highest population mobility and the specific localities where these are located. The locations at the topmost layer in the matrix are selected and evaluated in Phase II.

2.2.b PHASE II

Phase II involves direct observations and individual interviews with KIs at the specific sites identified in Phase I. In particular, GPS coordinates of the priority sites are collected using a GPS device, together with estimations of travellers' volume, information on accessibility, and existing public health measures and capacities. The data is collected through KoBo Collect, a tool for mobile data collection which allows to create digital surveys and store submissions.

2.3 CHALLENGES

1. Discrepancies in names of locations and information provided by different KIs create confusions and delays, especially during Phase II. This is enhanced by the lack of official names of various sites, including POEs. The issue of locality/site duplicates was mitigated by checking names prior to field observations, though final validation happened exactly when physically visiting the sites.
2. The questionnaires uploaded in the software used for data collection during Phase II, KoBo Collect, were not fully adequate for Nepal's context, despite initial preparatory work and analysis of available contextual data. As a result, questionnaires were updated and revised in order to better reflect the national situation.
3. Some priority locations identified for field observations were not accessible by vehicle due to the rough geographical terrain in the municipality, worsened by heavy rains during monsoon season. Long distances were often covered by foot by the enumerators, despite high weather temperatures (Picture 7 and 8).
4. Due to restricted movement and lockdown, KIs were harder to reach and continuous coordination was necessary to utilize time efficiently and arrange dispatchment of enumerators to priority sites.
5. Despite the enforcement of SOPs and reminders for IPC measures, participants were often inattentive, especially during FGDs. A great deal of attention was put by the field team to make sure physical distancing was respected, people were wearing masks adequately and were using hand sanitizer frequently. Gloves, masks and hand sanitizer were provided by IOM to both the NRCS collaborators and KIs.



Challenges: Example of road infrastructure (left) and IOM enumerator walking to reach the priority site (right)

3. RESULTS

3.1 PHASE I

Following the data entry and consequent matrix analysis (see Annex II), a total of 59 sites with high population mobility were selected for further assessments for Phase II. In particular, these are; 5 POEs, 11 Health Centres, 17 Traditional Healers, 3 Schools and Colleges, 4 Entertainment Centres, 4 Market Centres, 10 Migrant Worksites, 3 Transport Stations, and 2 Places of Worship (see Table I.1).

Table I.1: Full names and localities of vulnerable sites identified within the municipality

POEs		
<i>n</i>	Name Site	Locality
1	Jhulaghat POE	Jhulaghat
2	Burkeli POE	Burkeli
3	Naltadi POE	Naltadi
4	Sera POE	Sera
5	Tirkhadani POE	Tirkhadani

Health Centres		
<i>n</i>	Name Site	Locality
6	Bhatta Medical Clinic	Gothalapani
7	Bhatta Medical Store	Musyachaur
8	Dasharathchanda Ayurvedic Hospital	Shahilekh
9	Dehimandu Health Post	Dehimandu
10	District Hospital	Gothalapani
11	Jay Durga Medical Clinic	Musyachaur
12	Joshibunga Health Post	Joshibunga
13	Nikosakti Hospital	Shahilekh
14	Pallachaudali Health Post	Pallachaudali
15	Thaligada Health Post	Thaligada
16	Tripurasundari Health Post	Tripura

Traditional Healers	
<i>n</i>	Locality
17	Aaula Baidhya
18	Bhatti Gaun Dharni
19	Bhekkar Dharni
20	Bhoda Dharni
21	Chhela Dharni
22	Dadakharkhe Dharni (TG)
23	Dehimandu Bagauli
24	Durga Bhawani Dharni (Chamgaun)
25	Gothalapani Dharni (IB)
26	Jargaun Baidhya
27	Jargaun Fortune Teller
28	Nauhaat Pujari
29	Pujaragaun Fortune Teller (PSB)
30	Sera Dharni
31	Shahilekh Bagauli
32	Surkal Dharni
33	Thachaur Bagauli

Schools and Colleges		
<i>n</i>	Name Site	Locality
34	Birendra Higher Secondary School	Gothalapani
35	Farwest Jagannath Multiple Campus	Gothalapani
36	Ninglasaini Ma. Vi. School	Dehimandu

Entertainment Centres		
<i>n</i>	Name Site	Locality
37	Dehimandu Play Ground	Dehimandu
38	S.S Brothers Pool House	Gothalapani
39	Shahid Baldev Park	Gothalapani
40	Shahilekh Play Ground	Shahilekh

Market Centres		
<i>n</i>	Name Site	Locality
41	Dehimandu Market	Dehimandu
42	Gothalapani Market	Gothalapani
43	Jhulaghat Market	Jhulaghat
44	Utsab Market	Gothalapani

Migrant Worksites		
<i>n</i>	Name Site	Locality
45	Gothalapani Groceries Shop	Gothalapani
46	Shahilekh Motorcycle Workshop	Shahilekh
47	Paris Beauty Parlor	Gothalapani
48	Ansari Cosmetic Shop	Gothalapani
49	Until Shopping Centre	Gothalapani
50	Kanchan Gold Shop	Gothalapani
51	Subham Furniture Udhyog	Gothalapani
52	New Unique Tailoring Centre	Gothalapani
53	Malika Traders	Gothalapani
54	Milan Painting Shop	Gothalapani

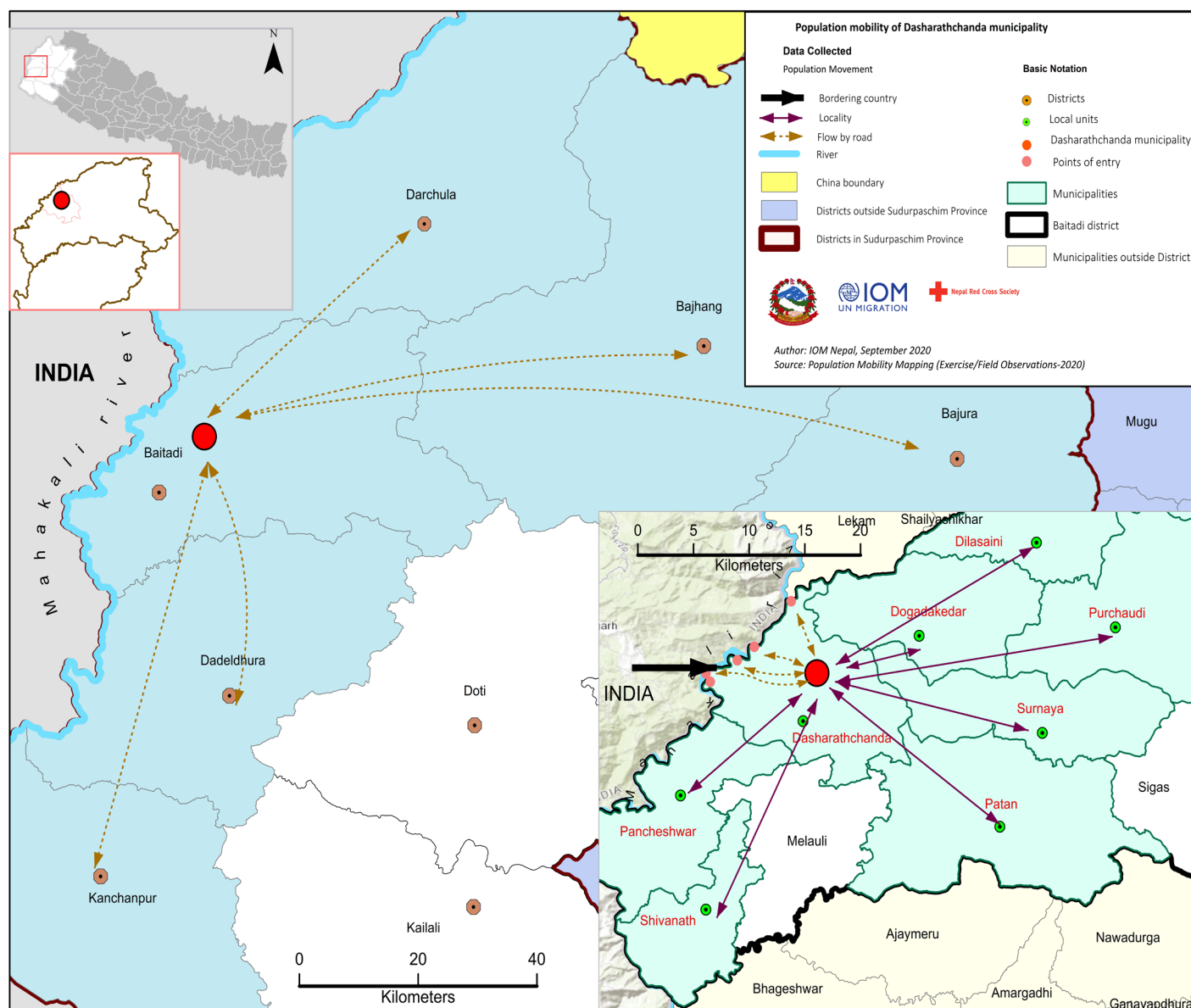
Transport Stations		
<i>n</i>	Name Site	Locality
55	Dehimandu Bus Park Station	Dehimandu
56	Gothalapani Bus Park Station	Gothalapani
57	Shahilekh Jeep Station	Shahilekh

Places of Worship		
<i>n</i>	Name Site	Locality
58	Ninglasaini Temple	Dehimandu
59	Tripurasundari Temple	Pujaragaun

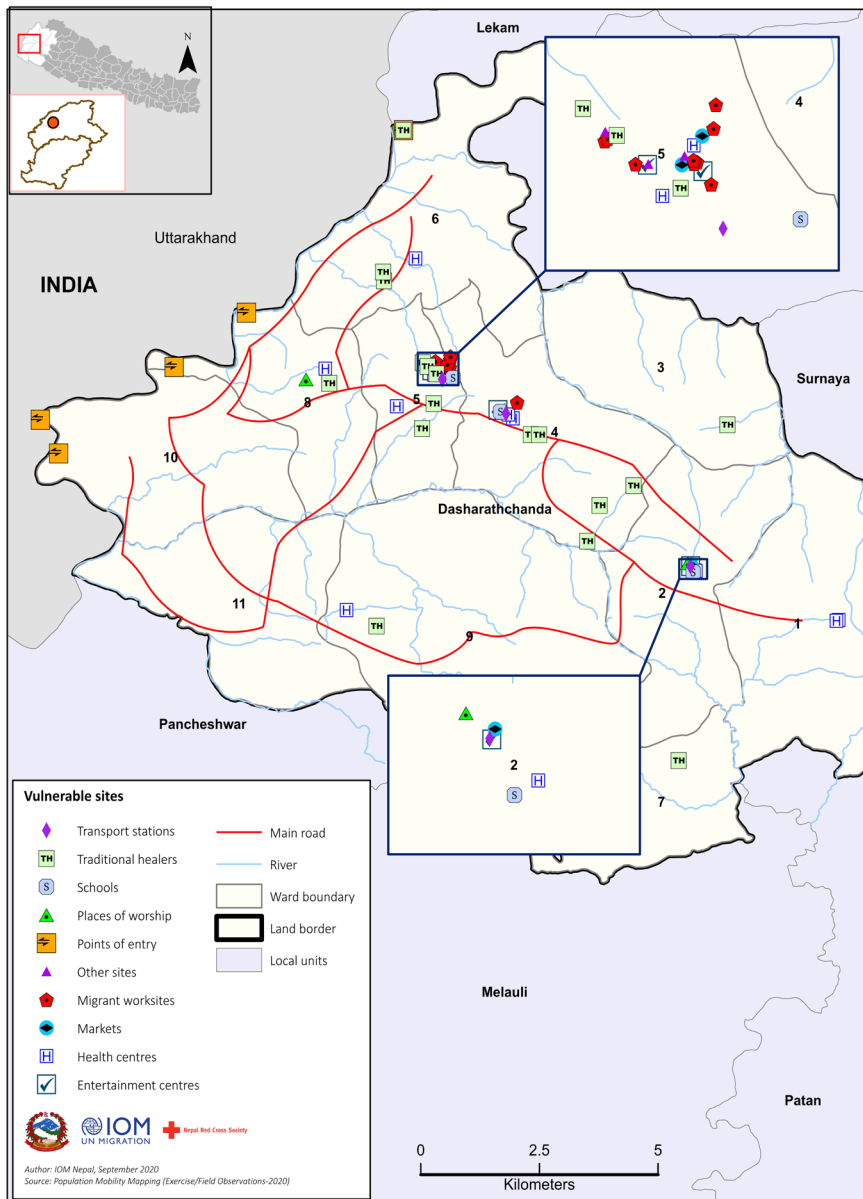
3.2 PHASE II

Based on the data gathered with KoBo Collect on POEs, population movement and vulnerable sites present in Dasharathchanda Municipality, the below maps were created using GIS software.

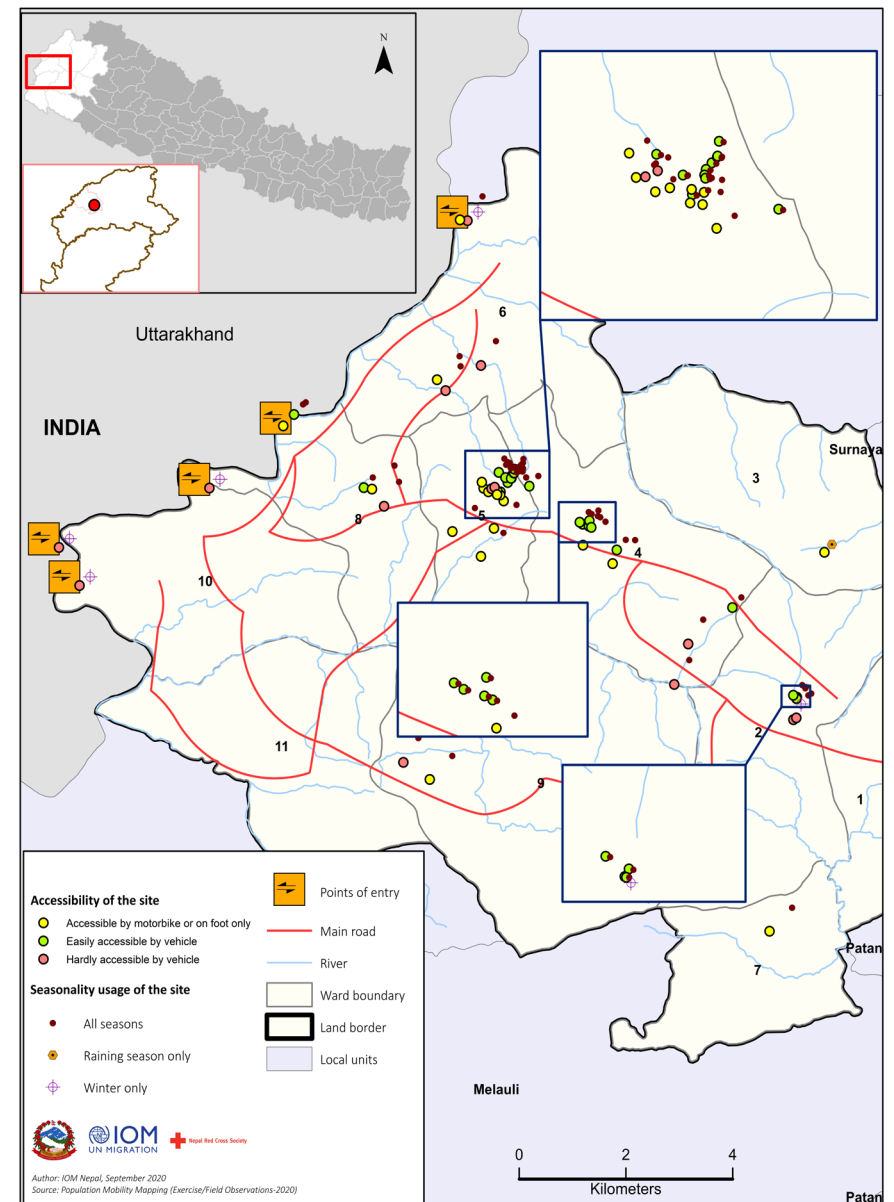
3.2.a MAPS



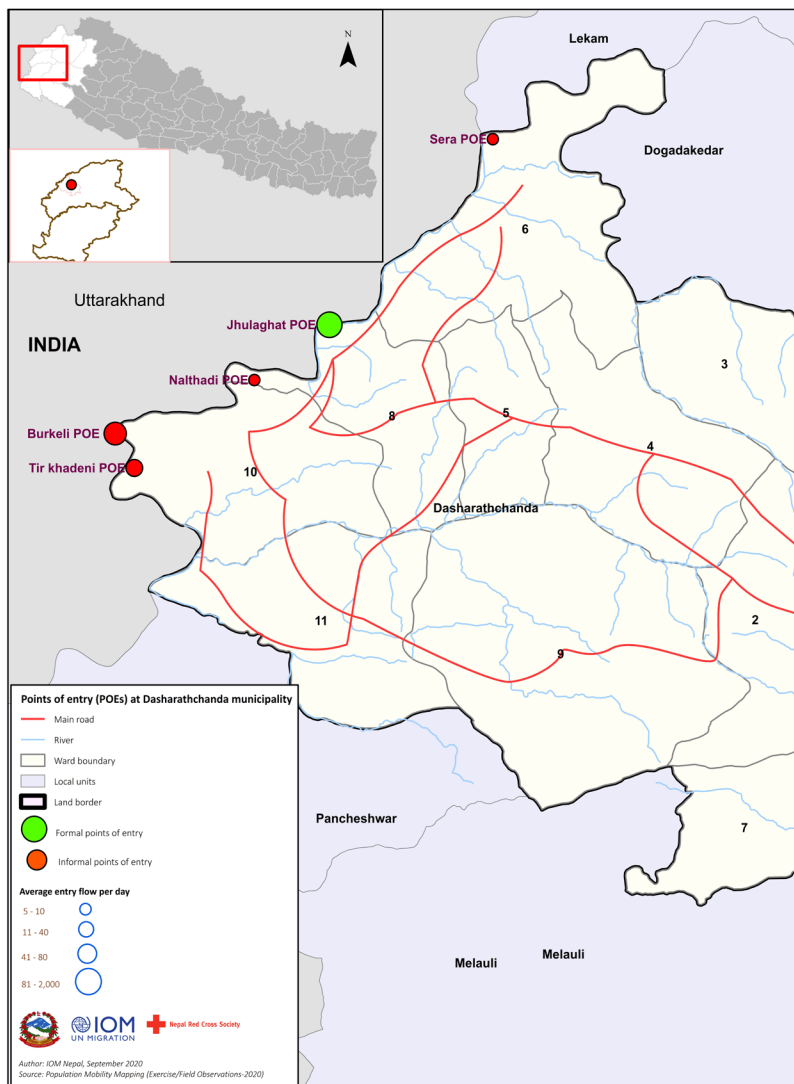
Map 2: Population movement from/to Dasharathchanda Municipality at the municipality, district and international level



Map 3: Identified vulnerable sites within the municipality boundary



Map 4: Accessibility and seasonality usage of identified vulnerable sites



Map 5: Formal and informal POEs at the India-Nepal border (Dasharathchanda Municipality)



Field Observations: Site assessments and interview with KIs

3.2.b POINTS OF ENTRY (POEs)

Population Mobility Pattern (who, where they come from, where they go)

The findings depict the POEs as the major routes people from India use to reach their final destination, Dasharathchanda Municipality and Baitadi. However, people from *Bajhang*, *Doti*, *Dadeldhura*, and *Darchula* districts also utilise these points of entry. Furthermore, the population mobility across these POEs is mainly from Dasharathchanda and *Purchaudi* municipalities. People cross these points throughout the year, though the highest influx of people is between July to October, whereas Saturday is the busiest day.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of connectivity, the majority of the population utilises *Jhulaghat POE* to commute to the main destination district (*Baitadi*) through *Gothalapani Junction* and the main road called *Satbanj-Jhulaghat*, to eventually reach *Junction Road*. Travellers at these sites also use informal (water landing) POEs, namely *Tirkhadeni*, *Burkeli*, *Natadi*, and *Sera* to access the main junction called *Gothalapani* and various transport stations, and finally reach their district and municipalities of destination. However, it is difficult to access these informal POEs by vehicle due to the terrain and road infrastructure, which results in people walking long distances to reach the municipality.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

The circle in blue colour represents the average daily flow, the circle in yellow the average entry flow on the busiest day, in red is the average entry flow per day, and the green circle shows the percentage of people coming from India. There were five (5) POEs assessed in Dasharathchanda Municipality, among these, only one is a formal POE, located at *Jhulaghat*. The population mobility was found to be higher at *Jhulaghat POE*, with an average flow of 1,500 people per day and 2,000 people on the busiest days. At *Burkeli POE* and *Natadi POE*, the average entry flow per day is 30 and 60 people, respectively, and on the busiest days the number increases to 80 each (see Fig. 1.1). The remaining two (2) POEs (*Tirkhadeni* and *Sera*) have an average entry flow between 15-20 people per day, and on the busiest days between 20-40 people. People coming from India are in higher numbers at *Burkeli* and *Tirkhadeni* POEs, with 50 and 30 per cent, respectively. *Jhulaghat*, *Natadi*, and *Sera* POEs have an estimated percentage of people coming from India of 10 each.

Average entry flow per day, busiest day, and percentage coming from India (September 2020)

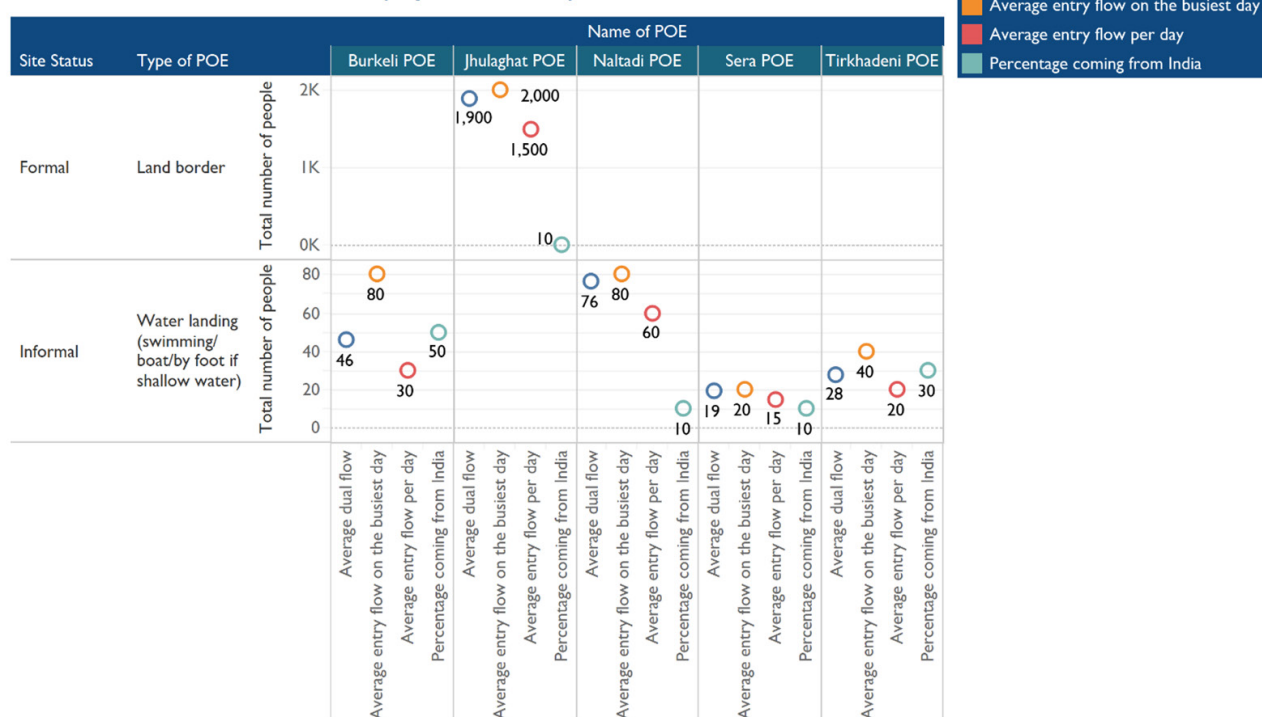


Fig. I.1: Mobility patterns across the POEs

The name of the nearest health centres from the POEs differs across the sites, except for *Burkeli* and *Tirkhadeni* POEs whose nearest health centre is *Barakot Health Post* (see Table I.2). The name of the most used health centre in Dasharathchanda Municipality is *District Hospital* (3/5), while from *Naltadi* and *Sera* POEs, the nearest and most used health centres are *Ratamata Health Post* and *Urban Health Centre*, respectively. All the POEs are busy throughout the week, except for *Tirkhadeni POE* whose busiest day is Saturday. Three (3) out of the five (5) investigated POEs do not have electricity available nor toilet facilities nearby (*Burkeli*, *Naltadi*, and *Tirkhadeni*), whereas in the remaining two (2), both are available. The busiest month of the year differs across each POE, made exception for *Jhulaghat POE*, which is equally busy throughout the year.

Table I.2: Basic health infrastructure at the POEs

Name of POE	Name of the nearest health centre	Name of the most used health centre	Busiest day of the week	Availability of electricity	Busiest day of the year	Availability of water	Availability of toilet nearby
Burkeli POE	Barakot Health Post	District Hospital	Every day	Not available	August, July, September, October, November	Not available	Not available
Jhulaghat POE	District Hospital	District Hospital	Every day	Available	Every month	Available	Available
Naltadi POE	Ratamata Health Post	Ratamata Health Post	Every day	Not available	June, July, August, September, October	Available	Not available
Sera POE	Urban Health Center	Urban Health Center	Every day	Available	June, July, August, September, October	Available	Available
Tirkhadeni POE	Barakot Health Post	District Hospital	Saturday	Not available	February	Not available	Not available

Fig. 1.2 shows the status of basic health infrastructure and the distance between the nearest health centre and the referral centre. The respondents from all POEs are knowledgeable of the procedures to follow if someone is affected by COVID-19. Three (3) out of five (5) POEs have special equipment to address health issues of Public Health Emergency of International Concern (PHEIC). There is no presence of International Health Regulations (IHR) focal point at the respective POEs to address cross border management issues at the national and international (corresponding countries) level. There is also absence of community health workers, agents or volunteers to address emergency health issues at the (BCPs). The distance to the nearest health centre from *Jhulaghat POE* is the farthest (18 Km away), whereas *Naltadi* and *Burkeli* POEs are 6 and 4 Km away, respectively. Similarly, the distance from the health centre to the nearest referral centre is around 18 Km in the case of *Burkeli* and *Jhulaghat* POEs, and 14 Km for *Tirkhadani POE*. Overall, the distance between health centres and referral centres from the POEs is significant.

Status of health infrastructure and distance to the nearest health centre

Name of POE	Knowledge for procedure to follow for suspected COVID-19 case	Availability of special equipment to address health issues of PHEIC	Presence of IHR focal point at POE	Presence of IHR from corresponding country	Presence of health community worker	Presence of health agent/ volunteer	Distance to the nearest health centre [in Km]	Distance from the nearest health centre to referral centre [in Km]
Burkeli POE	Yes	Available	Not available	Not available	Not available	Not available	4	18
Jhulaghat POE	Yes	Available	Not available	Not available	Not available	Not available	18	18
Naltadi POE	Yes	Not available	Not available	Not available	Not available	Not available	6	6
Sera POE	Yes	Available	Not available	Not available	Not available	Not available	1	1
Tirkhadani POE	Yes	Not available	Not available	Not available	Not available	Don't know	2	14

Fig. 1.2: The presence of IHR and PHEIC focal points, and distance to the nearest health/referral centre

In Dasharathchanda Municipality, less than 10 per cent of people wear mask across the POEs, except at the formal POE (*Jhulaghat*), where greater than 50 per cent wear masks (see Table 1.3). There is uninterrupted voice communication network across the various POEs. However, there is no tracking matrix or record book/device for travellers passing through the BCPs, at both formal and informal crossing points, except for *Sera POE*. Health screening stations, such as hand washing stations, hand sanitizer, and/or disinfectant are absent. The majority of the POEs are only used in winter, except for *Jhulaghat POE*, which is operational throughout the seasons. There is unavailability of both IPC personnel and equipment across all the POEs investigated in Dasharathchanda Municipality.

Table 1.3: Status of IPC at the POEs

Name of POE	Estimated percentage wearing masks	Communication status	Record of traveller's on book/device status	Availability of health screening status	Seasonality at POEs	Presence of IPC personnel
Burkeli POE	<10%	Good (uninterrupted network)	No	Not available	Winter only	Not available
Jhulaghat POE	>50%	Good (uninterrupted network)	No	Not available	All seasons	Not available
Naltadi POE	<10%	Good (uninterrupted network)	No	Not available	Winter only	Not available
Sera POE	<10%	Good (uninterrupted network)	Yes	Not available	Winter only	Not available
Tirkhadani POE	<10%	Good (uninterrupted network)	Do not know	Do not know	Winter only	Not available

3.2.c HEALTH CENTRES

Population Mobility Pattern (who, where they come from, where they go)

The majority of the people coming at the health centres are from the same municipality. However, due to the close proximity within communities, people also come from other districts outside *Baitadi*, such as *Dadeldhura*, *Darchula*, and *Bajhang* districts. In terms of movement at the municipality level, people with health centres as their final destination, mainly originate from *Surnaya Rural Municipality*, *Patan Municipality*, *Purchaudi Municipality*, and *Pancheshwar Rural Municipality*. According to the analysis obtained from the participatory mapping exercises, the health centres are open throughout the week and months, except for some cases where the facilities were closed due to capacity and financial challenges.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of accessibility, nearly all the health centres are accessible by vehicle, except for two (2) health posts – *Thaligada Health Post* and *Joshibunga Health Post*. *District Hospital*, *Nikosakti Hospital*, *Bhatta Medical* and *Dasharathchanda Ayurveda Hospital* are located at *Gothalapani Junction* connected through the main road, *Satbanj-Jhulaghat*. *Tripurasundari* and *Pallachaudali* health posts are situated in the same road (*Satbanj-Jhulaghat*). Patients and visitors come to these health centres by bus, minivan, car, and motorbike.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

In *Dasharathchanda Municipality*, eleven (11) health centres were investigated to determine their health capacity and population mobility. The bar in blue colour shows the average entry flow on the busiest day, in orange is the average entry flow per day, in light grey is the dual flow, and the grey bar indicates the percentage of people coming from India. On the busiest days, *Bhatta Medical Store*, *Nikosakti Hospital*, and *District Hospital* have the highest influx of people with 300, 150, and 130, respectively. On a daily basis, the average entry flow is 80, 100, and 90, respectively. At *Bhatta Medical Clinic*, *Dehimandu Health Post*, and *Joshibunga Health Post* the average entry flow is 60, 40, and 50, respectively, whereas on the busiest days the numbers increase to 100 each (see Fig. 2.1). The remaining health centres have an average entry flow of 15 people per day and 40 on the busiest days. People coming from other countries, notably India, are found in six (6) health centres with a percentage between 5 and 20 per cent. It is worth mentioning that the analysis in Fig. 2.1 is based on data from the three months prior to the date of observation (August 2020).

Average entry flow per day, busiest day and percentage coming from India (September 2020)

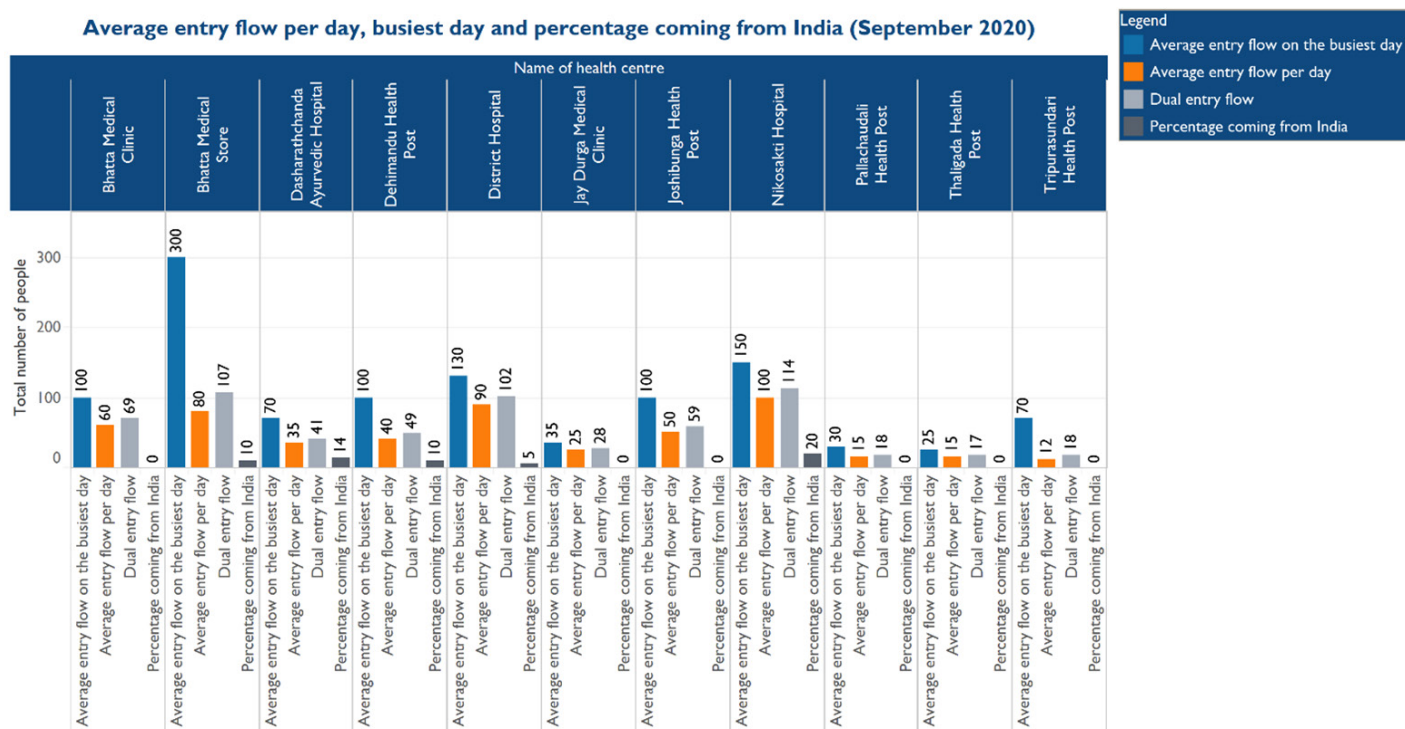


Fig. 2.1: Mobility patterns at the health centres

Fig. 2.2 shows the number of inpatients and outpatients at the respective sites based on the last three months from the date of observation (June-September 2020). Seven (7) out of eleven (11) health centres investigated are government owned, and only four (4) are private facilities. More than half (6/11) of the health centres do not have separate toilets for staffs and patients, whereas they are present in the remaining five (5) facilities. The average number of inpatients admitted in ward can only be found in *District Hospital* (90) and *Nikosakti Hospital* (20).

The largest number of outpatients is found at *District Hospital* and *Nikosakti Hospital* (1,200 each), while *Dasharathchanda Ayurvedic Hospital*, *Pallachaudali Health Post*, *Thaligada Health Post* and *Tripurasundari Health Post* have an average number of outpatients of 350. This means that patients are not admitted in these health centres, except for *District Hospital* and *Nikosakti Hospital*, which also have the largest number of stalls/drop holes of 14 and 10, respectively. *Bhatta Medical Clinic*, *Dasharathchanda Ayurvedic Hospital*, and *Tripurasundari Health Post* only have 2 stalls each, while the remaining health facilities do not have separate toilets for patients and staffs.

Number of Inpatients and Outpatients based on the last three months from the date of observation (September 2020)

Name of health centre	Type of health centre	Availability of separate toilet for staff and patient	Average number of Inpatient admitted in ward	Average number of Outpatient in ward	Number of stalls (drop holes) [Toilet facility]
Bhatta Medical Clinic	Private Hospital	Available	0	50	2
Bhatta Medical Store	Private Hospital	Not available	0	0	
Dasharathchanda Ayurvedic Hospital	Government Hospital	Available	0	390	2
Dehimandu Health Post	Government Hospital	Not available	0	35	
District Hospital	Government Hospital	Available	90	1,200	14
Jay Durga Medical Clinic	Private Hospital	Not available	0	35	
Joshibunga Health Post	Government Hospital	Not available	0	51	
Nikosakti Hospital	Private Hospital	Available	20	1,200	10
Pallachaudali Health Post	Government Hospital	Not available	0	500	
Thaligada Health Post	Government Hospital	Not available	0	384	
Tripurasundari Health Post	Government Hospital	Available	0	300	2

Fig. 2.2: Number of inpatients, outpatients and stalls (toilet facility) at the health centres

Fig. 2.3 shows the distance to the nearest water source and health centre, as well as the number of stalls for staffs and patients. The line in blue shows the distance to the nearest health centre, in orange is the distance to the nearest water source, the bar in grey indicates the number of stalls for patient, whereas the circle in red refers to the number of stalls for staff. The majority of the health centres' water source is nearby, except for *Jay Durga Medical Clinic* whose water source is 2 Km away. The distance to the nearest health centre from the surrounding communities is 5 Km in the case of *Thaligada Health Post*, and 3 Km each to *Joshibunga Health Post*, *District Hospital* and *Bhatta Medical Clinic*, whereas the remaining health centres are approximately 1.5 Km from the surrounding communities. *District Hospital* and *Nikosakti Hospital* have the largest number of stalls with 11 and 8 drop holes for patients, and 3 and 2 drop holes for staffs, respectively. Three (3) health centres (*Bhatta Medical Clinic*, *Dasharathchanda Ayurvedic Hospital*, and *Tripurasundari Health Post*) have only one (1) stall each for both patients and staffs, while the remaining four (4) health centres have no separate toilets for patients and staffs.

Distance to the nearest water source, health centre, and number of stalls for staff and patient

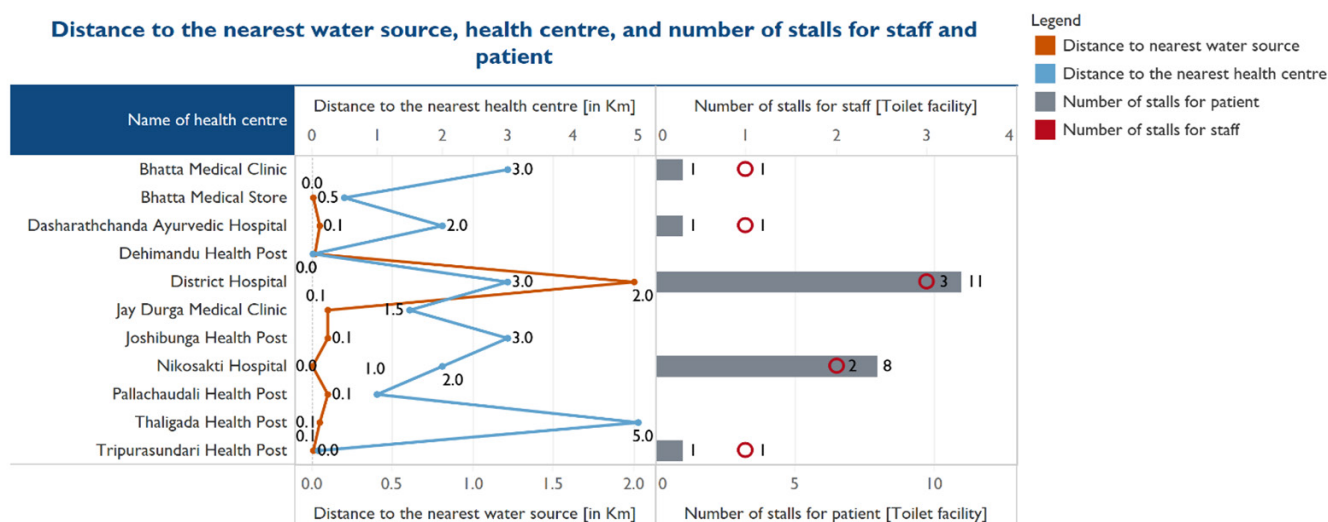


Fig. 2.3: Distance to the nearest water source and health centre, and number of stalls for staffs and patients

In Dasharathchanda Municipality, more than half (6/11) of the health centres agreed that patients seek alternative health care when someone gets sick (see Table 2.1). Home treatment, other public or private hospitals, pharmacies, religious leaders and traditional healers were reported by the key informants as the main places people seek alternative health care from. Overall, less than 10 per cent seek health care at home, and between 10-30 per cent rely on other public or private facilities or go to the pharmacy. According to the majority of the respondents, less than 10-30 per cent depend on religious leaders and traditional healers for health care.

Table 2.1: Most common places people seek care from before going to the hospital

Name of health centre	Care at home	Care at other public hospital	Care at other private hospital	Care at the pharmacy	Care at the religious leader	Care at the traditional healer
Bhatta Medical Clinic	31%-50%	<10%	10%-30%	10%-30%	<10%	<10%
Bhatta Medical Store	<10%	10%-30%	<10%	<10%	<10%	<10%
Dasharathchanda Ayurvedic Hospital	<10%	10%-30%	<10%	31%-50%	<10%	<10%
District Hospital	<10%	10%-30%	<10%	10%-30%	<10%	<10%
Jay Durga Medical Clinic	<10%	31%-50%	31%-50%	10%-30%	10%-30%	>50%
Nikosakti Hospital	31%-50%	10%-30%	31%-50%	31%-50%	10%-30%	10%-30%

Table 2.2 indicates the population of medical personnel at the various health centres investigated in Dasharathchanda Municipality. *Dasharathchanda Ayurvedic Hospital* has the highest total of medical personnel (125), out of which 123 are medical officers, compared to *District Hospital* (45 in total) with the largest influx of patients per day and only 4 medical officers. *Dehimandu Health Post* and *Tripurasundari Health Post* are next with a total of 29 (no medical officers) and 24 (no medical officers) personnel, respectively. Female Community Health Volunteers (FCHV) can be found in *Dehimandu Health Post* (18 FCHV), *Jashibunga Health Post* (10 FCHV), *Thaligada Health Post* (14 FCHV), and *Tripurasundari Health Post* (11 FCHV). The remaining designations at the health centres vary across the sites (see Table 2.2), with the smallest personnel found in *Bhatta Medical Store* and *Jay Durga Medical Clinic*, with only 1 and 2 staffs present, respectively.

Table 2.2: Population of medical personnel at the health centres

	Name of health centre										
	Bhatta Medical Clinic	Bhatta Medical Store	Dasharathchanda Ayurvedic Hospital	Dehimandu Health Post	District Hospital	Jay Durga Medical Clinic	Jashibunga Health Post	Nikosakti Hospital	Pallachaudali Health Post	Thaligada Health Post	Tripurasundari Health Post
Auxiliary Health Worker	0	0	0	1	5	0	0	0	0	2	1
Auxiliary Nursing Midwifery	0	0	0	3	8	0	1	1	3	2	2
Health Assistant	0	0	0	1	2	1	0	1	4	0	1
House keeper	1	0	0	1	1	0	1	3	0	0	0
Lab Assistant	1	0	0	0	2	0	1	2	0	0	0
Lab Technician	0	0	0	1	2	0	0	1	0	0	0
Medical Officer	0	0	123	0	4	0	0	2	0	0	0
Medical Recorder	0	0	0	0	1	0	0	1	0	0	0
Nursing Officer	0	0	0	0	0	0	0	2	0	0	0
Office Helper	1	0	2	1	15	0	1	3	0	1	1
Pharmacist	0	1	0	0	0	1	0	0	0	0	0
Pharmacy Assistant	1	0	0	0	1	0	0	1	0	0	0
Public Health Nurse	0	0	0	3	0	0	0	0	2	0	4
Radiographer	0	0	0	0	1	0	0	1	0	0	0
Staff Nurse	0	0	0	0	3	0	2	1	1	0	4
Female Community Health Volunteer	0	0	0	18	0	0	10	0	0	14	11
Total Health Officers	4	1	125	29	45	2	16	19	10	19	24

The assessment to determine the haves and have-nots of the health facilities was conducted at the various health centres. Nearly half (5/11) have conducted IPC training, whereas the remaining (6/11) have not. Greater than 70 per cent (8/11) are not receiving IPC supplies, made exception for *District Hospital, Nikosakti Hospital, and Bhatta Medical Clinic*. There is availability of waste management system for all the health centres investigated. Furthermore, more than 80 per cent (9/11) do not have health screening stations for visiting patients and other people, except for *District Hospital and Nikosakti Hospital*, with regular and 24/7 health screenings.

Only three (3) health centres (*Bhatta Medical Clinic, District Hospital, and Nikosakti Hospital*) have an emergency preparedness plan and have tested it less than three months ago (June-September 2020). The remaining nine (9) health centres do not have an emergency preparedness plan, and consequently have not tested it. Greater than 50 per cent (5/11) wear mask at these sites, while at the remaining centres (6/11) the percentage is between less than 10 per cent and up to 50. It is important to note that the majority of the health centres investigated during the PMM activities in Dasharathchanda Municipality has inadequate health infrastructure to address health public health threat, such as a pandemic and emerging diseases (see Table 2.3).

Table 2.3: Status of emergency preparedness plan, IPC, and health screening at the health centres

Name of health centre	Status of IPC training	Status of IPC supply	Availability of waste management	Presence of health screening station	Presence of health screening station 24/7	Emergency preparedness plan last tested	Availability of emergency preparedness plan	Estimated percentage wearing mask
Bhatta Medical Clinic	Yes	Available	Available	Not available	Not available	Less than 3 months	Available	>50%
Bhatta Medical Store	No	Not available	Available	Not available	Not available	Not tested	Not available	>50%
Dasharathchanda Ayurvedic Hospital	No	Not available	Available	Not available	Not available	Not tested	Not available	>50%
Dehimandu Health Post	Yes	Not available	Available	Not available	Not available	Not tested	Not available	10%-30%
District Hospital	Yes	Available	Available	Available	Available	Less than 3 months	Available	31%-50%
Jay Durga Medical Clinic	Yes	Not available	Available	Not available	Not available	Not tested	Not available	10%-30%
Joshibunga Health Post	No	Not available	Available	Not available	Not available	Not tested	Not available	31%-50%
Nikosakti Hospital	Yes	Available	Available	Available	Available	Less than 3 months	Available	>50%
Pallachaudali Health Post	No	Not available	Available	Not available	Not available	Not tested	Not available	<10%
Thaligada Health Post	No	Not available	Available	Not available	Not available	Not tested	Not available	31%-50%
Tripurasundari Health Post	No	Not available	Available	Not available	Not available	Not tested	Not available	>50%

At the health centres assessed, common diseases affecting people, which are also some of the main reasons people go to the health centre, are as follows, in order of importance; typhoid fever, COVID-19, influenza, HIV/AIDs, dengue and cholera (see Fig. 2.4). Typhoid is contracted by eating or drinking contaminated food or water and it is mainly caused by the lack of sanitation and unavailability of clean drinking water³, which indicates an inadequate hygiene system.

³ <https://www.who.int/immunization/diseases/typhoid/en/>

Common infectious diseases affecting people

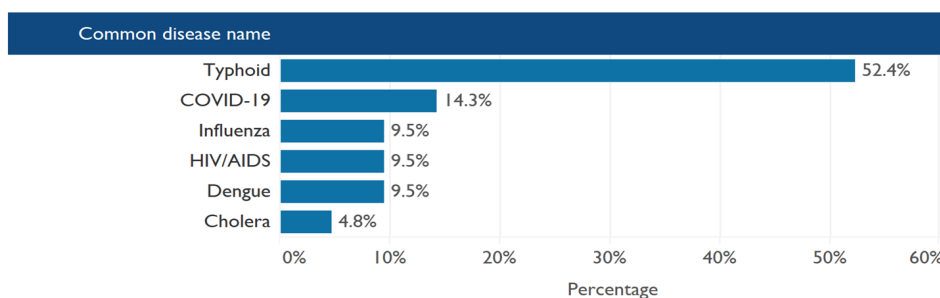


Fig. 2.4: Common diseases affecting people at the health centres

Table 2.4 indicates the availability of water facility, the busiest days and months, as well as the most used health centre in Dasharathchanda Municipality. Most of the health centres do check body temperature for visiting patients (8/11), while at the other health centres it is either not effective or available (*Bhatta Medical Clinic*, *Dehimandu Health Post*, and *Jay Durga Medical Clinic*). Three (3) health centres are busy throughout the week (*Bhatta Medical Clinic*, *Dasharathchanda Ayurvedic Hospital* and *Tripurasundari Health Post*), whereas the remaining (9/11) are busy mostly on Sunday and Monday. The most used health centre is *District Hospital* (7/11), followed by *Gurukhola Health Post* (2/11), *Dehimandu* and *Tripurasundari* health posts.

Table 2.4: Water availability, the busiest days/months, and the most used health centre

Name of health centre	Status of body temperature checking	Availability of water on site	Busiest day of the week	Busiest month of the year	Name of the most used health centre
Bhatta Medical Clinic	No	Not available	Every day	January, February, August, September, October	Gurukhola Health Post
Bhatta Medical Store	Yes	Available	Sunday, Monday, Tuesday	Every month	District Hospital
Dasharathchanda Ayurvedic Hospital	Yes	Available	Every day	September, October, November, December	District Hospital
Dehimandu Health Post	No	Available	Sunday, Monday	January, February, August, September, October	Dehimandu Health Post
District Hospital	Yes	Available	Sunday	May, June, October, November	District Hospital
Jay Durga Medical Clinic	Not effective	Available	Sunday	January, February, July, August	Gurukhola Health Post
Joshibunga Health Post	Yes	Available	Sunday, Monday, Friday	May, April	District Hospital
Nikosakti Hospital	Yes	Available	Sunday	February, March	District Hospital
Pallachaudali Health Post	Yes	Available	Monday	April, September, October	District Hospital
Thaligada Health Post	Yes	Available	Sunday	April, May, June	District Hospital
Tripurasundari Health Post	Yes	Available	Every day	January, February, March, April, December	Tripurasundari Health Post

The main purposes patients visit the health centres for treatment are as follows; typhoid, immunization, delivery, antenatal and post-natal care, surgery and malaria, in order of importance. Typhoid accounts for the major reason patients go to the health centres (21.6%), followed by immunization, delivery and ante/post-natal care (16.2% each). On the other hand, the main purposes for visitors' entry into the health centre are as follows; treating patients, visiting a health worker, visiting patients and lastly, material and infrastructure maintenance. This shows that, according to the dataset, most visitors are coming from India to deliver healthcare to patients in Nepal, which account for 60 per cent of the population influx that is not patients but health practitioners (see Fig. 2.5).

Main purpose patients enter the health centres and visitors from India

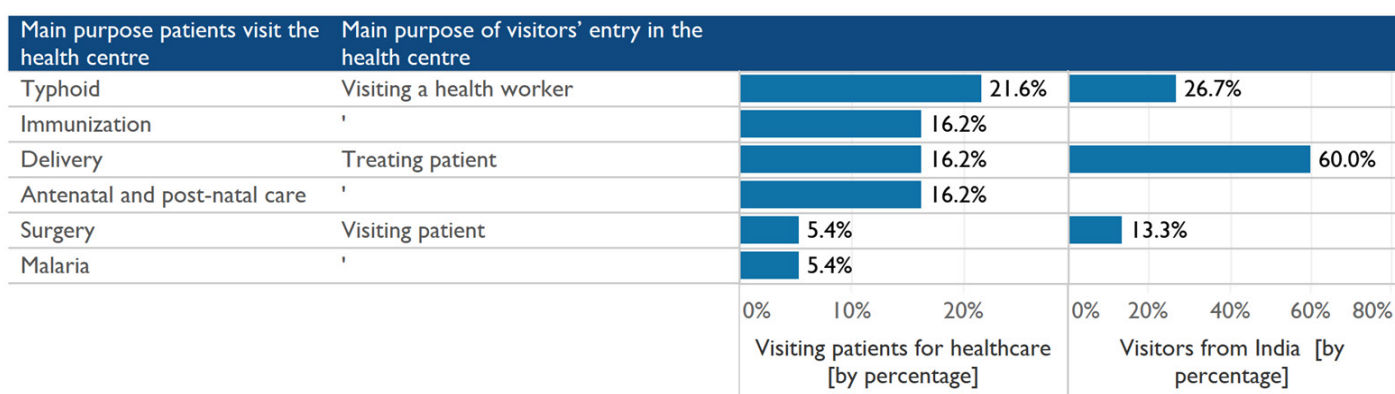


Fig. 2.5: Main purpose for patients entering the health centres and visitors from India

Fig. 2.6 shows the modes of transport for emergency cases from the nearest health centres to the nearest POE. According to the respondents, the most common means to access the respective POEs during emergency cases are as follows, in order of importance; private transport with motorbike and 3-wheel, ambulance (unequipped), and by foot. Public transports, by car or bus and by plane, are very unlikely to be utilised (see Fig. 2.6). On the other hand, the most common modes of transport used by patients or visitors to access the health centre are as follows, in order of relevance; motobike, car and minivan.

Mode of transport for emergency cases to the nearest POE and health centre

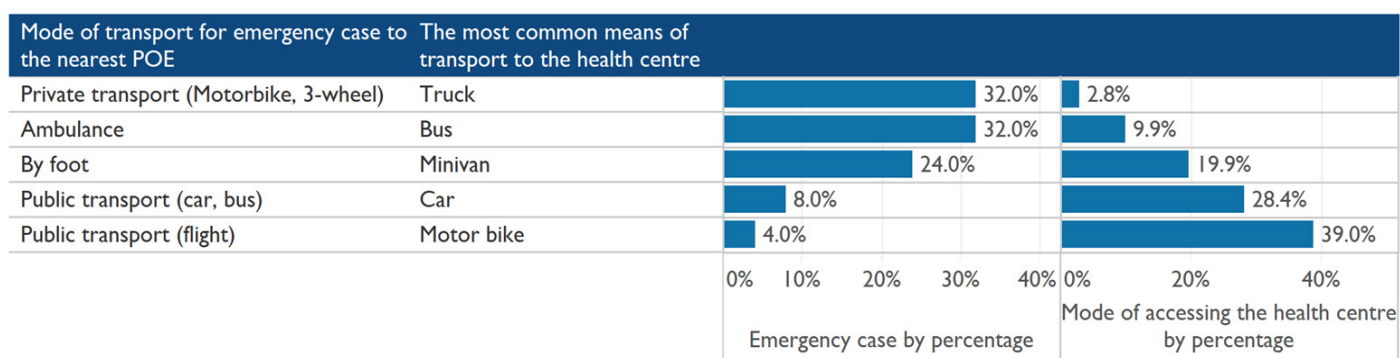


Fig. 2.6: Most common modes of transport to access the POEs during emergency cases from the health centres

Upon the assessment of health screening stations and SOPs measures across the health centres, it is important to mention some of the major reasons for the inadequate IPC supplies and lack of IPC training at the health centres. The most prominent were identified as unavailability in the national supply and no request in place, with a percentage of 54.5 and 27.3, respectively (see Fig. 2.7). The remaining factors, lack of money or no knowledge, do not carry a significant weight (9.1% each) in relation to the unavailability of IPC training and equipments. On the other hand, the major reasons for the absence of screening stations include; unavailability of tools/supplies and no infrastructure in place which account for the highest percentage of 57.1 and 28.6, respectively. The study revealed that if these SOPs and IPC measures were provided, close communities would be prepared to adopt the health screening across sites that have a high congregation of people.

Reasons for the absence of IPC training and health screening stations

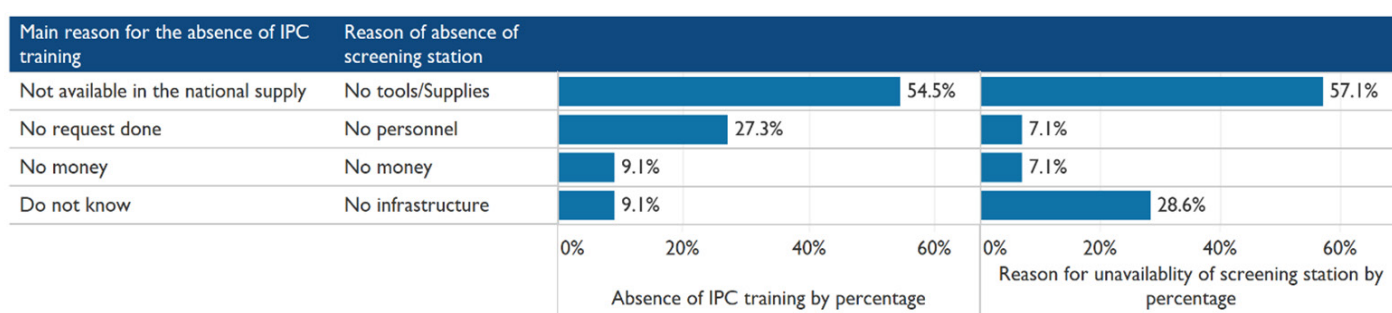


Fig. 2.7: Main reasons for the unavailability of IPC training and health screening stations

3.2.d TRADITIONAL HEALERS

Population Mobility Pattern (who, where they come from, where they go)

In Dasharathchanda Municipality, people visiting the traditional healers' compounds are mostly within the host municipality, and some originate from *Darchula*, *Dadeldhura*, *Kanchanpur*, and *Baitadi* districts. Furthermore, people's movement to these places, at the municipality level, mainly derives from *Patan Municipality*, *Dogadakedar Rural Municipality*, *Dilasaini Rural Municipality*, *Pancheshwar Rural Municipality* and *Purchaudi Municipality*.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

The study shows that, almost every traditional healer's place is accessible by car and motorbike. However, for *Bhekkar Bagauli*, *Jargaun*, and *Jargaun Baidhya* sites, there is no road accessible by vehicle. As a result, people travel by foot to reach these sites. The traditional healers are mostly located near the main host communities of *Bhekkar* and *Jargaun*. *Gothalapani Dhami (IB)*, *Shahilekh Bagauli*, and *Dehimandu Bagauli* traditional healers' sites are located in proximity to *Satbanj-Jhulaghat Road* connected to the main host communities of *Gothalapani*, *Shahilekh* and *Dehimandu*, respectively.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

As for the PMM activities conducted in Sudurpashchim Province, Dasharathchanda Municipality accounts for the highest number of traditional healers, according to the matrix analysis and field observations. The average entry flow per day (patients' visits) is 50 each at *Gothalapani Dhami (IB)* and *Nauhaat Pujari* localities, and increases to 100 and 60 people on the busiest day, respectively. Most of the localities (10/17) have an average entry flow of 30 or 20 per day (see Fig. 3.1). However, on the busiest days the influx of people in the traditional healers' compounds varies across the localities with an average of 50 people. The remaining localities are accessed by 20-35 people on the busiest days. The dual entry flow (both directions) is the sum average of people coming from India and the number of people passing through the border from Nepal to India (bar in light blue). The largest amount of people coming from India to Nepal can be found in *Pujaragaun Fortune Teller* locality (50%), whereas the majority of the traditional healer's

localities (8/17) account for 10 per cent. Some of the traditional healers' localities (6/17) are only visited by people within Dasharathchanda Municipality itself.

Average entry flow per day, busiest day, and percentage coming from India (September 2020)

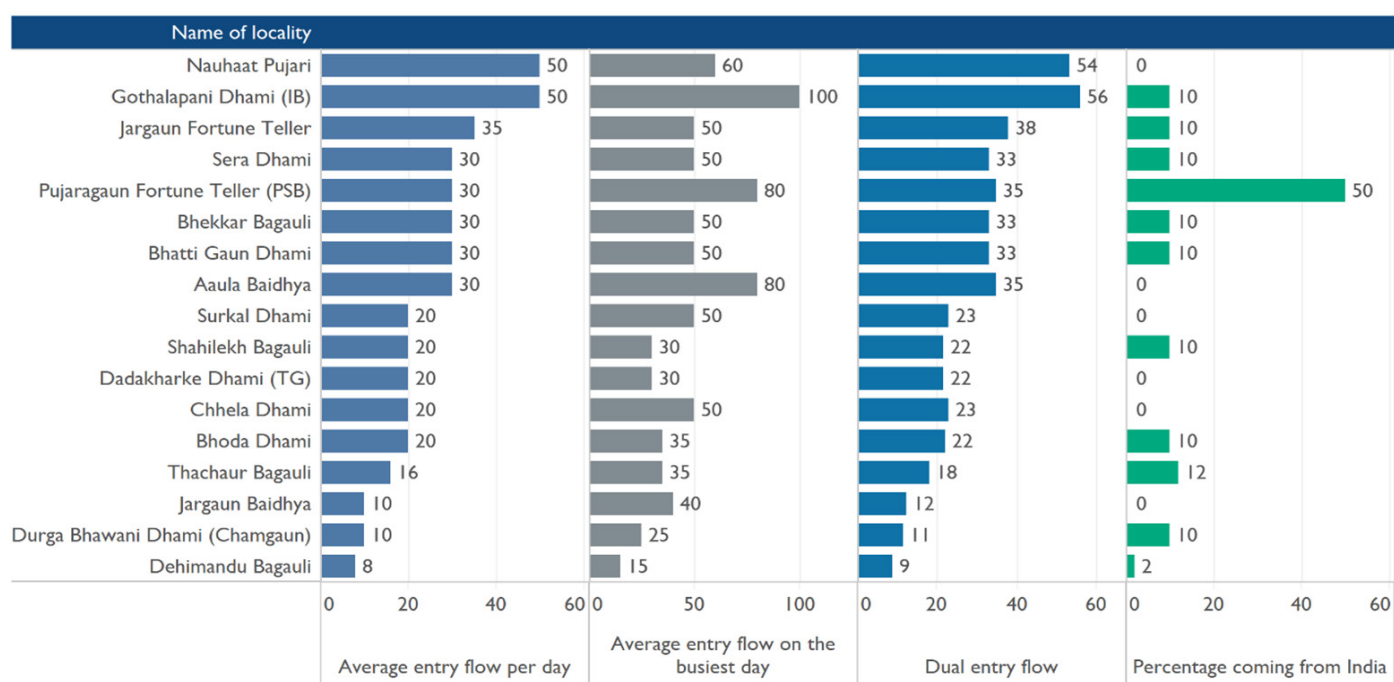


Fig. 3.1: Mobility patterns at the traditional healers' compounds

The majority of the respondents (11/17) agreed that patients visiting the traditional healers seek alternative healthcare before going to these sites, whereas the remaining (6/17) were either uncertain or did not believe visitors seek alternative healthcare prior to traditional healers' support. All the traditional healers' localities are open to everyone and are operational day and night, except for *Aaula Baidhya*, *Dadakharkhe Dhami (TG)*, *Jargaun Baidhya*, and *Jargaun Fortune Teller* localities, which are operational only during the day (see Fig. 3.2). All compounds are operational throughout the seasons, except for *Dura Bhawani Dhami (Chamgaun)*, which is operational only during the rainy season.

Suspected cases of COVID-19 were found at *Aaula Baidhya*, *Bhoda Dhami*, and *Gothalapani Dhami (IB)*. The distance to the nearest health centre varies across the localities but the farthest distance from the traditional healers' compounds is 4 Km (*Nauhaat Pujari*) and 7 Km (*Bhekkar Bagauli*). The distance from the respective health centres to the referral centres is almost the same across the localities, except for *Jargaun Baidhya* and *Jargaun Fortune Teller*, which are 8 Km away each.

Site operational period, suspected COVID-19 case and distance to the nearest health centre

Name of locality	Patient seek alternative health care before coming to the traditional healer	Compound open to everyone	Compound open day and night	Seasonality	Suspected COVID-19 case on site	Distance to the nearest health centre [in Km]	Distance from the health centre to referral centre [in Km]
Aaula Baidhya	Yes	Yes	Day	All seasons	Yes	2	3
Bhatti Gaun Dhami	Yes	Yes	Day and Night	All seasons	No	1	2
Bhekkar Bagauli	No	Yes	Day and Night	All seasons	No	7	7
Bhoda Dhami	Yes	Yes	Day and Night	All seasons	Yes	2	2
Chhela Dhami	No	Yes	Day and Night	All seasons	No	3	3
Dadakharkhe Dhami (TG)	Yes	Yes	Day	All seasons	No	1	1
Dehimandu Bagauli	Do not know	Yes	Day and Night	All seasons	No	2	1
Durga Bhawani Dhami (Chamgaun)	Do not know	Yes	Day and Night	Rainy season only	No	1	1
Gothalapani Dhami (IB)	Do not know	Yes	Day and Night	All seasons	Yes	1	1
Jargaun Baidhya	Yes	Yes	Day	All seasons	No	1	8
Jargaun Fortune Teller	Yes	Yes	Day	All seasons	No	2	8
Nauhaat Pujari	Yes	Yes	Day and Night	All seasons	No	4	4
Pujaragaun Fortune Teller (PSB)	Yes	Yes	Day and Night	All seasons	No	1	3
Sera Dhami	Yes	Yes	Day and Night	All seasons	No	1	1
Shahilekh Bagauli	Do not know	Yes	Day and Night	All seasons	No	2	2
Surkal Dhami	Yes	Yes	Day and Night	All seasons	No	2	2
Thachaur Bagauli	Yes	Yes	Day and Night	All seasons	No	1	1

Fig. 3.2: Operational period, suspected COVID-19 cases, and distance to the nearest health/referral centre

Fig. 3.3 shows the common diseases cured by the traditional healers and the main reasons for people to visit the traditional healers' compounds. In order of importance, the following are the major health issues addressed by the traditional healers; abdominal pain, mental problem, and lower abdominal pain, with a percentage distribution of 18.5 and 14.8 (each), respectively. The third layer of the chart includes; other reasons (divination, protection and disease cure), headache and fever, with an equal percentage distribution of 11.1, followed by the forth layer; yellow fever and diarrhea with 5.6 per cent each and lastly, the fifth layer; snake bite and skin diseases, with an equal percentage distribution of 3.7.

Common diseases traditional healers cures and main reasons people visit traditional healer's compound

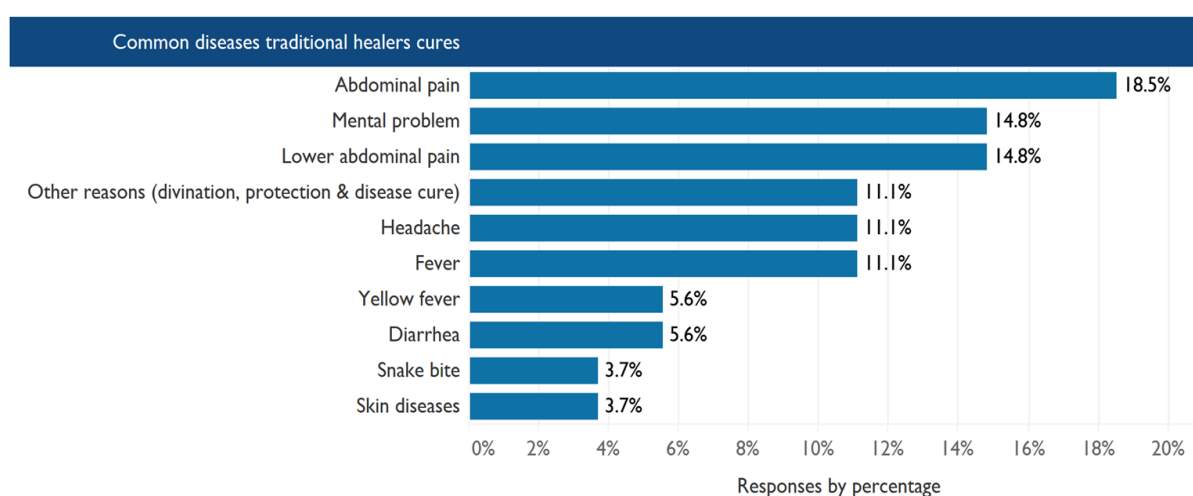


Fig. 3.3: Common diseases and health issues addressed at the traditional healers' compounds

According to the traditional healers, the most used health centre in Dasharathchanda Municipality is *District Hospital* (9/17), while it varies across the remaining localities due to the distance apart. On average, the estimated percentage of people that wears a mask at these localities is between 10-30, though the majority do not wear masks (<10%). Most of the traditional healers' compounds do not have a waste management system as a measure to control waste (10/17). As a result, there are challenges in controlling waste, proved by the visibility of trash in the open (10/17), stagnant water on the floor (6/17), and unwanted animals/insects (16/17). These contribute to the spread of contagious diseases, especially malaria caused by mosquitoes.

Table 3.1: Waste management, environmental condition, and estimated percentage of people wearing masks

Name of locality	Name of the most used health centre	Estimated percentage wearing mask	Availability of waste management system	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects	Visibility of trash in the open
Aaula Baidhya	District Hospital	<10%	Not available	Not visible	Yes, visible	Yes, visible
Bhatti Gaun Dhami	District Hospital	31%-50%	Available	Not visible	Yes, visible	Not visible
Bhekkar Bagauli	Ratamata Health Post	10%-30%	Not available	Not visible	Yes, visible	Yes, visible
Bhoda Dhami	Thaligada Health Post	<10%	Not available	Not visible	Yes, visible	Yes, visible
Chhela Dhami	District Hospital	10%-30%	Not available	Yes, visible	Yes, visible	Yes, visible
Dadakharkhe Dhami (TG)	Joshibunga Health Post	<10%	Not available	Yes, visible	Yes, visible	Yes, visible
Dehimandu Bagauli	Dehimandu Health Post	10%-30%	Available	Not visible	Yes, visible	Not visible
Durga Bhawani Dhami (Chamgaun)	Durga Bhawani Health Post	31%-50%	Available	Not visible	Not visible	Not visible
Gothalapani Dhami (IB)	District Hospital	10%-30%	Available	Yes, visible	Yes, visible	Not visible
Jargaun Baidhya	District Hospital	<10%	Not available	Yes, visible	Yes, visible	Yes, visible
Jargaun Fortune Teller	District Hospital	>50%	Not available	Not visible	Yes, visible	Yes, visible
Nauhaat Pujari	District Hospital	<10%	Available	Not visible	Yes, visible	Not visible
Pujaragaun Fortune Teller (PSB)	District Hospital	>50%	Available	Not visible	Yes, visible	Not visible
Sera Dhami	Urban Health Center	<10%	Not available	Not visible	Yes, visible	Yes, visible
Shahilekh Bagauli	District Hospital	31%-50%	Available	Yes, visible	Yes, visible	Not visible
Surkal Dhami	Surkal Health Post	10%-30%	Not available	Yes, visible	Yes, visible	Yes, visible
Thachaur Bagauli	Thaligada Health Post	<10%	Not available	Not visible	Yes, visible	Yes, visible

Table 3.2 shows the use of protective equipment, the presence of isolated rooms, the organisation of the site, and the people coming from India at the respective localities. The majority of these places are busy throughout the week (14/17) and throughout the year (8/17), whereas the busiest months at the remaining localities are November and December. More than half of the traditional healers do not use protective materials/gears during their practices (9/17). Most traditional healers do not have an isolated room to treat patients (12/17), with only a minority having a dedicated place for sick people (5/17). The vast majority of the traditional healers' compounds are not organized in sectors (13/17). Patients mainly come from other countries, notably India, and close communities for treatment and guidance (10/17), whereas the remaining are Nepalese citizens (7/17).

Table 3.2: Use of protective gears, isolated room, site organisation, and people coming from India

Name of locality	Busiest day of the week	Busiest day of the year	Use of protective materials during practices	Availability of isolated room during practices	Organisation of traditional healer's compound in sectors	People coming from other countries
Aaula Baidhya	Every day	Every month	No	Not available	Not organised	Yes
Bhatti Gaun Dhami	Every day	Every month	Yes	Not available	Organised	Yes
Bhekar Bagauli	Every day	January, June, December	Yes	Not available	Not organised	Yes
Bhoda Dhami	Every day	March, June, July	No	Available	Not organised	No
Chhela Dhami	Monday, Wednesday	May, June, December	No	Not available	Not organised	No
Dadakharka Dhami (TG)	Saturday, Friday	June	No	Not available	Not organised	No
Dehimandu Bagauli	Sunday, Wednesday	Every month	Yes	Not available	Not organised	Yes
Durga Bhawani Dhami (Chamgaun)	Every day	January, November, December	Yes	Not available	Organised	Yes
Gothalapani Dhami (IB)	Every day	Every month	Yes	Not available	Not organised	Yes
Jargaun Baidhya	Every day	Every month	No	Not available	Not organised	No
Jargaun Fortune Teller	Every day	Every month	No	Available	Organised	Yes
Nauhaat Pujari	Every day	Every month	No	Available	Not organised	No
Pujaragaun Fortune Teller (PSB)	Every day	Every month	Yes	Not available	Not organised	No
Sera Dhami	Every day	February, April, June, September	No	Available	Not organised	Yes
Shahilekh Bagauli	Every day	Every month	Yes	Not available	Organised	Yes
Surkal Dhami	Every day	June, July, December	Yes	Not available	Not organised	No
Thachaur Bagauli	Every day	February, April, September	No	Available	Not organised	Yes

3.2.e SCHOOLS AND COLLEGES

Population Mobility Pattern (who, where they come from, where they go)

The study shows that schools located in Dasharathchanda largely attract students from within the same municipality. However, when it comes to colleges, pupils also come from other close-by municipalities and districts. Schools/colleges are open every day, except on Saturday, and are busy throughout the year in terms of population mobility.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

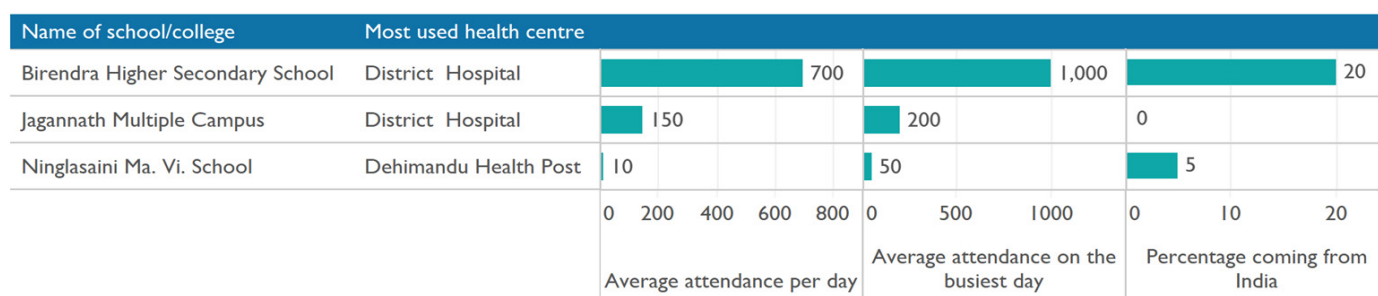
Among the schools/colleges investigated in Dasharathchanda Municipality, *Jagannath Multiple Campus* and *Birendra Higher Secondary School* are closely located to *Gothalapani Junction*, connected to *Satbanj-Jhulaghat Road*, and accessible by bus, truck, car, minivan, and motorbike. Furthermore, *Ninglasaini Ma.Vi. School* also lies at *Satbanj-Jhulaghat Road* and is situated near the largest localities, *Dehimandu*, *Kathpatya*, and *Satbanj*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Three (3) educational institutions were investigated in Dasharathchanda Municipality. The most used health centre is *District Hospital*. The average attendance per day at *Birendra Higher Secondary School* is 700 and 1,000 students on the busiest day. At *Jagannath Multiple Campus*, the population mobility is 150 per day and 200 on the busiest day. Among these schools/colleges, 20 per cent comes from India at *Birendra Higher Secondary School*, and 5 per cent at *Ninglasaini Ma.Vi. School* (top figure). There is absence of health agents or community health workers for pupils/students who get sick, except for *Ninglasaini Ma.Vi. School* (bottom figure). The distance to the nearest health centre

is 5 Km from *Jagannath Multiple Campus* and 2 Km from *Birendra Higher Secondary School*, whereas the distance to the nearest water source is less than 1 Km. The farthest distance to both water source and the nearest health centre from *Jagannath Multiple Campus* is 500 meters and 5 Km, respectively (see Fig. 4.1).

Average attendance per day, on the busiest day and percentage of students from India (September 2020)



Availability of health agent and distance to the nearest health centre and water source

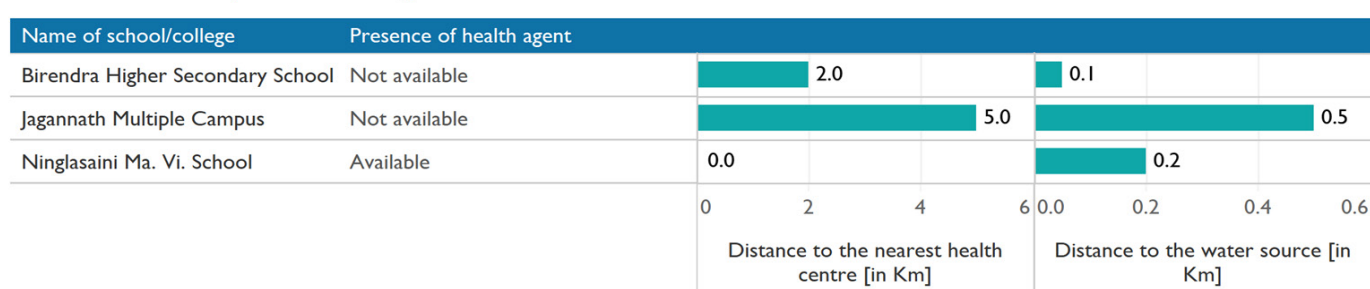
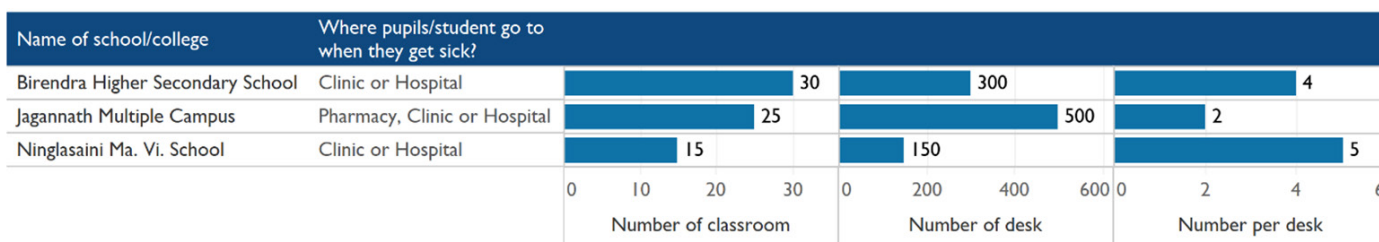


Fig. 4.1: Average attendance (top) and distance to the nearest health centre and water source (bottom)

The respondents agreed that students seek alternative healthcare when they get sick, however, the majority asserted that pupils are referred to a clinic or hospital and sometimes a pharmacy (top figure). The three (3) schools/colleges; *Birendra Higher Secondary School*, *Jagannath Multiple Campus*, and *Ninglasaini Ma.Vi. School* have 30, 25, and 15 classrooms, respectively. They have 300, 500, and 150 desks, and 4, 2, and 5 students/pupils per desk, respectively. The bottom figure shows the availability and distribution of toilet facilities at the schools/colleges. Separate toilets for male and female teachers are absent in all three (3) educational institutions.

However, gender-separated toilets are available for students as follows; 7 for females and 5 for male students in *Birendra Higher Secondary School*, 4 each per gender in *Jagannath Multiple Campus*, 6 for females and 5 for males in *Ninglasaini Ma.Vi. School* (see Fig. 4.2). In terms of number of students per toilet, the highest number of students using the same toilet are found at *Birendra Higher Secondary School* and *Ninglasaini Ma.Vi. School*, 1 toilet for over 47 female pupils and 1 toilet for over 55 male pupils, respectively (see Fig. 4.2 and 4.3). This is closely followed by *Jagannath Multiple Campus* (1 toilet for almost 38 female students and 1 toilet for 25 males).

Number of classrooms, desks and where student go to when they get sick



Toilet facilities in the schools/colleges

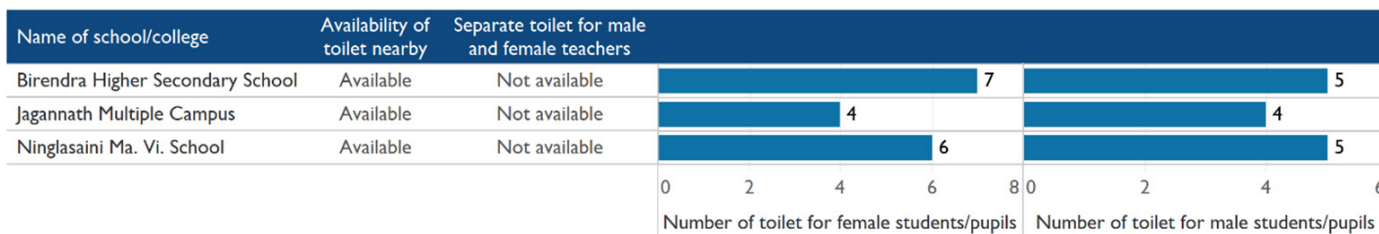


Fig. 4.2: Classrooms and desks size (top) and toilet facilities at the schools/colleges (bottom)

Fig. 4.3 shows the school population distribution in the schools/colleges investigated. The most populated schools are *Birendra Higher Secondary School* and *Ninglasaini Ma. Vi. School* with a total enrolment in 2019 of 617 and 594, respectively (before the pandemic). *Jagannath Multiple Campus* enrolments last year (2019) were 250. There are more female students than males in all the schools investigated in Dasharathchanda Municipality (*Birendra Higher Secondary School*, *Jagannath Multiple Campus*, and *Ninglasaini Ma. Vi. School*), with an average difference of 37, 50 and 46, respectively. A higher number of teachers is found at *Birendra Higher Secondary School* (36), compared to *Jagannath Multiple Campus* and *Ninglasaini Ma. Vi. School* (20 each).

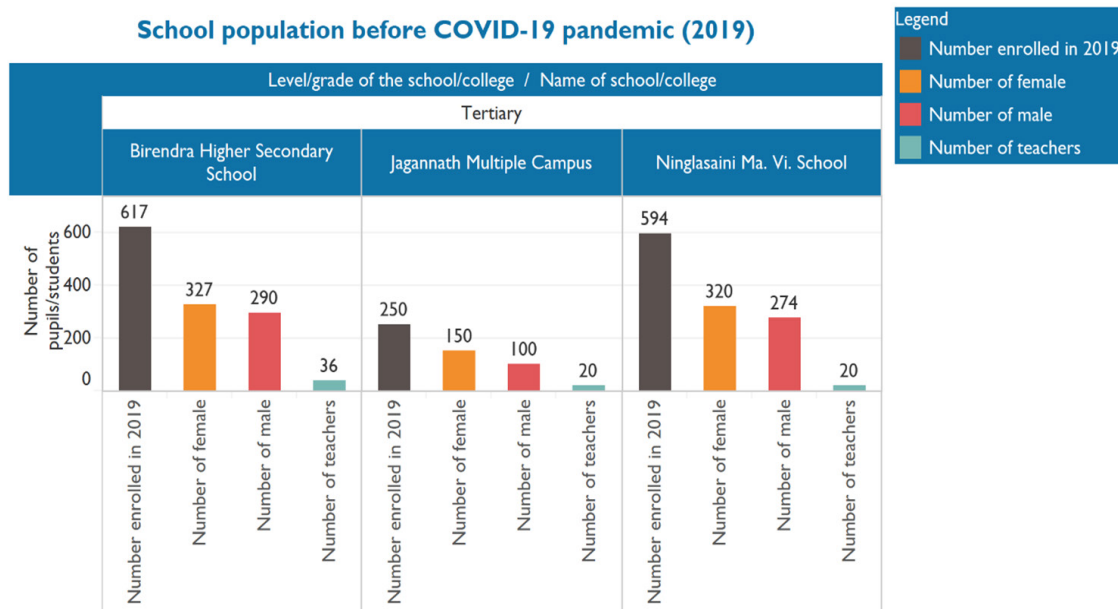


Fig. 4.3: Population distribution at the schools/colleges

Greater than 50 per cent of people wear masks. There is no isolated place dedicated for sick pupils/students, except at *Birendra Higher Secondary School*. All three (3) educational institutions have water facilities and are operational throughout the seasons. None of the sites have a cafeteria nor food services for students and/or teachers. A suspected case of COVID-19 was reported in *Birendra Higher Secondary School* (see Table 4.1).

Table 4.1: Health checks and schools/colleges seasonality

Name of school/college	Estimated percentage wearing mask	Isolated place dedicated for sick pupil/student	Availability of water on site	Presence of cafeteria/food service	Suspected COVID-19 case	Seasonality
Birendra Higher Secondary School	>50%	Available	Available	Not available	Yes	All seasons
Jagannath Multiple Campus	>50%	Not available	Available	Not available	No	All seasons
Ninglasaini Ma. Vi. School	>50%	Not available	Available	Not available	No	All seasons

Birendra Higher Secondary School and *Jagannath Multiple Campus* are busy throughout the week and year, except for *Ninglasaini Ma. Vi. School*, which is busier on Sunday and mostly attended in August. The schools have a working waste management system in place, proved by the absence of trash and stagnant water on the floor. However, there is visibility of unwanted animals/insects, except at *Birendra Higher Secondary School*. The nearest health centre to the schools varies due to the distance between these sites and the variability factor of the respondents (see Table 4.2).

Table 4.2: Waste management system, the busiest days/months, and the nearest health centre

Name of school/college	Busiest day of the week	Busiest month of the year	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects	Name of the nearest health centre
Birendra Higher Secondary School	Every day	Every month	Available	Not visible	Not visible	No	Nikosakti Hospital
Jagannath Multiple Campus	Every day	Every month	Available	Not visible	Not visible	Yes, limited	District Hospital
Ninglasaini Ma. Vi. School	Sunday	August	Available	Not visible	Not visible	Yes, limited	Dehimandu Health Post

3.2.f ENTERTAINMENT CENTRES

Population Mobility Pattern (who, where they come from, where they go)

The mobility pattern at the places of entertainment in Dasharathchanda Municipality accounts for every day, except during lockdown. However, the busiest days and months are Saturday and Friday, and July, August and September, respectively. Congregations at these sites mainly originate from the same district (*Baitadi*) and others, such as; *Darchula*, *Dadeldhura*, *Kanchanpur*, and *Kailali* districts. On the other hand, at the municipality level, people who visit these sites are mainly coming from *Patan Municipality*, *Dilasaini Rural Municipality*, *Purchaudi Municipality*, *Sunraya Rural Municipality*, *Shivanath Rural Municipality*, and *Dogadakedar Rural Municipality*.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

Among the investigated entertainment centres, *S.S. Brothers Pool House* and *Sahid Baldev Park* are located at *Gothalapani Junction*, which is the biggest junction of this municipality and is connected to *Satbanj-Jhulaghat Road*.

People coming from other districts can access these sites by bus, truck, car, minivan, and motorbike. However, from other municipalities as well as localities, there are alternative walk-way routes to access the entertainment centres. *Shahilekh Play Ground* and *Dehimandu Play Ground* are situated near *Shahilekh* and *Dehimandu* localities, respectively, and are connected to *Satbanj-Jhulaghat Road*. As a result, these sites are accessible by bus, truck, car, minivan, and motorbike.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

The bar in grey shows the average dual flow (both directions), in orange is the average entry flow on the busiest day, red indicates the average entry flow per day, and the green bar refers to the percentage of people coming from India. The mobility pattern across the entertainment centres is higher in *Shahilekh Play Ground* and *Dehimandu Play Ground* with 90 and 50 people per day, and 200 and 100 people on the busiest day, respectively. These are followed by *Shahid Baldev Park* whose average entry flow is 50 per day and 80 on the busiest day. Among these sites, only *Dehimandu Play Ground* is visited by people coming from India (10%), while the visitors at the remaining entertainment centres are from *Dasharathchanda Municipality* itself. The dual entry flow refers to population mobility within the same municipality or people coming from other municipalities to reach the sites, made exception for *Dehimandu Play Ground*, which has both Nepalese and Indians coming to the centre.

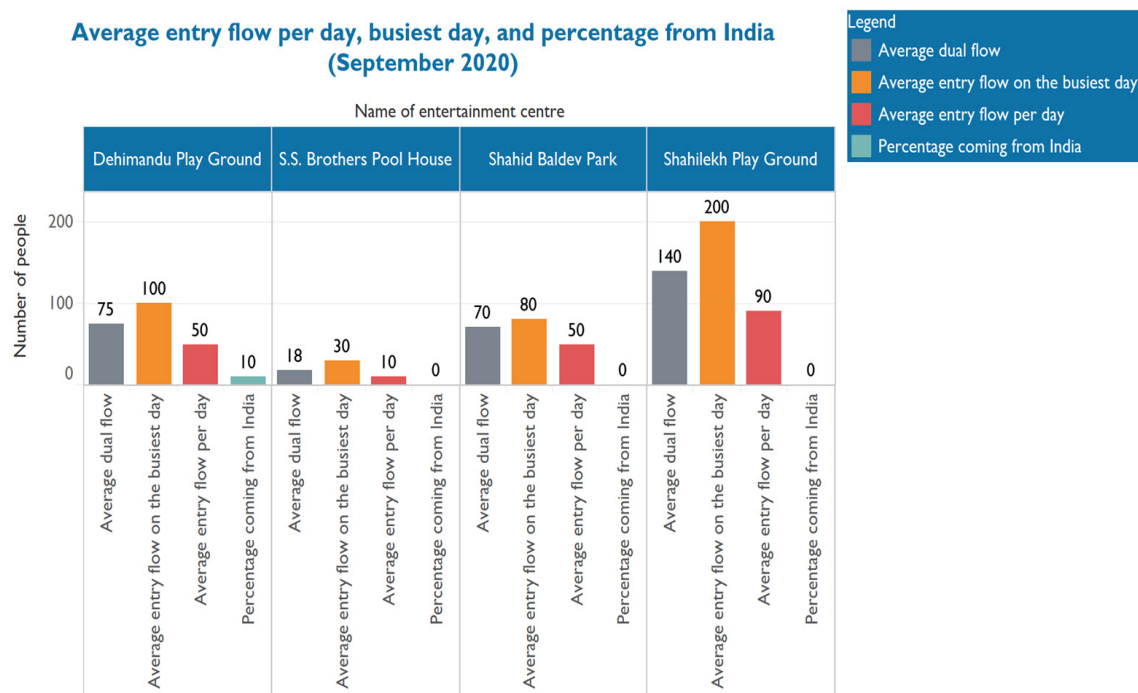


Fig. 5.1: Population mobility at the entertainment centres

There is inadequate body temperature checking at most sites (3/4), except at *Dehimandu Play Ground*. All the entertainment centres are operational throughout the seasons, except for *Dehimandu Play Ground*, which is only operational in winter. There is availability of water facilities on site or nearby, made exception for *Shahid Baldev Park*. The distance from the respective entertainment centres to the nearest health centre differs across each site. The farthest are *Shahilekh Play Ground* and *Shahid Baldev Park*, about 2 Km and 1 Km away, respectively, whereas the remaining two (2), *Dehimandu Play Ground* and *S.S Brothers Pool House*, are 500 meters and 200 meters away, respectively (see Fig. 5.2).

Basic health screening and toilet facility

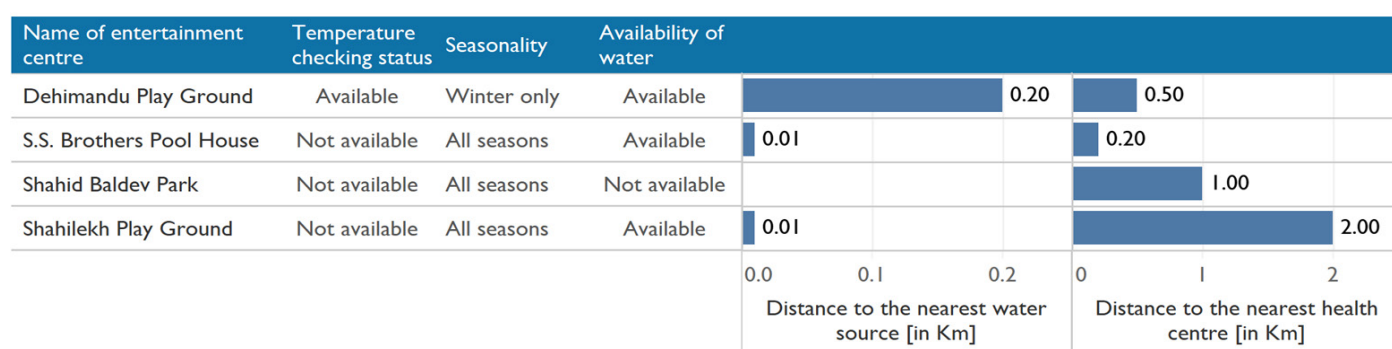


Fig. 5.2: Water facility, distance to the water source and nearest health centre

Among the entertainment centres investigated in Dasharathchanda Municipality, there is unavailability of community health workers and isolated places dedicated for ill individuals (3/4), except at *Dehimandu Play Ground*. Most of the entertainment centres are busy on Friday and Saturday, and are mostly visited between July and October. Toilet facilities are present at all sites, except at *Shahid Baldev Park*. The highest number of stalls (drop holes) and so the best equipped toilet facilities can be found at *Shahilekh Play Ground* (see Fig. 5.3).

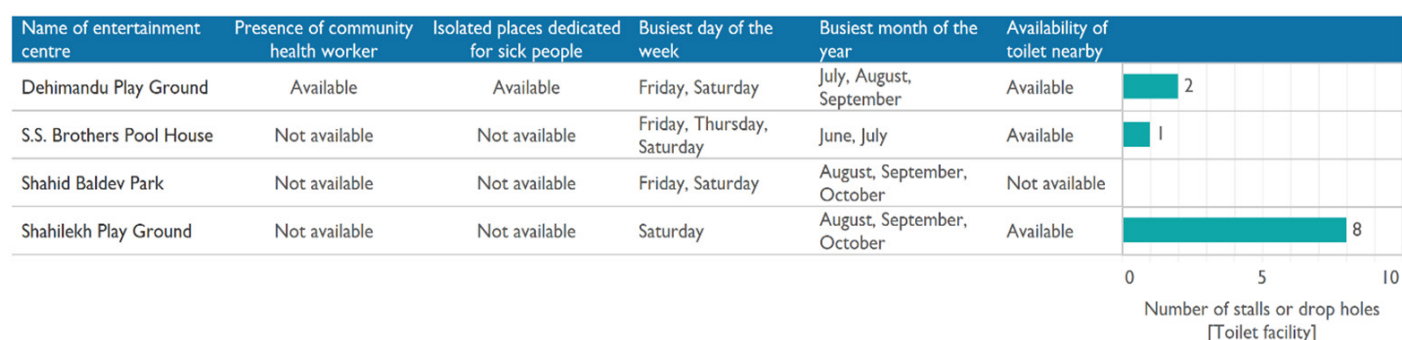


Fig. 5.3: Availability of health worker, isolated room, the busiest days/months and toilet facility

Among all sites assessed, none has health screening station nor availability of record book/device for visitors (see Table 5.1). Only half of these sites have a waste management system in place. Unwanted animals/insects are widely visible, except at *Shahid Baldev Park*, however, most of the sites do not have stagnant water on the floor (3/4), except at *Dehimandu Play Ground*. Fifty (50) per cent of the sites have trashes visible in the open. The name of the most used health centre is *District Hospital* (3/4), followed by *Dehimandu Health Post* in the case of *Dehimandu Play Ground*.

Table 5.1: Hygiene and travellers' status at the entertainment centres

Name of entertainment centre	Presence of health screening station	Availability of waste management system	Visibility of unwanted animals/insects	Estimated percentage wearing mask	Visibility of trash in the open	Visibility of stagnant water on the floor	Availability of record book/device for visitors	Name of the most used health centre
Dehimandu Play Ground	Not available	Not available	Yes, visible	31%-50%	Yes, visible	Yes, visible	Not available	Dehimandu Health Post
S.S. Brothers Pool House	Not available	Available	Yes, visible	>50%	Not visible	Not visible	Not available	District Hospital
Shahid Baldev Park	Not available	Not available	Not visible	10%-30%	Yes, visible	Not visible	Not available	District Hospital
Shahilekh Play Ground	Not available	Available	Yes, visible	>50%	Not visible	Not visible	Not available	District Hospital

3.2.g MARKET CENTRES

Population Mobility Pattern (who, where they come from, where they go)

In regard to market centres, the highest population mobility routes in localities can be found in *Jhulaghat*, *Gothalapani*, and *Dehimandu*. These markets are open every day, however, the busiest days are Saturday and Sunday. Additionally, the busiest months are May and June. The study reveals that people originate mainly from *Baitadi*, *Kanchapur*, *Dadeldhura*, and *Darchula* districts. A part from *Dasharathchanda Municipality*, individuals travel to the markets from *Dilasaini Rural Municipality* and *Patan Municipality*.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

Jhulaghat Market is situated at *Jhulaghat POE*, which is connected to *Satbanj-Jhulaghat Road*, and consequently the main junction called *Gothalapani*. People access this market by bus, truck, minivan, car, and motorbike. *Gothalapani Market* is located at *Gothalapani Junction*, which links *Dasharathchanda Municipality* and other municipalities. To access this market, there are other alternative vehicle routes, which connect the nearest localities, namely *Shahilekh*, *Khaligada* and *Ishwori Ganga*. Furthermore, *Dehimandu Market* is also located at *Satbanj-Jhulaghat Road*, which connects the nearest localities; *Gurukhola*, *Gwallekh*, *Kathpatya* and *Shahilekh*. As a result of challenges in terms of mobility pathway, there are also some alternative footways mostly used to access *Dehimandu Market* when travelling from *Shahilekh*, *Kathpatya* and *Gwallekh*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Four (4) marketplaces were investigated in *Dasharathchanda Municipality*. The bar in grey colour shows the average dual flow, in blue is the average entry flow on the busiest day, the orange bar indicates the average entry flow per day, and the green refers to the percentage of people coming from India. According to the findings, *Gothalapani Market* is the largest market by population with 2,000 people visiting per day and 4,000 people on the busiest day. *Dehimandu* and *Jhulaghat* markets have an average entry flow of 350 and 100 per day, while on the busiest day the number increases to 500 and 200 people, respectively. In terms of people coming from other countries, notably India, the percentage is higher at *Dehimandu* and *Jhulaghat* markets, with around 45 and 30 per cent, respectively. Due to the high influx of people at *Gothalapani Market*, 15 per cent comes from India (600 people) on the busiest day, and 10 per cent in the case of *Utsab Market* (see Fig. 6.1).

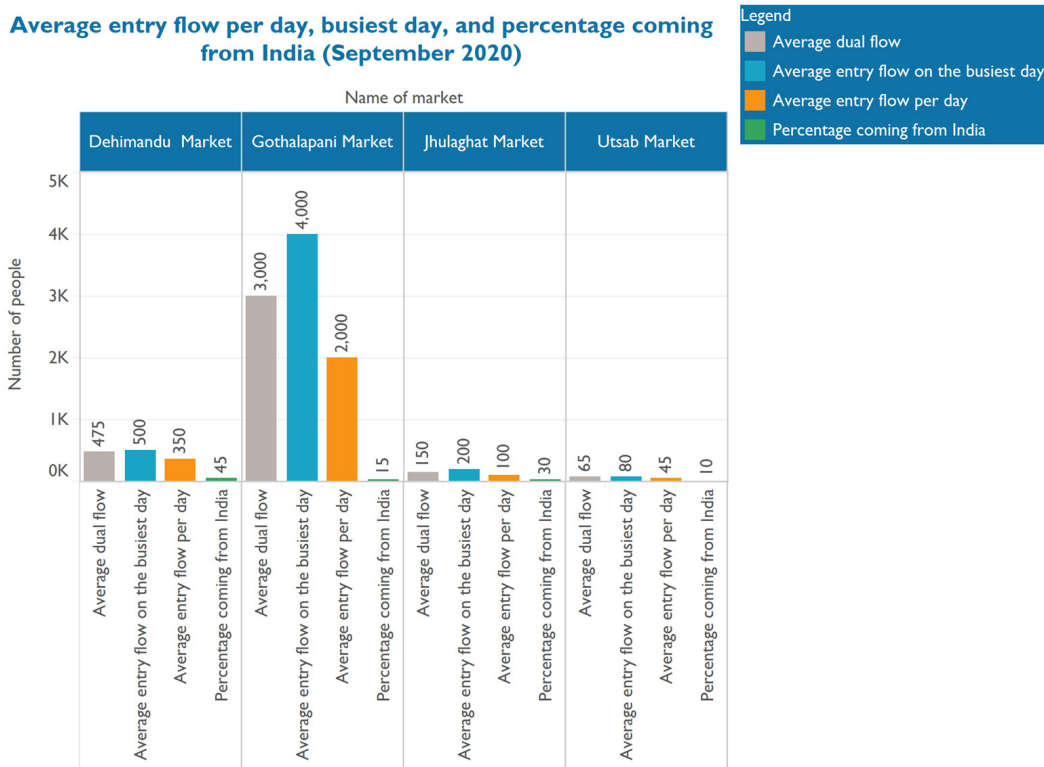


Fig. 6.1: Population mobility at the markets centres

Despite the availability of waste management systems, these are inadequate due to the following reasons; visibility of trash in the open and presence of unwanted animals/insects. However, there is no breeding habitat for mosquitoes at the market centres (no visibility of stagnant water on the floor). The most used health centre is *District Hospital* (2/4), followed by *Dehimandu Health Post* and *Jhulaghat Health Post*. In 100 per cent of the sites, there is unavailability of isolated room/place dedicated for people who fall ill before the arrival of health worker(s). Health authorities for emergency cases are widely missing at the market centres, made exception for *Dehimandu Market*. Half of the respondents agreed that greater than 50 per cent of people wear masks, whereas the average in the other two (2) markets falls between 20-40 per cent (see Table 6.1).

Table 6.1: Hygiene status at the market centres

Name of market	Availability of waste management system	Name of the most used health centre	Availability of isolated places dedicated for sick people	Presence of health authority for emergency case	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects	Visibility of trash in the open	Estimated percentage wearing mask
Dehimandu Market	Available	Dehimandu Health Post	Not available	Available	Not visible	No	Yes, limited	31%-50%
Gothlapani Market	Available	District Hospital	Not available	Do not know	Not visible	No	Yes, limited	>50%
Jhulaghat Market	Available	Jhulaghat Health Post	Not available	Not available	Not visible	Yes, limited	Yes, limited	10%-30%
Utsab Market	Available	District Hospital	Not available	Not available	Not visible	Yes, limited	No	>50%

Toilet facilities are available across all the market centres, with at least 2 stalls or drop holes each. Similarly, water facilities are present either on site or nearby (within 50 meters), except for *Gothlapani Market*, whose source of water is 2 Km away. All the market centres are near health centres, at most 1 Km away from their respective localities.

The busiest days of the week across the market centres are Sundays and Saturdays, while the busiest months of the year are May and June, except for *Jhulaghat* and *Utsab* markets, which are busy throughout the year. There are no health screening stations, such as hand sanitizer, soap hand washing, and temperature checking before visitors enter the markets centres. According to respondents from the market centres, in case of illness, people seek health care from clinics or hospitals, and pharmacies (see Fig. 6.2).

Availability of water and toilet facilities and distance to the nearest health centre

Name of market	Availability of toilet nearby	Availability of water	Busiest day of the week	Busiest month of the year	Availability of health screening station	Where people go to when they are sick?	Distance to the nearest health centre [in Km]	Distance to the nearest water source [in Km]	Number of stalls (drop holes) [Toilet facility]
Dehimandu Market	Available	Available	Sunday	May, June, July	Do not know	Clinic or Hospital	1.00	0.05	2
Gothalapani Market	Available	Available	Saturday	May, June	Not available	Clinic or Hospital	0.50	2.00	3
Jhulaghat Market	Available	Available	Saturday, Sunday	Every month	Not available	Pharmacy, Clinic or Hospital	0.50	0.01	2
Utsab Market	Available	Available	Every day	Every month	Not available	Clinic or Hospital	0.80	0.02	2

Fig. 6.2: Basic hygiene, alternative treatment places and distance to the nearest health centre

The sale of food across the market centres is also a health determinant, however, in the case of Nepal there are not significant challenges in terms of meat consumptions, due to its cultural and religious background. The major food/ goods sold include; goods/merchandise, fruits/vegetables and prepared foods, which share a percentage distribution of 15.4, 15.4 and 11.5, respectively (see Fig. 6.3). Timber, sand, meat/poultry, livestock (goat), industrial chemicals, fish and canned food/drinks, all share an equal weight of 7.7 per cent.

Food/goods sold at the market centre

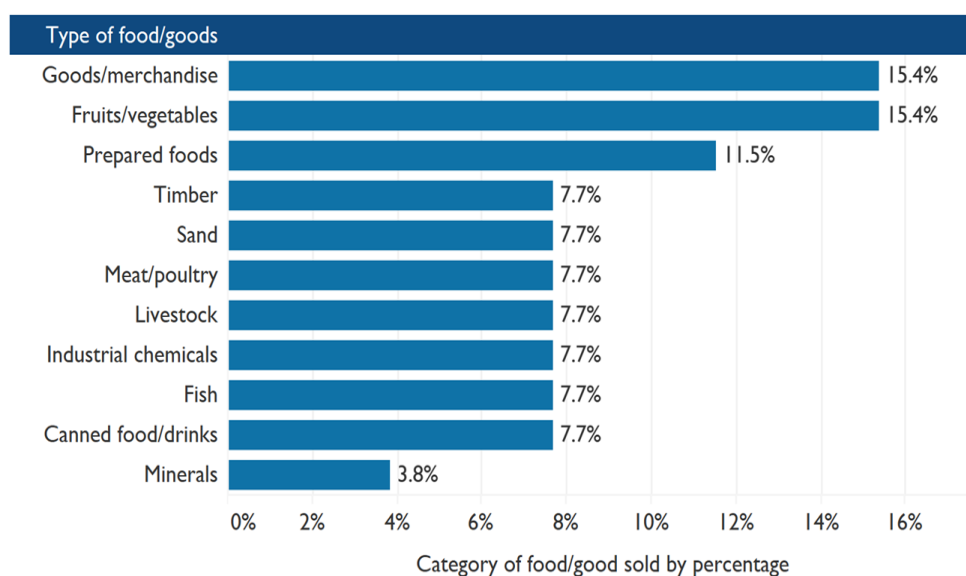


Fig. 6.3: Types of food/goods sold at the market centres

3.2.h MIGRANT WORKSITES

Population Mobility Pattern (who, where they come from, where they go)

The migrant workers are mainly from *Darchula, Doti, Achham, and Bajhang* districts. According to the study obtained from participatory mapping exercises, nearly half of the migrant workers come from India, and nomadic movement across these sites is not uncommon, especially in case of lockdown. Migrant workers also come from close-by municipalities, namely; *Patan Municipality, Purchaudi Municipality, Dilasaini Rural Municipality, Shivanath Rural Municipality and Pancheshwar Rural Municipality*.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

The results show that most of the migrant worksites in Dasharathchanda Municipality are located at *Gothalapani Junction*, which is situated at *Satbanj-Jhulaghat Road*, commonly used by people coming from India. The migrant workers coming from other districts mainly travel by trucks and motorbikes. However, people coming from municipalities nearby use alternative routes to make their way shorter to access these sites, and mainly commute by foot due to the unavailability of road infrastructure.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Ten (10) migrant worksites were assessed in Dasharathchanda Municipality, and account for the largest number in this specific site category among other locations in Sudurpashchim Province, where the PMM activities were implemented. Fig. 7.1 shows the population mobility sorted in descending order of magnitude according to the average entry flow per day. *Gothalapani Groceries Shop* and *Shahilekh Motorcycle Workshop* account for 150 and 80 people per day, and 200 and 100 people on the busiest day, respectively. There is an equal entry flow per day at *Paris Beauty Parlor* and *Ansari Cosmetic Shop* (70 each), while on the busiest day the number increases to 100 and 150 people, respectively. At the remaining migrant worksites, the average entry flow per day is between 20-50 people, while on the busiest day reaches 50-60 people, respectively. The percentage of people coming from India is 20 for both *Gothalapani Groceries Shop* and *Subham Furniture Udhyog*. These are followed by *Paris Beauty Parlor*, *Kanchan Gold Shop*, and *Malika Traders* with 10 per cent each, and *Milan Painting Shop* with 2 per cent only. People accessing the remaining migrant worksites are from Dasharathchanda Municipality and/or other municipalities within Nepal.

Average entry flow per day, busiest day, and percentage coming from India (September 2020)

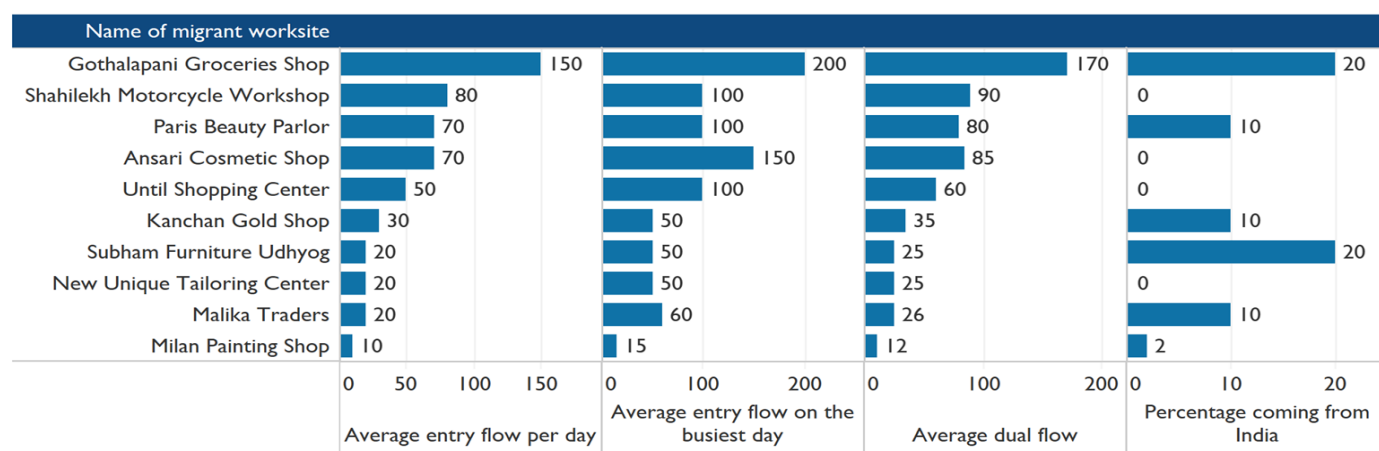


Fig. 7.1: Population mobility at the migrant worksites

Among all the migrant worksites investigated, no health screening stations are in place for either workers or visitors. Similarly, the vast majority of the sites does not check body temperature, except for *Shahilekh Motorcycle Workshop*. Most of the migrant worksites have accommodation for their staffs (7/10), contrary to *Paris Beauty Parlor*, *New Unique Tailoring Centre* and *Until Shopping Centre* (3/10). The most used health centre from these sites is *District Hospital* (8/10) and *Bhatta Medical Clinic* (2/10). The majority has toilet facilities on site (8/10) and water facilities nearby (7/10), except for *Ansari Cosmetic Shop*, *Subham Durniture Udhog*, and *Until Shopping Centre*, the latter with toilets available but no water. The busiest day of the week and month differ across each migrant worksite, except for *Gothalapani Groceries Shop*, *New Unique Tailoring Centre*, and *Shahilekh Motorcycle Workshop*, which are busy throughout the week, and *Paris Beauty Parlor*, equally accessed throughout the year (see Table 7.1).

Table 7.1: Hygiene status and busiest days/months at the migrant worksites

Name of migrant worksite	Availability of health screening station	Status of body temperature checking	Availability of accomodation for staff	Name of the most used health centre	Availability of toilet nearby	Availability of water	Busiest month of the year	Busiest day of the week
Ansari Cosmetic Shop	Not available	Not available	Available	District Hospital	Not available	Not available	January, May, June, August	Friday, Sunday
Gothalapani Groceries Shop	Not available	Not available	Available	District Hospital	Available	Available	Every month	Every day
Kanchan Gold Shop	Do not know	Do not know	Available	Bhatta Medical Clinic	Available	Available	March, April	Saturday
Malika Traders	Not available	Not available	Available	District Hospital	Available	Available	Every month	Saturday, Friday, Monday, Wednesday
Milan Painting Shop	Not available	Not available	Available	Bhatta Medical Clinic	Available	Available	March	Saturday
New Unique Tailoring Center	Not available	Not available	Not available	District Hospital	Available	Available	May, July	Every day
Paris Beauty Parlor	Not available	Not available	Not available	District Hospital	Available	Available	Every month	Saturday, Sunday, Friday
Shahilekh Motorcycle Workshop	Not available	Available	Available	District Hospital	Available	Available	Every month	Every day
Subham Furniture Udhog	Not available	Not available	Available	District Hospital	Not available	Not available	March, April	Saturday
Until Shopping Center	Not available	Not available	Not available	District Hospital	Available	Not available	January, May, June, August	Wednesday, Monday, Friday

Waste management, in terms of vulnerability capacity analysis, is a determinant of health challenges. There is a wide availability of waste management systems (8/10), except for *Shahilekh Motorcycle Workshop* and *Until Shopping Centre* (2/10). Three (3) out of ten (10) migrant worksites have trashes visible in the open, whereas there is visibility of unwanted animals/insects at all the sites investigated but no stagnant water on the floor, made exception for *Ansari Cosmetic Shop*. Five (5) migrant worksites are between 2 Km and 1 Km distant from the nearest health centre, whereas the remaining are 500 meters away. In most cases, the site's source of water is nearby, except for *Kanchan Gold Shop*, which is 5 Km away (see Fig. 7.2).

Waste management, and distance to nearest health centre and water source

Name of migrant worksite	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects							
Subham Furniture Udhog	Available	Yes, visible	Not visible	Yes, visible	<div><div></div></div>	2.00					
Shahilekh Motorcycle Workshop	Not Available	Yes, visible	Not visible	Yes, visible	<div><div></div></div>	2.00	0.01				
Gothalapani Groceries Shop	Available	Yes, visible	Not visible	Yes, visible	<div><div></div></div>	2.00	0.00				
Malika Traders	Available	Not visible	Not visible	Yes, visible	<div><div></div></div>	1.00	0.02				
Kanchan Gold Shop	Available	Not visible	Not visible	Yes, visible	<div><div></div></div>	1.00		<div><div></div></div>	5.00		
Until Shopping Center	Not Available	Not visible	Not visible	Yes, visible	<div><div></div></div>	0.50					
New Unique Tailoring Center	Available	Not visible	Not visible	Yes, visible	<div><div></div></div>	0.50		<div><div></div></div>	0.40		
Milan Painting Shop	Available	Not visible	Not visible	Yes, visible	<div><div></div></div>	0.50		<div><div></div></div>	0.50		
Ansari Cosmetic Shop	Available	Not visible	Yes, visible	Yes, visible	<div><div></div></div>	0.50					
Paris Beauty Parlor	Available	Not visible	Not visible	Yes, visible	<div><div></div></div>	0.05			0.02		
					0	1	2	0	2	4	6
					Distance to the nearest health centre [in Km]			Distance to the nearest water source [in Km]			

Fig. 7.2: Waste management, estimated percentage wearing masks and distance to the nearest water source and health centre

At the migrant worksites, there is no tracking matrix (record book/device) for visitors. Between 10-30 per cent of people do wear masks, and according to the respondents, unless uncertain, no suspected COVID-19 case was found at these locations. All the migrant worksites are operational throughout the seasons. People rely on alternative healthcare, if sick, and go to clinics or hospitals, and pharmacies. At nearly all the sites (9/10), a community health worker or agent responsible for sick people is absent, except at *Gothalapani Groceries Shop* (see Table 7.2).

Table 7.2: Tracking visitors/travellers and estimated percentage of people wearing masks

Name of migrant worksite	Record book/device for visitors	Estimated percentage wearing mask	Suspected COVID-19 case on site	Seasonality	Where people go when they are sick	Availability of community health worker for emergency case
Ansari Cosmetic Shop	Not available	31%-50%	No	All seasons	Clinic or Hospital	Not available
Gothalapani Groceries Shop	Do not know	>50%	No	All seasons	Clinic or Hospital	Available
Kanchan Gold Shop	Not available	10%-30%	Do not know	All seasons	Clinic or Hospital	Not available
Malika Traders	Not available	10%-30%	No	All seasons	Clinic or Hospital	Not available
Milan Painting Shop	Not available	<10%	No	All seasons	Clinic or Hospital	Not available
New Unique Tailoring Center	Not available	>50%	No	All seasons	Clinic or Hospital	Not available
Paris Beauty Parlor	Not available	31%-50%	No	All seasons	Clinic or Hospital	Not available
Shahilekh Motorcycle Workshop	Not available	>50%	No	All seasons	Pharmacy, Clinic or Hospital	Not available
Subham Furniture Udhog	Do not know	10%-30%	Do not know	All seasons	Clinic or Hospital	Not available
Until Shopping Center	Not available	31%-50%	No	All seasons	Clinic or Hospital	Not available

The main activities conducted at the migrant worksites are; factory, mining and timber logging. Among these, factory is the major activity of migrant worksites with 70 per cent, and the remaining 30 per cent is shared between mining and timber logging (see Fig. 7.3). There are only two types of accommodation facilities for staffs at the migrant worksites; wooden house, which accounts for the majority (85.7%), and zinc type (14.3%).

Type of activity and accommodation at the migrant worksite

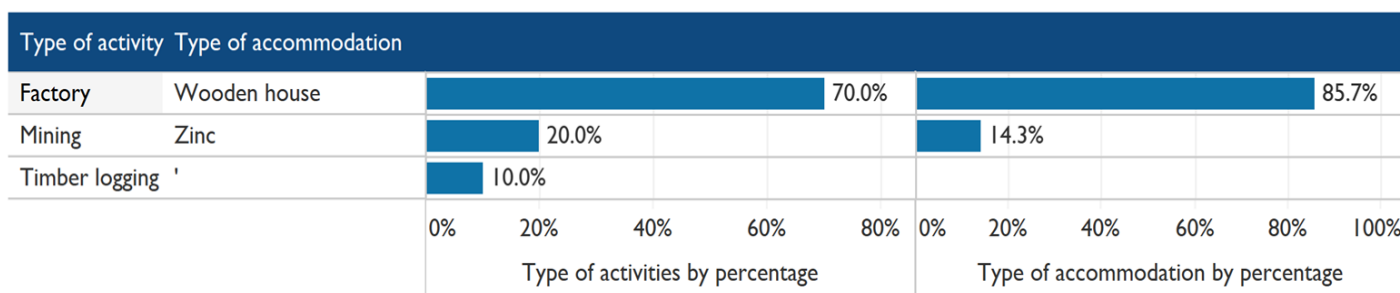


Fig. 7.3: Type of activity and accommodation at the migrant worksites

3.2.i TRANSPORT STATIONS

Population Mobility Pattern (who, where they come from, where they go)

The study shows that people from India as well as Nepalese citizens come to transport stations, which connect close-by municipalities, and account for one of the largest population mobility patterns among all site categories. However, the population mobility accounts for specific districts of origin, specifically; *Kanchanpur, Kailali, Dadeldhura, Bajura, Bajhang and Darchula*, from which travellers reach their main district of destination, *Baitadi*. People from other municipalities mainly come from *Patan Municipality, Pancheshwar Rural Municipality, Dogadakedar Rural Municipality, Purchaudi Municipality* and *Shivanath Rural Municipality*.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

Gothalapani Bus Park Station is the biggest transport station in *Dasharathchanda Municipality* and is located at *Gothalapani Junction*, connected to *Satbanj-Jhulaghat Road*. *Shahilekh Jeep Station* and *Dehimandu Bus Park* transport stations are also connected to *Satbanj-Jhulaghat Road* and the nearest localities are *Durga Bhawani, Kathpatya, Dehimandu, Gurukhola* and *Satbanj*.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

The bar in brown colour shows the average dual flow, in blue is the average entry flow on the busiest day, in orange is the average entry flow per day, while the red bar refers to the percentage of people coming from India. Only three (3) transport stations investigated in *Dasharathchanda Municipality* have high mobility (*Dehimandu Bus Park Station, Gothalapani Bus Park Station* and *Shahilekh Jeep Station*). The average entry flow per day at *Shahilekh Jeep Station* is 500 people, and on the busiest day is 700. The average entry flow per day at *Dehimandu Bus Park Station* and *Gothalapani Bus Park Station* is 250 and 50 people, respectively. On the busiest day the number increases to 350 and 100 travellers, respectively. All the transport stations assessed have people coming from India, with 25 per cent at *Dehimandu Bus Park Station*, 50 per cent at *Gothalapani Bus Park Station*, and 15 per cent at *Shahilekh Jeep Station*, which accounts for the highest mobility of people (see Fig. 8.1).

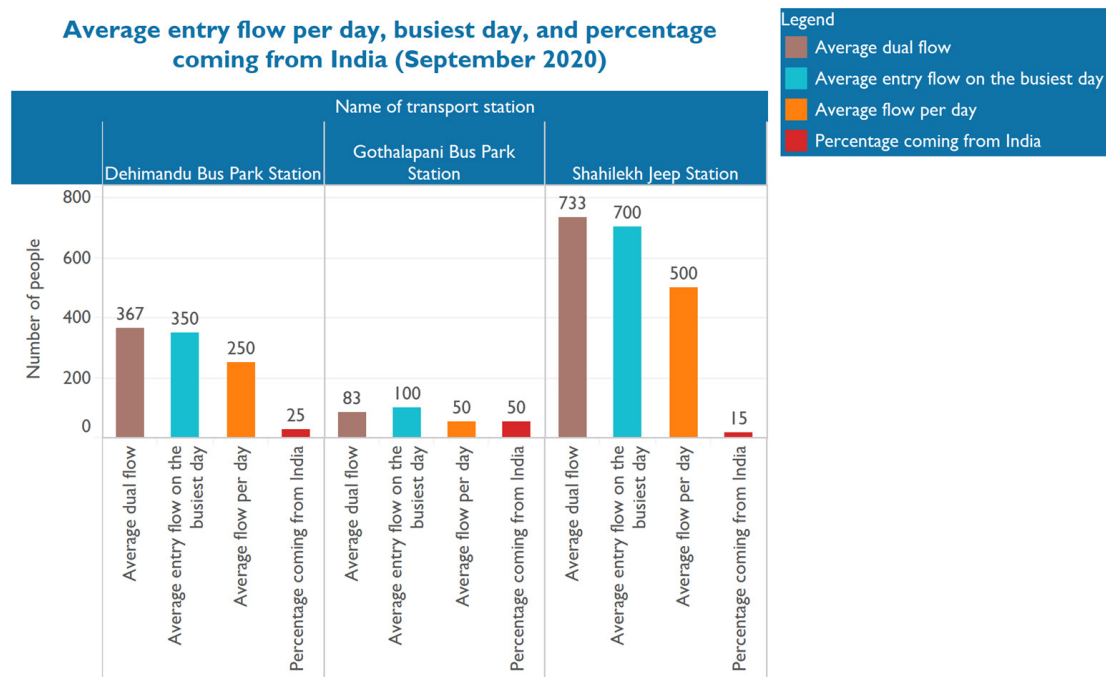


Fig. 8.1: Population mobility at the transport stations

Among the three (3) transport stations, one does not have toilet facilities nearby (*Gothalapani Bus Park Station*), and similarly, only one has no water facilities present on site (*Shahilekh Jeep Station*). The majority of these sites are busy throughout the week and months, except for *Dehimandu Bus Park Station*, whose busiest day and months are Saturday and May-June, respectively (see Fig. 8.2). There is unavailability of record books/devices for tracking purposes, especially travellers' origins and destinations. *Dehimandu Bus Park Station* and *Gothalapani Bus Park Station* are 1 Km and 10 meters away from the nearest water source, respectively. The distance to the nearest health centre is 50 meters and 500 meters from *Dehimandu Bus Park Station* and *Gothalapani Bus Park Station*, respectively, whereas *Shahilekh Jeep Station* is the farthest being 2 Km away. *Dehimandu Bus Park Station* has 2 stalls (drop holes) for males and females, whereas *Shahilekh Jeep Station* has 1 stall for both genders.

Availability of water and toilet facilities, busiest days/months, and distance to the nearest water and health centres

Name of transport station	Availability of toilet nearby	Availability of water on site	Busiest day of the week	Busiest month of the year	Availability of record book/device for travellers	Distance to the nearest water source [in Km]	Distance to the nearest health centre [in Km]	Number of stalls (drop holes) [Toilet facility]
Dehimandu Bus Park Station	Available	Available	Saturday	May, June	Do not know	1.00	0.05	2
Gothalapani Bus Park Station	Not available	Available	Every day	Every month	Not available	0.01	0.50	
Shahilekh Jeep Station	Available	Not available	Every day	Every month	Not available		2.00	1

Fig. 8.2: Water availability, travellers' tracking status and busiest days/months

In regard to transport stations, the name of the nearest health centres varies across each based on their respective localities. Greater than 50 per cent wear mask at *Dehimandu Bus Park Station* and *Shahilekh Jeep Station*, and between 31-50 per cent wear masks at *Gothalapani Bus Park Station*. There is inadequate presence of community health workers or agents in charge of health issues (2/3). The following key parameters or indicators are missing at the transport

stations: health screening stations, body temperature checking, and isolated place dedicated for people that get sick (see Table 8.1).

Table 8.1: Health screening and tracking travellers' status

Name of transport station	Name of the nearest health centre	Estimated percentage wearing mask	Availability of community health worker/volunteer	Presence of health screening station	Body temperature checking status	Availability of isolated place dedicated for people that get sick
Dehimandu Bus Park Station	Dehimandu Health Post	>50%	Available	Not available	Not available	Not available
Gothalapani Bus Park Station	District Hospital	31%-50%	Not available	Not available	Not available	Not available
Shahilekh Jeep Station	Nikosakti Hospital	>50%	Not available	Not available	Not available	Not available

According to the analysis and eye findings, at the transport stations there is an adequate waste management system due to the following reasons; availability of proper waste disposal, no trash in the open, and no stagnant water found on the floor, which mosquitoes use as a breeding habitat. However, there was visibility of unwanted animals/insects at *Gothalapani Bus Park Station*. All the sites investigated are operational throughout the seasons in Dasharathchanda Municipality (see Table 8.2).

Table 8.2: Waste management system at the transport stations

Name of transport station	Availability of waste managemnt system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects	Seasonality
Dehimandu Bus Park Station	Available	Not visible	Not visible	Not visible	All seasons
Gothalapani Bus Park Station	Available	Not visible	Not visible	Yes, visible	All seasons
Shahilekh Jeep Station	Available	Not visible	Not visible	Not visible	All seasons

3.2.j PLACES OF WORSHIP

Population Mobility Pattern (who, where they come from, where they go)

In terms of population mobility, when it comes to places of worship, people mainly come from within the same district (*Baitadi*), and some originate from *Dadeldhura*, *Darchula*, *Kanchanpur*, *Kailali*, and *Bajhang*. On the other hand, at the municipality level, people travel to these sites mainly from *Patan Municipality*, *Dilasaini Rural Municipality*, *Purchaudi Municipality*, *Sunraya Rural Municipality*, and *Shivanath Rural Municipality*. The analysis also reveals that the sites are busy throughout the week, months, and seasons.

Connectivity (link with the main community, route, accessibility, mode of transport, seasonality, communication)

In terms of connectivity, *Ninglasaini Temple* is connected to *Satbanj-Jhulaghat Road*, which lies nearby the following localities; *Dehimandu*, *Satbanj*, *Shahilekh*, and *Gurukhola*. People use buses, trucks, minivans, cars and motorbikes to access this site. Additionally, *Tripurasundari Temple* is also connected to *Satbanj-Jhulaghat Road* and is located near

Gothalapani Junction. According to the analysis, people coming from India access these places of worship by alternative routes, mainly through trucks and motorbikes.

Vulnerability/Capacity Analysis (in front of a risk of spread of communicable diseases)

Population mobility

There were only two (2) places of worship with high population mobility in Dasharathchanda Municipality, namely *Tripurasundari Temple* and *Ninglasaini Temple*. On average, the population mobility at *Tripurasundari Temple* is 100 visitors per day, and 600 on the busiest day. At *Ninglasaini Temple*, the average entry flow per day is 50 visitors, while on the busiest day the number reaches 200. Both places of worship are visited by a minority of people coming from India (5%). Congregations at these sites mainly happen as a result of cultural and religious festivals. The temples are busy throughout the week but the busiest months of the year fall in April, July, June, and December.

Waste management and estimated percentage of people wearing masks

According to the respondents, the nearest health centre from *Tripurasundari Temple* and *Ninglasaini Temple* is *Tripura Sub Health Post* and *Dehimandu Health Post*, respectively. The estimated percentage of people wearing masks at these sites is between 31-50. Despite the availability of a waste management system at *Ninglasaini Temple*, there is inadequate control of waste disposal due to the following; visibility of trash in the open and stagnant water on the floor, as well as presence of unwanted animals/insects within the compound of *Ninglasaini Temple*, contrary to *Tripurasundari Temple*, where there is an adequate waste disposal system.

Health screening and basic facilities at places of worship in Dasharathchanda

Water and toilet facilities are available nearby, about 10 meters and 200 meters from *Tripurasundari Temple* and *Ninglasaini Temple*, respectively. There are 10 stalls or drop holes (toilet facilities) at *Tripurasundari Temple* and only 2 stall or drop holes (toilet facilities) at *Ninglasaini Temple*. The following are completely missing with respect to health screening status; health screening station, temperature checking or functional thermometers, hand sanitizer and other screening techniques that help mitigate the spread of the COVID-19 pandemic. There is either interrupted network system or no voice communication system at *Tripurasundari Temple*, while *Ninglasaini Temple* has an uninterrupted voice communication system /Global System Mobile (GSM) communication.

3.3 GENERAL ANALYSIS

This section of the report indicates the general analysis of all common variables or indicators where its core parameters are evaluated, holistically. Some indicators were analysed separately since different findings were obtained from various sites. The rationale of combining these variables lies in the fact that the results would be the same across all the sites where the study was conducted. Key highlights are listed as follows:

1. Communication system
2. Sources of water
3. Names of unwanted animals/insects and other domestic animals
4. Modes of transport
5. List of procedures to follow when someone is affected by COVID-19
6. Major reasons for the busiest days/months

Fig. 9.1 shows the percentage distributions of various indicators for all the sites in Dasharathchanda Municipality, related to the concept of vulnerability capacity analysis. The pie charts show the communication system (top left), various sources of water (top right), unwanted animals/insects (bottom left), and most used modes of transport (bottom right).

The most common means of voice communication system (GSM) involves phones or text messages (57%), followed by the use of internet to access emails and social media technologies (33%). The remaining two (UHF/VHF radio and no communication) are not significant. However, it is important to note that, according to the findings, some of the sites where there is poor, or no communication are the informal POEs. The main source of water is the public water system, which accounts for the highest percentage (75%). The remaining 30 per cent is shared by other sources of water, such as well, delivery by truck or vehicle, and rain catchment. This is because at some of the sites there is inadequate electricity to pump the main dam to the respective localities and urges communities to use alternative means to access water.

The visibility of animals across all the sites was validated, although based on the community setting in Nepal, people live with domestic animals, such as cows, goats, and buffaloes. As a result, these animals fall into the category of 'wanted animals' as people commonly live with them. Based on research, it is possible for animals of this nature to transmit communicable diseases to other humans, especially when these animals deposit their manure on the floor combined with improper waste management systems. However, in regard to Nepal's context, mosquitoes and ants/beetles are the most common insects affecting people, which in turn cause or facilitate the spread of diseases to humans. Specifically, mosquitoes bites⁴ may lead to diseases, such as zika virus, West Nile virus, Chikungunya virus, dengue and malaria. These are followed by cockroaches⁵, which cause other diseases, such as salmonellosis, typhoid fever, cholera, dysentery, dengue, and campylobacteriosis, to name a few.

In Dasharathchanda Municipality, the most common means to access the sites, in order of importance, include; travel by foot, motor bike, car, minivan, bus, and truck. People at these sites, especially at the POEs, have to walk for long distances to access the health centres and other basic amenities.

⁴ <https://www.cdc.gov/niosh/topics/outdoor/mosquito-borne/>

⁵ https://www.who.int/water_sanitation_health/resources/vector288to301.pdf

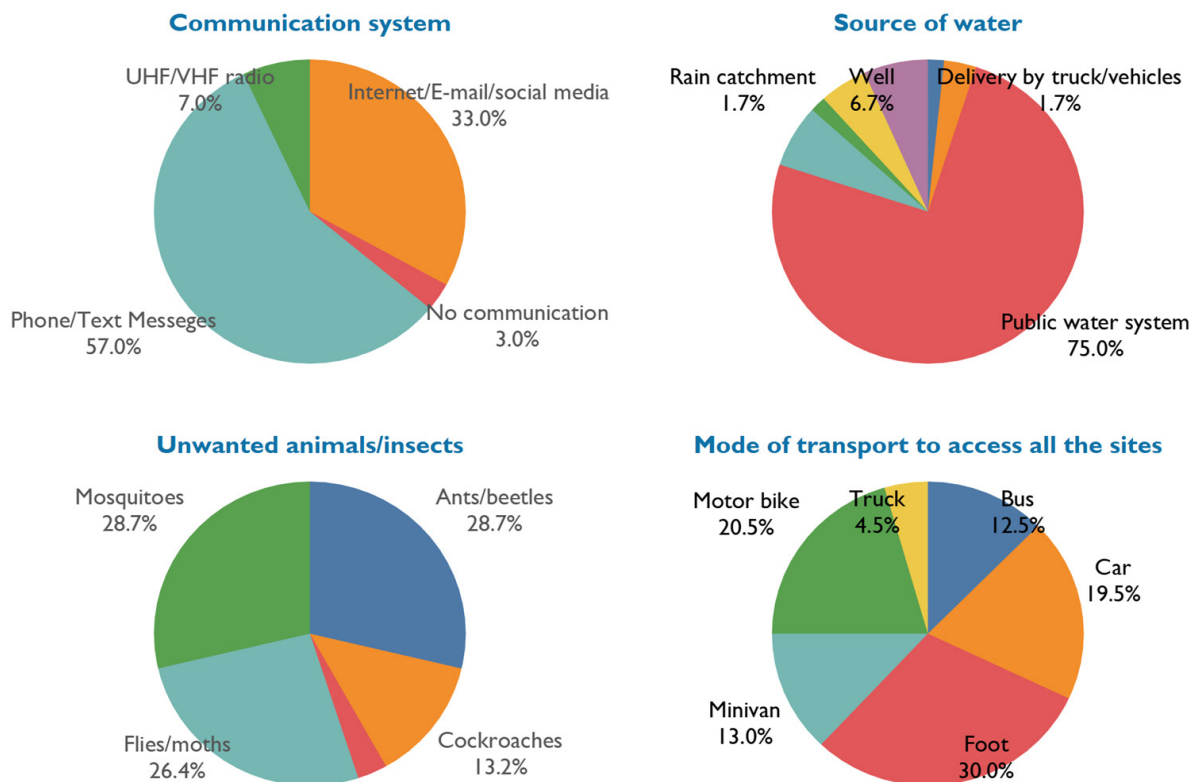


Fig. 9.1: Communication system, source of water, mode of transport, and unwanted animals/insects for all sites

By investigating the various sites in the municipality, one of the aims was to identify the major reasons for the influx or movement of people coming from within and outside Nepal, specifically India. The study revealed that, in order of importance; crusades, cultural festivals, market days (sporadic or nomadic), markets (set up in a locality, temporal or permanent) and religious festivals, are the major factors for the busiest days or months of the year (see Fig. 9.2). This information is important to track people's movement and consequently enforce adequate measures, such as SOPs and other health mechanisms, within the sites highlighted in this study, which have high congregations of people periodically.

Main purpose for the busiest days/months

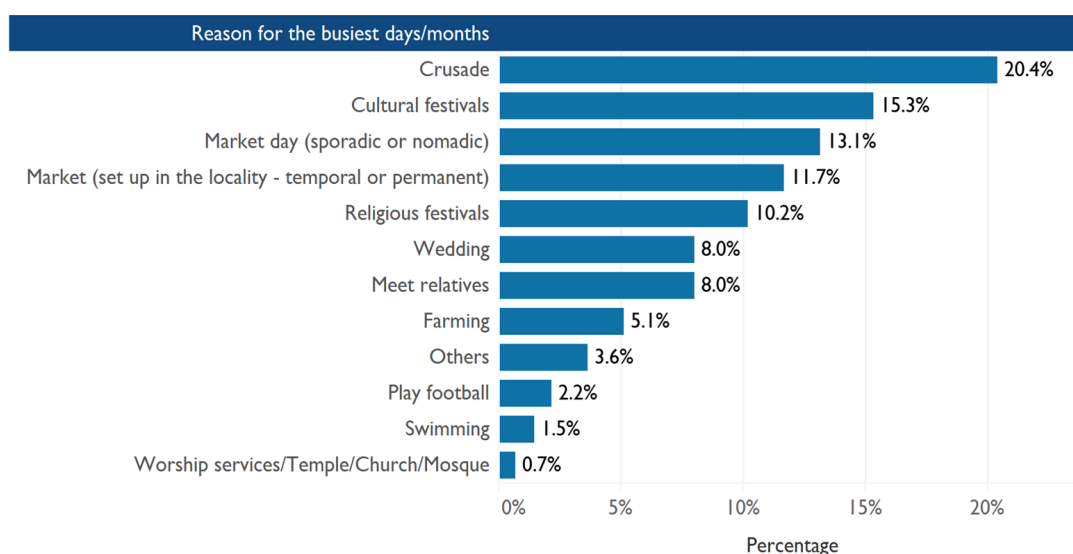


Fig. 9.2: Major reasons for the busiest days/months in Dasharathchanda Municipality

During a pandemic or an outbreak, there are always concerns of how people should respond to emergency cases of affected people. The list of procedures was evaluated in percentage as follows, in order of importance, according to the respondents; call or notify on-site authorities, call emergency hot line, counsel and calm the patient, and lastly, isolate the patients. This shows that people are aware of the techniques or procedures to follow if someone is affected by COVID-19. In terms of seasonality, most of the respondents agreed that the sites are operational throughout the year (90.3%), with only a few operational during winter or the rainy season (see Fig. 9.3).

List of procedure to follow for affected person of COVID-19

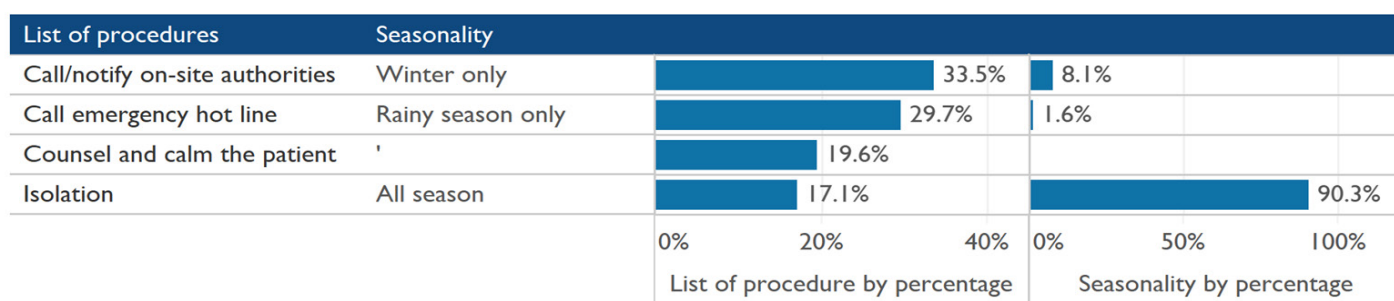


Fig. 9.3: Seasonality and list of procedures to follow if someone is affected by COVID-19

4. CONCLUSIONS, RECOMMENDATIONS AND LESSONS LEARNT

4.1 CONCLUSIONS

It is important to note that, in some of the sites where the research was conducted, the questions asked to key informants refer to practices prior to the enforcement of lockdown and restricted movement regulations. In this sense, the aim was to identify and understand the population mobility patterns both across bordering municipalities, and between Nepal and India.

Points of entry (POEs)

Five (5) POEs were investigated in Dasharathchanda Municipality, with only one formal POE at *Jhulaghat*. The remaining POEs are informal and water landing points crossing the Mahakali River. *Jhulaghat* POE is by far the most used with an average entry flow of 1,500 people per day and 2,000 on the busiest day. However, the highest percentage of people coming from India is found at *Burkeli* POE (50%) and *Tirkhadani* POE (30%). Despite not being the nearest, the most used health centre across the POEs is *District Hospital*. *Burkeli* POE, *Tirkhadani* POE and *Naltadi* POE do not have electricity nor toilet facilities nearby, water is also not available, except at *Naltadi* POE. The majority of the POEs are busy throughout the week, and mainly between July and September.

Out of the five (5) POEs investigated, none has health community workers, health agents/volunteers, IPC personnel, and an IHR focal point on site nor in the corresponding country (India). It is worrying that less than 10 per cent of people wear masks across the POEs, aggravated by the fact that no health screening stations are either available or working.

Health Centres

Out of the eleven (11) health centres assessed in Dasharathchanda Municipality, more than half (7/11) are government owned. The highest percentage of people coming from India is found at *Nikosakti Hospital* (20%) and *Dasharathchanda Ayurvedic Hospital* (14%). The absence of patients in the inpatient ward could be explained by the limited number of beds at the health centres in the municipality (see municipality profile above), though *District Hospital* is currently under expansion (September 2020). Six (6) health centres do not have separate toilets for patients and staffs. The highest number of stalls is found at *District Hospital* with 11 stalls for patients and 3 for the hospital personnel. However, it is also the farthest health facility from the water source (2 Km), compared to 100 meters or less for the other sites.

According to the respondents, people mainly seek alternative health care from pharmacies and public hospitals, and a lesser percentage relies on religious and traditional healers (<10%). However, it is important to note that the number of traditional healers (17) exceeds that of health centres (11), and traditional healers are often located in remote and less accessible areas where communities live. It is noteworthy that more than 80 per cent of the health centres assessed (9/11) do not have health screening stations nor an emergency preparedness plan. Similarly, only two (2) health facilities have IPC supplies at disposal, the unavailability due to lack in the national supply or no request put forward.

Traditional Healers

The vast majority of the traditional healers have an average entry flow between 50 and 100 people. Most of the traditional healers (11/17) have visitors coming from India, with the highest percentage found at *Pujaragaun Fortune Teller* (50%). All compounds are open to everyone throughout the seasons, except for *Dura Bhawani Dhami (Chamgaun)*, which is operational only during the rainy season. Ten (10) out of the seventeen (17) traditional healers interviewed do not have a waste management system in place which pose health risks. Similarly, greater than 50 per cent of the traditional healers (9/17) do not use protective materials while treating the patients, who may suffer from abdominal or lower pain, headache or fever.

Schools and Colleges

Among the three (3) educational institutions investigated at Dasharathchanda Municipality, *Birendra Higher Secondary School* is the most attended (more than 1,000 attendees on the busiest day) by Nepali and Indians, with the highest percentage of people coming from India (20%). Due to its population, this school has the largest number of classrooms (30) and desks (300). The people per desk are the second highest (4), after *Ninglasaini Ma. Vi. School* (5). All sites have gender-separate toilets for students but not for teachers, the latter accounting for 5 per cent of the school population, on average. Water is available at all the schools, together with an adequate waste management system, proved by the absence of trash and stagnant water on the floor.

Entertainment Centres

On average, the entertainment centres are accessed by 50 people on a daily basis. The busiest months fall between July and September. *Shahilekh Play Ground* is the most popular with 200 visitors entering on the busiest day. Body temperature checking is absent at three (3) out of the four (4) centres assessed. Water and toilet facilities are widely available (3/4). However, none of the sites has availability of health screening stations, nor keep a record of travellers' movement.

Market Centres

Among the four (4) market centres assessed, *Gothalapani Market* is by far the most popular with 4,000 people on the busiest day and 2,000 on normal days. All sites are visited by people coming from India, with percentages oscillating between 10 and 45. No isolation places for sick individuals are available nor health screening stations are in place. However, water and toilet facilities are present at all the markets. Health centres and water sources are in proximity to the sites, within 1 Km and 2 Km, respectively.

Migrant Worksites

This category is the third largest in Dasharathchanda Municipality, after traditional healers and health centres, and it is comprised of ten (10) assessed sites. The highest number of migrant workers are found at *Gothalapani Groceries Shop* with an average entry flow of 200 on the busiest day. More than half of the sites employ Indian citizens (between 10 and 20 per cent). Similar to other sites, migrant worksites lack health screening stations, body temperature checking, community health workers on site, and records of visitors/workers. Seventy (70) per cent of the locations have accommodation for staffs, mostly made of wood. The vast majority of the migrant worksites do not have trash visible in the open nor stagnant water on the floor, due to an appropriate waste management system in place.

Transport Stations

Similar to migrant worksites, all the transport stations are accessed throughout the year by people coming from India (between 15 and 50 per cent). Population mobility varies according to the specific site, and it ranges from 100 to 700 on the busiest days. Water and toilet facilities are widely available across all four (4) transport stations, made exception for *Dehimandu Bus Park Station* and *Gothalapani Bus Park Station*, respectively. In terms of hygiene, the environments are clean, with no visible trash, stagnant water and unwanted animals, except for *Gothalapani Bus Park Station*.

Places of Worship

Only two (2) places of worship, *Tripurasundari Temple* and *Ninglasaini Temple*, were assessed in Dasharathchanda Municipality, based on their population mobility; 600 and 200 visitors on the busiest days, respectively. Both are open throughout the week, months, and seasons. Similarly to other sites investigated in the municipality, health screening stations, temperature checking and other IPC measures are absent, which make these places vulnerable to infectious diseases, such as COVID-19.

4.1.a ADDITIONAL FINDINGS

As shown in the analysis, some of the observed sites have common characteristics and face similar health challenges in terms of population mobility and public health risks mapping. The following are recurrent:

- The most used hospital is *District Hospital*, despite not always being the nearest from the sites assessed.
- Inadequate or no presence of health authorities/agents dedicated for sick people, as well as isolation rooms for ill people at the vast majority of the sites.
- Despite the presence of waste management systems, more often than not, they are not adequate, and consequently affect the sanitary conditions of already vulnerable locations.
- Several modes of transport are used to travel from/to/within Dasharathchanda Municipality. Travel by foot is substantial, especially to reach POEs, traditional healers, markets and migrant worksites.
- Water (mainly public water system) and toilet facilities are generally available, however not at all sites, including some POEs.
- People generally understand and are aware of procedures to follow if someone is affected by COVID-19. However, the percentage of people wearing masks is limited throughout the locations in Dasharathchanda Municipality.
- There is an insufficient presence of health screening stations, including hand washing with soap, hand sanitizer and IPC, and body temperature checking at the investigated sites, including some of the health centres.
- The majority of the assessed sites are open throughout the year and seasons, though their busiest period varies depending on their category and location.
- In terms of population mobility patterns, at the district level, they mainly originate from *Darchula, Bajhang, Banjura, Dadeldhura*, and *Kanchanpur*; whereas at the municipality level, people's movement emanates from *Dilasaini, Purchaudi, Surnaya, Patan, Pancheswar, Shivanath* and *Dogadakedar* municipalities.
- A large number of the sites investigated are situated near or connected to *Satbanj-Jhulaghat Road* and *Gothalapani Junction*.

4.2 RECOMMENDATIONS

PMM has allowed us to better grasp the dynamics and characteristics of human mobility in Dasharathchanda Municipality. The strength of PMM is two-fold; on one hand, its systematic methodology enables for data validation throughout the process; and on the other, it is inherently inclusive of the local communities which are personally involved and actively contribute not only to the rolling out of the activities, but to the final results which will impact the society, as a whole. Based on the PMM analysis of the area, several recommendations are suggested:

1. Establish health screening stations at POEs and all other priority locations, specifically transport stations, entertainment centres, and migrant worksites. Body temperature checking should be advised at all sites with high population mobility, considering the easy accessibility and low cost of thermometers, and hand sanitizer should be provided to visitors and travellers accessing the respective sites.
2. Set up mechanisms to record and track people's movement, especially their origin and destination. This is especially the case for POEs and transport stations. The information collected is indispensable to trace any affected case, in the event of an outbreak.
3. Strengthen IPC and Water, Sanitation and Hygiene (WASH) at all priority sites identified in the study with limited capacities and high population mobility. In case of lack of IPC and Personal Protective Equipment (PPE),

the national supply should be addressed to ensure that everyone has access to basic items, such as surgical masks and hand sanitizer.

4. Invest in capacity building of health infrastructure. This is especially the case for health posts, which are often located in remote areas and are hardly accessible, even by foot. In case of grave ill people, they may not be able to reach the sites and receive the necessary health care. Similarly, medical equipment should be widely available to health workers and volunteers.
5. Focus on risk communication and community engagement. Based on direct field observation and from the respondents, the community seems to lack knowledge of potential risks of infectious diseases, such as COVID-19, and preventive measures for transmission. Citizens should be involved in health-related activities and awareness should be raised on the importance of good sanitary conditions affected by waste management systems, as well as the availability of water and toilet facilities.
6. Develop a health working group for Nepal and corresponding countries at formal POEs for both IHR and PHEIC focal points. This will allow for a better management of travellers' movement, especially for tracking purposes.
7. Conduct an urgent training and capacity development of health staff/immigration/security officials at POEs, including development of SOPs for the POEs and key priority areas.
8. Conduct leadership training for all traditional healers in order to enhance their health practices, adhere to SOPs within their communities, especially in hostile communities where people rely on them for health and other issues.

The findings will be shared with MoHP for further actions.

4.3 LESSONS LEARNT

1. Stakeholders' engagement at all levels (national, district and municipality) is key to ensure effective implementation and ownership of the project. Through such multi-level engagement, the capacity of officers is also enhanced, which in turn contributes to the sustainability of the project. Consequently, this helps to integrate mobility pattern data in epidemiological surveillance for meaningful analysis of public health risks.
2. Community engagement and participation at all levels of implementation ease the process of municipality entry, data collection and municipality/community ownership of the project. This also helps communities understand the possible vulnerabilities, in terms of health risks, that exist in the area, especially during the COVID-19 pandemic.
3. The training and simulations are key for the staff/enumerators to expand their knowledge and improve their skills in interviewing informants and collecting data. This in turn allows to validate and adopt the data collection tools ensuring they are suitable for the local context.
4. Early planning/preparations, logistical arrangements (vehicles, training materials, data collection, maps, plans for field teams, hand sanitizers, masks, etc.) are important for timely and effective implementation of the activities.
5. Field debriefing sessions are necessary to discuss successes, lessons learnt, challenges and recommendations for future improvement of action plans since the project exercise is a learning process in itself.

5. ANNEXES

5.1 ANNEX I

Groups and indicator weights for the vulnerability analysis selection

Indicator Group	Group Weight	Group Weight Score Rationale	Indicator	Indicator Weight
1. Ground Crossing Points	10	1) All points of entry and transit points carry equal weight (10) 2) Local people mix with travelers from outside the community in vehicles 3) Communities along major corridors/routes of transportation are vulnerable to infection through business activities with potentially infected travelers	The top 5 largest number of people crossing throughout the year	3
			The top 5 most easily accessible by car, lorry, truck or minivan	2
			Border crossing points most likely used by travelers to travel long distance internationally (Yes=1/No=0)	2
			Towns or villages along the border that share a common language or currency with villages across the border (Yes=1/No=0)	1
			Towns or villages close to regular or periodic large gatherings of people (Yes=1/No=0)	2
2. Water Landing Sites	10	1) All points of entry and transit points carry equal weight (10) 2) Local people mix with travelers from outside the community and through business activities at the border areas 3) Surrounding communities at river-side are vulnerable to infection through business activities with potentially infected travelers	The top 5 wharfs with largest number of boats and passengers coming from and going to other countries	3
			The top 5 wharfs with largest number of boats and passengers and coming from and going to other ports in the country	1
			Wharfs with largest number of boats landing throughout a year	1
3. Main Roads, Junctions and Rivers	0	1) There are no indicators associated with main routes, junctions and rivers. 2) The main roads, junctions and rivers identified by the group will be marked on the map, purely as a reference to preferred, high-volume mobility pathways.	N/A	0
4. Markets	10	1) Carries equal weight as Transit points (10) 2) Local people mix with travelers from outside the community through business activities at the market 3) Surrounding communities at markets are vulnerable to infection through business activities with potentially infected travelers and marketers	Markets attracting the largest number of people from other countries	10
5. Migrant Worksites	10	1) Local people mix with travelers from outside the community through business activities at the market 2) Surrounding communities at markets are vulnerable to infection through business activities with potentially infected travelers and marketers 3) Migrant workers may not have access to or be able to afford local healthcare, facilities or treatment 4) Worksite environmental conditions and infrastructure amplify spread of infectious diseases 5) Foreign workers have no immunities to local diseases 6) Migrant workers introduce foreign communicable diseases to local populations	Worksites have the most number of workers	10

6. Traditional Healers	20	1) Traditional Healers attract people who are ill (infected) 2) Culturally, traditional medicine is the preferred provider over clinical/hospital/government care 3) Traditional healers are most vulnerable providers, because they have no protective equipment, supplies or practices, like a clinical/hospital setting. 4) Host communities are vulnerable to infection from hosting infected individuals from outside the community, who seek treatment from the healer or fortune tellers	Traditional healers attracting the largest number of people from other countries	20
7. Health Facilities	15	1) Health facilities attract people who are ill (infected) 2) There is a history of healthcare workers and their families/communities becoming infected through ineffective or nonexistent preventative measures and subsequent unsafe burial practices 3) Host communities are vulnerable to infection by hosting infected individuals from outside the community, seeking treatment at the facility	Health facilities attracting the largest number of people from other countries	15
8. Transport Stations	10	1) All points of entry and transit points carry equal weight (10) 2) Local people mix with travelers from outside the community in vehicles 3) Surrounding communities transportation hubs are vulnerable to infection through business activities with potentially infected travelers	Transport stations attracting the largest number of foreign workers	10
9. Schools	5	1) Local students mix with students from outside the community	Schools and colleges attracting the largest number of people from other countries	5
10. Places of Worship	10	1) Religious leaders and institutions attract people who are ill (infected) 2) Spiritual power/healing is preferred provider over clinical/hospital/government care 3) Religious leaders are vulnerable, because they have no protective equipment, supplies or practices, like a clinical/hospital setting.	Places of worship attracting the largest number of people from other countries	10
11. Places of Entertainment	2	1) Local people mix with travelers from outside the community at public venues and seasonal festivals, resulting in greater potential for exposure to infectious diseases	Places of entertainment attracting the largest number of people from other countries	2
12. Other Places	2		Other places attracting the largest number of people from other countries	2

5.2 ANNEX II

Vulnerability capacity and sites location generated by the matrix analysis

			Group Weight		10	10	20	15	10
			Individual Indicator Weight		10	10	20	15	10
Afficher les localités			Markets	Migrant Worksites	Traditional Healers	Health Facilities	Transport Stations		
Locality	Priority Score	Priority	Markets that attract the largest number of people from other countries	Worksites that have the largest number of workers	Traditional and Religious Healers that attract the largest number of people from other countries	Health Facilities that attract the largest number of people from other countries	Transport stations that attract the largest number of people of people		
Gothalapani	1241		210	260	20	420	220		
Dehimandu	700		130	0	40	60	170		
Shahilekh	611		130	110	0	270	20		
Jhulaghat	564		220	0	0	0	210		
Jargaun	400		0	0	400	0	0		
Gothalapani Bajar	380		0	380	0	0	0		
Pujaragaun	340		0	0	100	0	0		
Gadhi	176		30	0	0	0	0		
Chhela	160		0	0	160	0	0		
Sera	154		0	0	80	0	0		
Musyachaur	145		10	0	0	75	60		
Ishwori Ganga	110		0	0	0	0	0		
Aaula	100		0	0	100	0	0		
Baglekhan	84		0	0	0	0	0		
Thachaur	80		0	0	80	0	0		
Tir Khadeni	75		0	0	0	0	0		
Tichaura	60		0	0	60	0	0		
Durga Bhawani	60		0	0	60	0	0		
Dewolhat	54		0	0	40	0	0		
Thaligada	50		0	0	0	30	0		
Sundarkhali	50		0	0	0	0	0		



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