POPULATION MOBILITY AND PUBLIC HEALTH RISK MAPPING

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

Suryodaya Municipality

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1. INTRODUCTION

The Coronavirus disease 2019, hereinafter referred to as COVID-19, is caused by SARS CoV-2 Virus 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 9 December 2020, the number of cases stands at 67,210,778, including 1,540,777 deaths worldwide.[1]

In Nepal, the first case of COVID-19 was reported on 23 January 2020. As of 9 December 2020, the total number of confirmed cases in Nepal stands at 241,995 and 1,614 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 nation-wide lockdown, closure of international border, testing of suspected cases, isolation, treatment, contract tracing, and management of quarantine centres.

1.1 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:

1. 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=EAIaIQobChMIpu2y9aym6wIVjx0rCh2zNgN6EAAYASAAEgI1zvD_BwE*

[2] *Ibid*

II. Lumbini Province

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

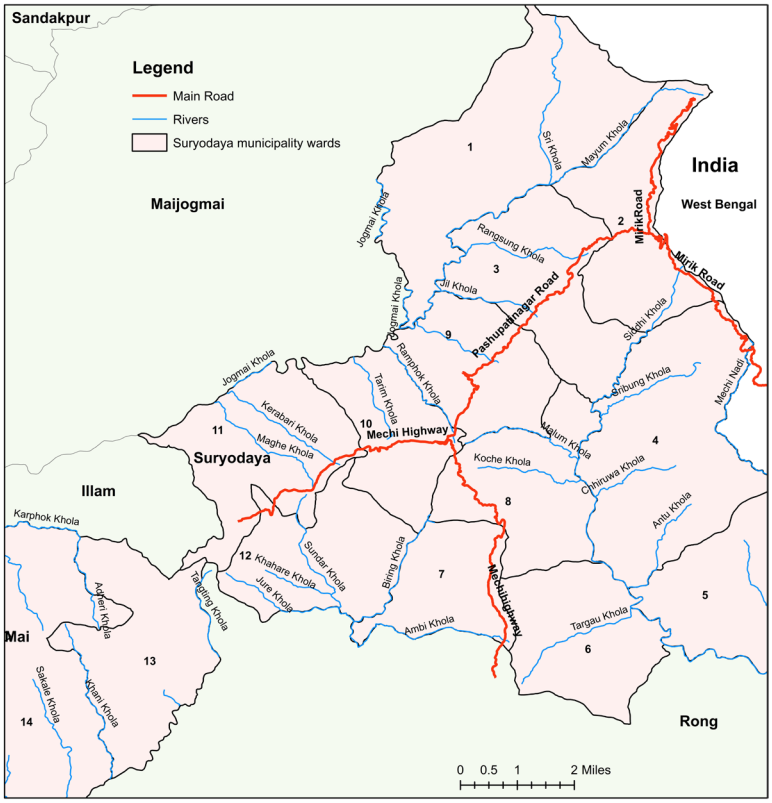
III. Province 1

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 Suryodaya Municipality, Province 1, between 14 and 18 October 2020.

1.2 MUNICIPALITY PROFILE

Suryodaya Municipality is located in Ilam District, in the south-eastern part of Nepal. Situated in the hilly area (1565 m above sea level, on average), the municipality is over 490 km away from Kathmandu, the capital city. It covers a total of 252.5 sq. Km (see Map 1), and borders with Maijogmai Rural Municipality in the north, India in the east, Rong Rural Municipality in the south, Mai Municipality in the south-west, and Ilam Municipality in the west.



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

According to the census in 2011, the population living in the area is 56,691 (27,861 men and 28,830 women). The main sources of income in the municipality are agriculture, tourism, and business. In Suryodaya Municipality there are a total of 9 urban health centres, including two (2) Primary Health Care Centers, and 7 health posts, for a total capacity of 8 beds. Registered health workers are 46, with 3 doctors, 2 nurses, 21 auxiliary nursing midwives, and 20 auxiliary health workers.

1.3 OBJECTIVES

The PMM has four main objectives:

1. Identify travellers' profiles and mobility patters 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 obtainment 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 City on 14 and 15 August 2020, in Nepalgunj Sub-Metropolitan City on 9 and 10 September 2020, and in Biratnagar Metropolitan City on 1 and 2 October 2020 (Picture 3 and 4), for a total of 45 NRCS staffs who have supported the IOM PMM staff in the implementation of field activities. 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: The PMM trainer presenting in Nepali (left) and GPS coordinate training (right)

2.2 DATA COLLECTION

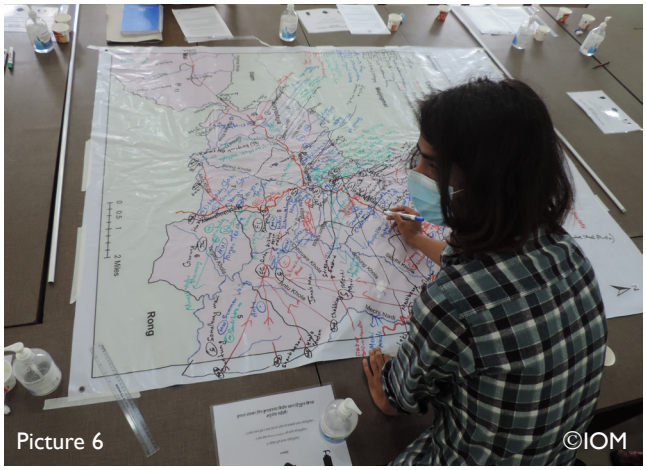
The method implemented in Suryodaya Municipality involves two different phases.

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 Suryodaya Municipality was conducted on 14 and 15 October 2020 and was comprised of 5 FGDs. A total of 24 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 FGDs in Suryodaya 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 1). 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 social 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: Examples of road infrastructure

3. RESULTS

3.1 PHASE I

Following the data entry and consequent matrix analysis (see Annex 2), a total of 87 sites with high population mobility were selected for further assessments for Phase II. In particular, these are; 18 POEs, 10 Health Centres, 6 Traditional Healers, 7 Schools and Colleges, 4 Entertainment Centres, 8 Market Centres, 6 Migrant Worksites, 12 Transport Stations, 9 Places of Worship, and 7 Other Places (see Table 1.1).

Table 1.1: Full names and localities of vulnerable sites identified within the municipality

POEs		
n	**Name Site**	**Locality**
1	Bhalukhop POE	Bhalu Khop
2	Harkate POE	Harkate
3	Pashupatinagar Int. POE	Pashupatinagar
4	Odare Arubote POE	Arubote
5	Gufapatal Int. POE	Gufa patal
6	Jure Bhanjyang POE	Jure Bhanjyang
7	Samalbung Int. POE	Samalbung
8	Tribeni Chowk POE	Chumbang
9	Teen Block Int. POE	Teen Block
10	Jobmai Khosla POE	Sangubasi
11	Chhiruwa Int. POE	Chhiruwa
12	Mechi Bazar Int. POE	Shree Antu
13	Chhabise Int. POE	Chhabise
14	Maneybhanjyang Int. POE	Maneybhanjyang
15	Chitrey Int. POE	Chitre
16	Khola Godam Int. POE	Khola Godam
17	Two Mile Int. POE	Tashi Gaun
18	Sungtung Int. POE	Sungtung

Health Centres		
n	**Name Site**	**Locality**
19	Shrijana Medical Hall	Fikkal Chowk
20	Fikkal Primary Health Center	Fikkal
21	Mechi Ayurdevic Health Facility	Aitabare
22	Loksom Ayurdevic Clinic	Fikkal
23	Suryodaya Primary Health Center	Pashupatinagar
24	Om Ayurdevic Clinic	Fikkal
25	Suryodaya Fikkal Polyclinic	Fikkal
26	Fikkal Hospital Pvt. Ltd.	Fikkal
27	Astanga Ayurdevic Pharmacy	Fikkal
28	Jhapa Chasma Ghar	Fikkal

Traditional Healers	
n	**Locality**
29	Gairigaun Guru (TK)
30	Harkate Mata
31	Pashupatinagar Mata
32	Teen Khutte Lama Guru
33	Artheytaar Baba
34	Gairigaun Guru

Schools and Colleges		
n	**Name Site**	**Locality**
35	Krishna Asram Madhyamik Vidhalaya	Kanyam
36	Fikkal Secondary School	Fikkal
37	Everland International Academy	Fikkal
38	Sunrise English School	Fikkal
39	Karfok Bidhyamandir Secondary School	Karfok
40	Janak Ma. Vi.	Shree Antu
41	Karfok Multiple Campus	Karfok

Entertainment Centres		
n	**Name Site**	**Locality**
42	Pashupatinagar View Point	Pashupatinagar
43	Karfok Play Ground	Karfok
44	Antu Pond	Shree Antu
45	Kanyam View Point	Kanyam

Market Centres		
n	**Name Site**	**Locality**
46	Fikkal Market	Fikkal
47	Harkate Market	Harkate
48	Teenghare Market	Teen Ghare
49	Pashupatinagar Market	Pashupatinagar
50	Kattuse Market	Kattuse
51	Gorkhe Market	Gorkhe
52	Shanti Market	Shanti Chowk
53	Maneybhanjyang Market	Maneybhanjyang

Migrant Worksites		
n	**Name Site**	**Locality**
54	The New Pradhan Hotel	Teen Ghare
55	Kanyam Tea State	Kanyam
56	Ilam Tea Producer	Aitabare
57	Samal Valley Tea State	Samalbung
58	Lucky Cheese Factory	Teen Ghare
59	Bindhyabasini Eco Brick Industry	Teen Ghare

Transport Stations		
n	**Name Site**	**Locality**
60	Fatak Taxi Stand	Fikkal
61	Kanyam Taxi Stand	Kanyam
62	Antu Taxi Stand	Shree Antu
63	Antu Taxi Stand	Fikkal
64	Pashupatinagar Taxi Stand	Pashupatinagar
65	Pashupatinagar Taxi Stand	Fikkal
66	Ilam Taxi Stand	Fikkal
67	Jhapa Taxi Stand	Fikkal
68	Harkate Taxi Stand	Harkate
69	Teen Ghare Taxi Stand	Tenn Ghare
70	Pashupatinagar Buspark	Pashupatinagar
71	Samalbung Taxi Station	Shanti Bajar

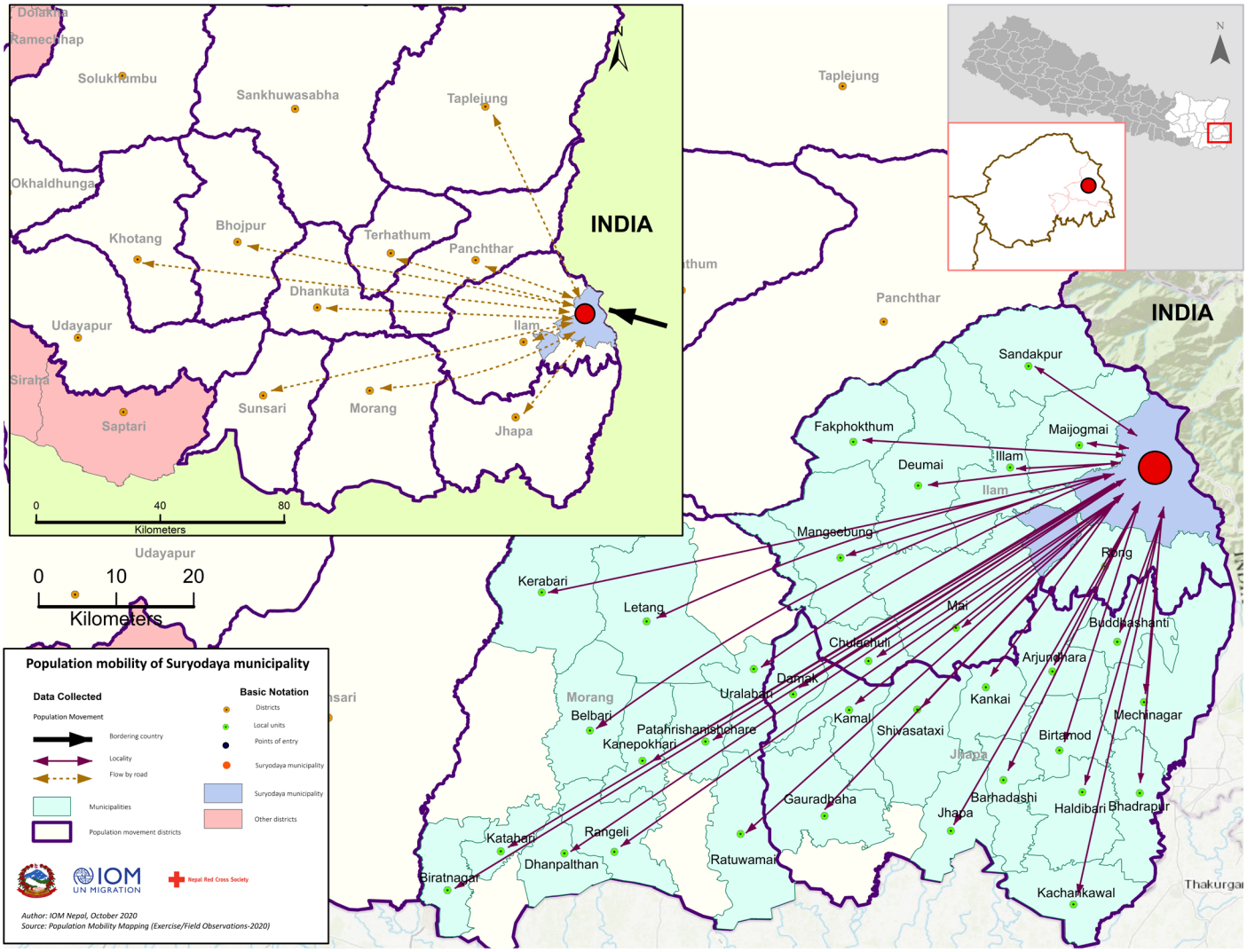
Places of Worship		
n	**Name Site**	**Locality**
72	Shiva Temple	Barbote
73	Panchakanya Temple	Panchakanya
74	Chitrey Monastery	Maneybhanjyang
75	Shree Krishna Pranami Temple	Fikkal
76	Pashupatinath Temple	Pashupatinagar
77	Mangal Temple	Melbote
78	Urgen Chholing Yolmo Monastery	Teen Khutte
79	Fensol Monastery	Fikkal
80	Believers Church	Barbote

Other Places		
n	**Name Site**	**Locality**
81	Kanyam Festival	Kanyam
82	Fikkal Festival Celebration	Fikkal
83	Laakhe Dance Exhibition	Fikkal
84	Krishna Janmasthami Festival	Fikkal
85	Harkate Lila Hotel	Harkate
86	Suryodaya Municipality Office	Fikkal
87	LamatarJunction	Lamatar

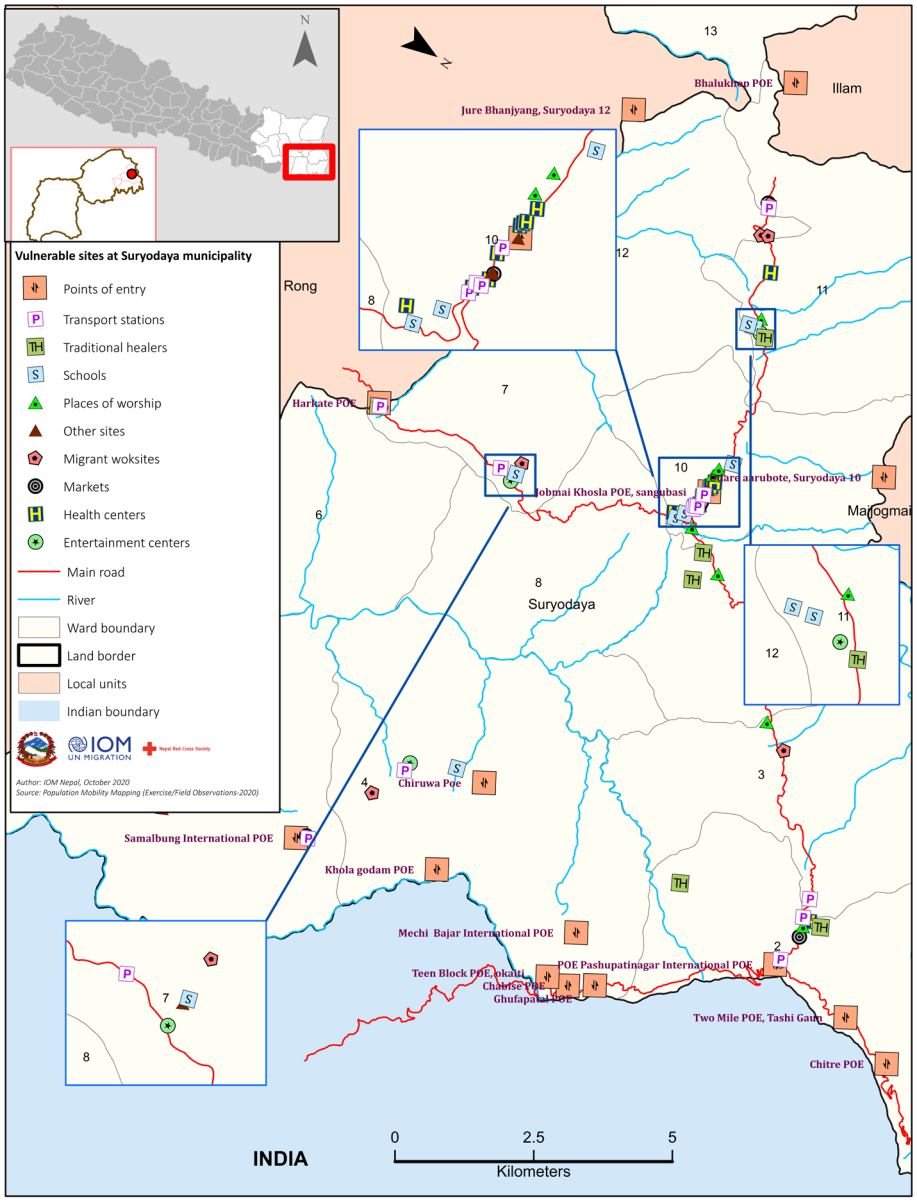
3.2 PHASE II

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

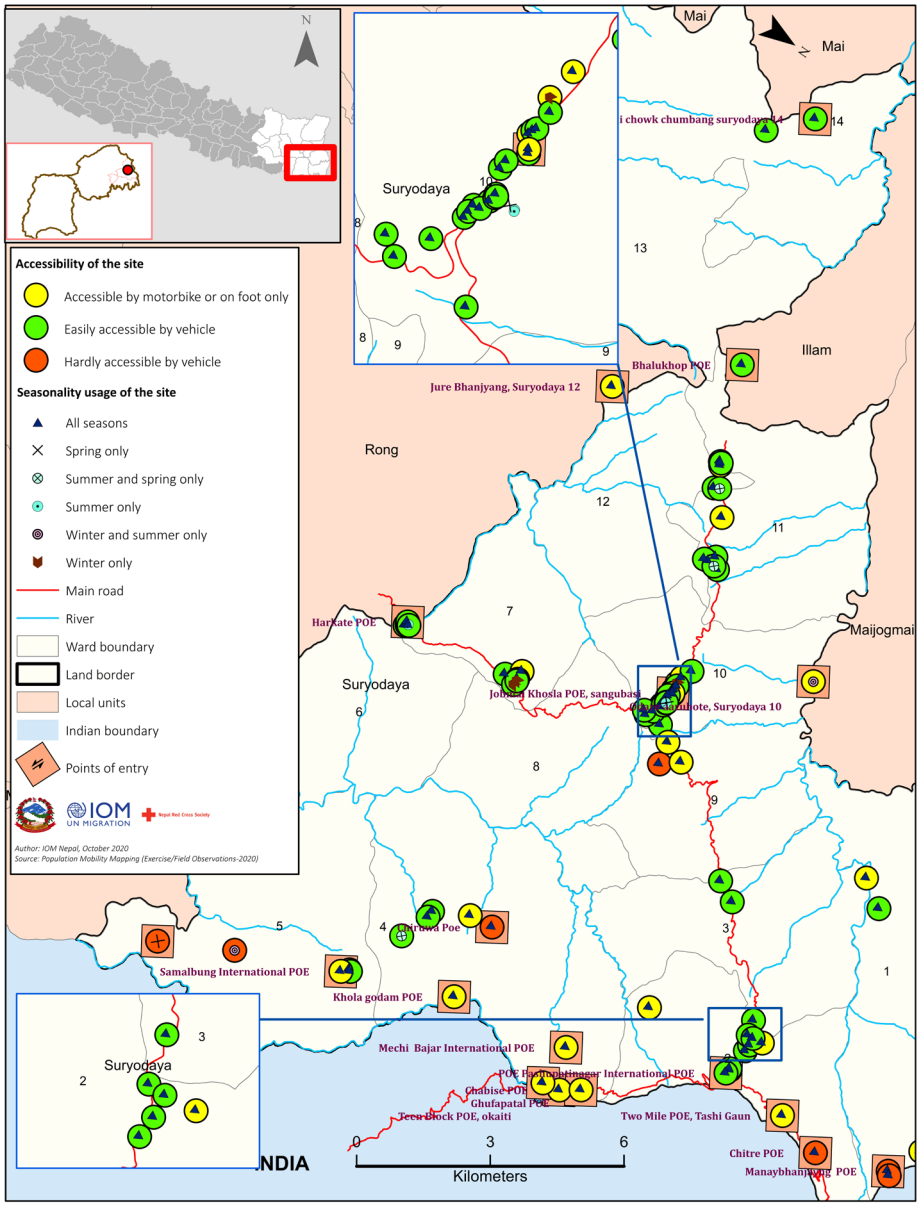
3.2.a MAPS



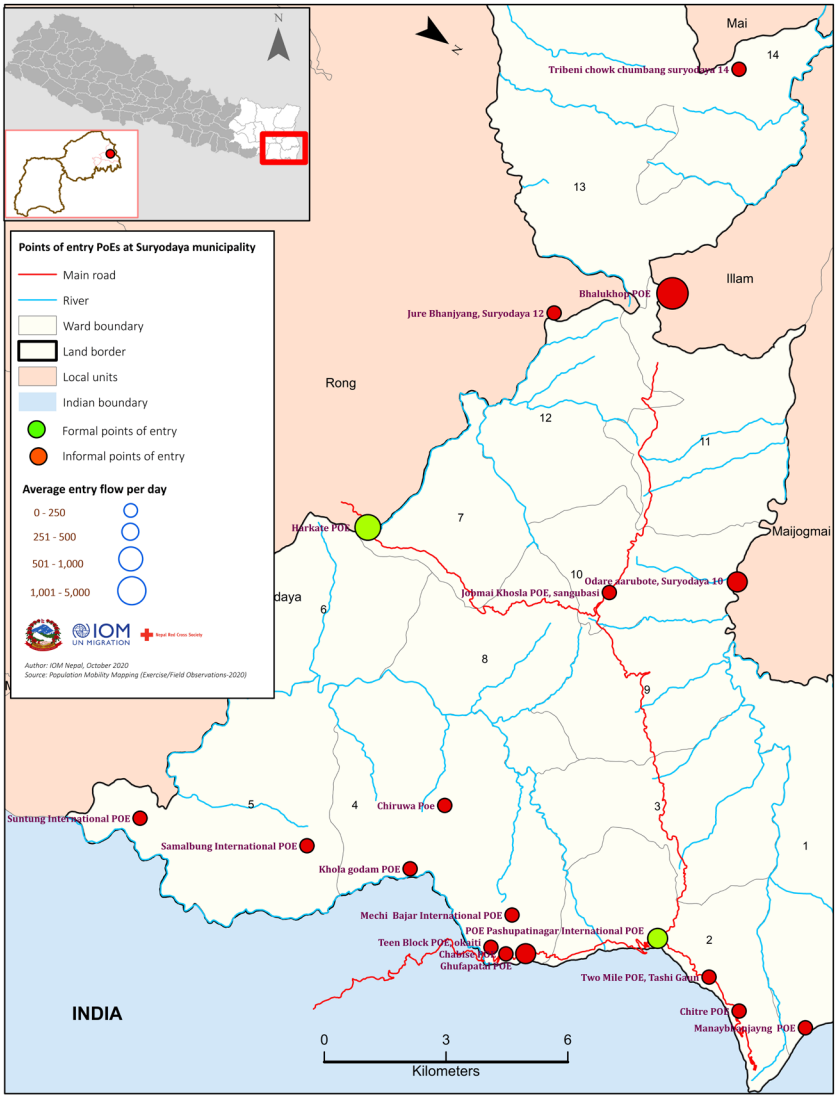
Map 2: Population movement from/to Suryodaya Municipality at the municipality, district and international level



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 (Suryodaya Municipality)

Field Observations: Site assessments and interviews with KIs

3.2.b POINTS OF ENTRY (POEs)

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

The study reveals that the identified POEs in Suryodaya Municipality attract a significant number of people from Nepal and India. However, people from Malaysia, Nigeria, Bhutan and USA are also accounted for in the population mobility at the respective POEs. According to the analysis, *Pashupatinagar Int. POE* is reported as the only formal crossing point between Nepal and India in Suryodaya Municipality. People crossing the identified POEs come from all over the country, however, they predominantly travel from *Ilam, Jhapa, Panchthar, Taplejung, Sunsari, Morang, Tehrathum* and *Dhankuta* districts. Correspondingly, at the municipality level, the population mobility to the POEs mostly originates from *Suryodaya Municipality, Rong Rural Municipality, Shivasatakshi Municipality, Maijogmai Rural Municipality, Mai Municipality, Sandakpur Rural Municipality, Ilam Municipality, Mangsebung Rural Municipality, Gauradaha Municipality,* and *Arjundhara Municipality.* In Suryodaya Municipality, the POEs are open to the public every day and throughout the year, except for temporary stoppage of cross-border movement imposed by the government in the event of public health crisis or any other governance issue. However, in normal times, the busiest days are documented as Saturday and Sunday. In the same way, December and January are recorded as the busiest months in terms of higher population mobility.

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

In terms of connectivity, *Pashupatinagar Int. POE* (formal) is situated at *Pashupatinagar* locality which is associated with *Fikkal-Pashupatinagar Road.* This POE is accessible by all kinds of vehicles, however, people from India mainly use cars, minivans and motorbikes to access the site. As per observations, the nearest localities to this POE are documented as *Artheytaar, Rungsung, Bouddhadham*, and *Teen Khutte*. Similarly, *Two Mile POE* and *Chitrey POE* are located at *Two Mile* and *Chitrey* localities, and despite not being accessible by vehicle, they are linked to *Rishi Road* (Indian road) at the border. The nearest localities to these POEs are recorded as *Pashupatinagar, Simana, Chitry, Tashi Gaun,* and *Rungsum*. Likewise, *Maneybhanjyang POE* is based in *Maneybhanjyang* locality, which has minimal vehicular movement due to the difficult geographical terrain as well as the unavailability of black top road. However, during the winter season, some vehicles can access this POE. The nearest localities to this POE are reported as *Manglabare, Chhaghare,* and *Chhedi Khola*. Correspondingly, *Chhabise POE, Gufapatal POE, Mechi Bazar POE, Teen Block POE,* and *Khola Godam POE* are situated at *Chhabise, Gufapatal, Mechi Bazar, Teen Block* and *Khola Godam* localities, respectively, in close proximity to each other. According to the field observations, the Nepal-India border extends in such a way that these POEs are close to each other, however, due to its geography, they are accessible by different localities as mentioned above. These POEs are well accessible by all kinds of vehicles, however, people from localities nearby predominantly use cars and motorbikes. As per observations, the nearest localities to these POEs are observed as *Mechi Bazar, Okaiti, Gufapatal, Char Mile*, and *Shree Antu*. On the other hand, *Chhiruwa POE, Samalbung POE, Jure Bhanjyang POE,* and *Sungtung POE* are situated at *Chhiruwa, Samalbung, Shree Antu* and *Sungtung* localities, and they are located in close proximity to each other. All these POEs are accessible by vehicle, except for *Sungtung POE*. According to the findings, *Sungtung POE* presents unavailability of a vehicle road due to the difficult terrain, therefore, people access this site by foot. Furthermore, *Odare Arubote POE* is based in *Arubote* locality, which is connected to the *Mechi Highway* and the nearest localities are observed as *Maghe, Fikkal, Namsalilng* and *Dhode*. Similarly, *Bhalukhop POE* is located at *Bhalukhop* locality, which is connected to the *Mechi Highway* in *Teen Ghare* locality, and close to *Teen Ghare, Kattuse, Aitabare* and *Panchakanya* localities. Likewise, *Tribeni Chowk POE* lies in *Tribeni Chowk* locality which is connected to the *Mechi Highway* via *Namsaling Road,* with good accessibility by all kinds of vehicles. The nearest localities to this POE are reported as *Arubote, Premjung,*

and *Namsaling*. Correspondingly, *Jobmai Khosla POE* is situated at *Jobmai Khosla* locality which is connected to the *Mechi Highway* in *Fikkal* locality. The study suggests that the nearest localities to this POE are *Lapsibhote, Makarjung, Premjung* and *Dhap*. Furthermore, *Harkate POE* is situated at *Harkate* locality, which is connected to the *Mechi Highway* via several smaller vehicle routes connecting localities close by, *Faajeegaun, Kanyam, Kolbong,* and *Marse*.

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

A total of eighteen (18) POEs were investigated in Suryodaya Municipality, which is less than in Mechinagar Municipality (20) but higher than in Biratnagar Metropolitan City (13), and the second largest number of assessed POEs across the municipalities where PMM activities were conducted. Among them, only one (1) is formal and seventeen (17) are informal crossing points. Similarly, the majority of the POEs assessed are land border (17/18), except for *Sungtung Int. POE,* a water landing site (swimming/boat/by foot if shallow water). In Fig. 1.1, the POEs are sorted in descending order of magnitude and the topmost layer of the figure shows that *Bhalukhop POE* (informal) accounts for the highest entry flow across all the POEs in Suryodaya Municipality, with a population mobility of 5,000 people per day and 15,000 people on the busiest day. This is followed by *Harkate POE, Pashupatinagar Int. POE (formal), Odare Arubote POE,* and *Gufapatal Int. POE,* with a population distribution of 1,000, and 500 each per day, and 3,000, 700, 1,200, and 700 people on the busiest day, respectively. The remaining thirteen (13) POEs have a minimum of 10 people and a maximum of 250 people per day, while on the busiest day, the population size increases to a minimum of 12 people and a maximum of 1,000 people. All the POEs in Suryodaya Municipality attract people from other countries with a majority from India, and specifically, *Pashupatinagar Int. POE, Odare Arubote POE, Jure Bhanjyang POE,* and *Khola Godam Int. POE* receive people from India, USA, Bhutan, Malaysia, Nigeria, and China. Though the average entry flow at *Pashupatinagar Int. POE* (formal) is limited (500 people per day and 700 on the busiest day) compared to *Bhalukhop POE* (informal), the former attracts the largest number of people from India (95%/475 people per day), followed by *Samalbung Int.* and *Jobmai Khosla* POEs (50%/100 and 50 people per day, respectively). The third highest influx of people from India, in terms of percentage, occurs at *Gufapatal Int. POE, Teen Block Int. POE,* and *Maneybhanjyang Int. POE* with 30 and 25 per cent each, respectively. The remaining POEs have at most 10 per cent and at least 1 per cent of people coming from other countries (see Fig. 1.1).

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

Name of POE	Type of POE	Site status	People coming from other country	Average entry flow per day	Average entry flow on the busiest day	Average dual flow	Percentage coming from other country
Bhalukhop POE, Bhalukhop	Land border	Informal	India	5,000	15,000	5,833	10
Harkate POE, Harkate	Land border	Informal	India, USA, Bhutan, China	1,000	3,000	1,167	3
Pashupatinagar Int. POE, Pashupatinagar	Land border	Formal	India	500	700	539	95
Odare Arubote POE, Arubote	Land border	Informal	India, Malaysia	500	1,200	567	10
Gufapatal Int. POE, Gufapatal	Land border	Informal	India	500	700	539	30
Jure Bhanjyang POE, Jure Bhanjyang	Land border	Informal	India, Malaysia	250	1,000	306	2
Samalbung Int. POE, Samalbung	Land border	Informal	India	200	450	225	50
Tribeni Chowk POE, Chumbang	Land border	Informal	India	100	1,000	156	1
Teen Block Int. POE, Okaiti	Land border	Informal	India	100	200	111	25
Jobmai Khosla POE, Sangubasi	Land border	Informal	India	100	150	108	50
Chhiruwa Int. POE, Chhiruwa	Land border	Informal	India	80	100	86	20
Mechi Bazar Int. POE, Shree Antu	Land border	Informal	India	60	80	64	2
Chhabise Int. POE, Chhabise	Land border	Informal	India	60	80	64	10
Maneybhanjyang Int. POE, Maneybhanjyang	Land border	Informal	India	50	120	57	25
Chitrey Int. POE, Chitre	Land border	Informal	India	50	100	56	5
Khola Godam Int. POE, Khola Godam	Land border	Informal	India, Nigeria	30	50	33	10
Two Mile Int. POE, Tashi Gaun	Land border	Informal	India	25	50	28	5
Sungtung Int. POE, Sungtung	Water landing (swimming/boat/by foot)	Informal	India	10	12	11	2

Fig. 1.1: Mobility patterns across the POEs

The most used health centre differs across the POEs and their localities. However, *Fikkal Primary Health Centre* accounts for the most used (8/18), followed by *Pashupatinagar Primary Health Centre* and *Fikkal Hospital* (3/18 each). The majority of the POEs have electricity (15/18), except for *Bhalukhop POE, Jure Bhanjyang POE,* and *Maneybhanjyang Int. POE,* contrary to the analysis obtained in Mechinagar Municipality and Biratnagar Metropolitan City, where most of the POEs lack electricity (80%). At all the POEs assessed, the busiest days vary across the sites, however, they are mostly busier between Thursday-Saturday, except for *Bhalukhop POE, Chhabise Int. POE, Gufapatal Int. POE, Teen Block Int. POE,* and *Two Mile Int. POE*, which are busy throughout the week (see Table 1.2). Most of the sites are busy throughout the year (12/18), while at the remaining POEs, the busiest months are January, March, April, June, July, October, November, and December. Most of the POEs do not have toilet facilities nearby (17/18), except for *Maneybhanjyang Int. POE*. There is availability of water (for drinking, handwashing and/or other purposes) at twelve (12) POEs, while the remining six (6) POEs lack water facilities on site.

Table 1.2: Basic health infrastructure at the POEs

Name of POE	Name of the most used health centre	Availability of electricity	Busiest day of the week	Busiest month of the year	Availability of toilet nearby	Availability of water on site
Bhalukhop POE, Bhalukhop	Fikkal Primary Health Center	Not available	Every day	Every month	Not available	Not available
Chhabise Int. POE, Chhabise	Pashupatinagar Primary Health Center	Available	Every day	June, July, August	Not available	Not available
Chhiruwa Int. POE, Chhiruwa	Fikkal Primary Health Center	Available	Thursday, Sunday	October, November, December	Not available	Available
Chitrey Int. POE, Chitre	Pashupatinagar Primary Health Center	Available	Friday	Every month	Not available	Not available
Gufapatal Int. POE, Gufapatal	Fikkal Hospital	Available	Every day	Every month	Not available	Not available
Harkate POE, Harkate	Harkate Health Post	Available	Saturday, Friday	Every month	Not available	Available
Jobmai Khosla POE, Sangubasi	Fikkal Hospital	Available	Thursday, Saturday	June, July, January	Not available	Available
Jure Bhanjyang POE, Jure Bhanjyang	Fikkal Primary Health Center	Not available	Sunday ,Thursday	Every month	Not available	Available
Khola Godam Int. POE, Khola Godam	Chhiruwa Primary Health Center	Available	Sunday	Every month	Not available	Available
Maneybhanjyang Int. POE, Maneybhanjyang	Gorkhe Health Post	Do not know	Friday, Sunday	Every month	Available	Available
Mechi Bazar Int. POE, Shree Antu	Fikkal Primary Health Center	Available	Sunday	December, November, October	Not available	Available
Odare Arubote POE, Arubote	Fikkal Primary Health Center	Available	Thursday	Every month	Not available	Available
Pashupatinagar Int. POE, Pashupatinagar	Fikkal Primary Health Center	Available	Monday	March, April	Not available	Not available
Samalbung Int. POE, Samalbung	Fikkal Primary Health Center	Available	Saturday	Every month	Not available	Available
Sungtung Int. POE, Sungtung	Samalbung Health Post	Available	Saturday	December, November, October	Not available	Available
Teen Block Int. POE, Okaiti	Fikkal Hospital	Available	Every day	Every month	Not available	Available
Tribeni Chowk POE, Chumbang	Fikkal Primary Health Center	Available	Saturday	Every month	Not available	Available
Two Mile Int. POE, Tashi Gaun	Pashupatinagar Primary Health Center	Available	Every day	Every month	Not available	Not available

Sixteen (16) out of the eighteen (18) POEs investigated in Suryodaya Municipality lack special equipment to address health related issues of Public Health Emergency of International Concern (PHEIC), expect for *Chitrey Int. POE* and *Two Mile Int. POE.* Furthermore, an assessment was also done to determine International Health Regulations (IHR) status across the POEs, especially the formal POE. Among them, none has an IHR focal point within the border, and only the formal POE (*Pashupatinagar Int.*) has one in the corresponding country, notably India. Similarly, there is no presence of community health workers or agents or volunteers responsible for health issues related to minor and emergency cases (15/18), except at *Chitrey POE, Two Mile Int. POE,* and *Pashupatinagar Int. POE.* The distance to the nearest or most used health centre differs across each POE. The topmost bars (left) show that *Teen Block Int. POE* and *Chhabise Int. POE* are the farthest away from the health centres, at approximately 7 Km each. These are followed by *Mechi Bazar Int. POE* and *Gufapatal Int. POE,* at about 6 Km each. On the contrary, the remaining POEs are between less than 1 Km and up to 5 Km away from the nearest health centres. The distance from the nearest health centre to the referral centre differs across the majority of the POEs, except for *Sungtung Int. POE, Odare Arubote POE, Khola Godam Int. POE, Chitrey Int. POE, Two-Mile Int. POE,* and *Harkate POE* whose distances are the same as that from the nearest health centre (see Fig. 1.2). Overall, the distance to the referral centres is significant for most

of the POEs (10/18), with a minimum of 8 Km and a maximum of 20 Km. The distance to the nearest water source varies across the twelve (12) POEs with water facilities, although within a radius of 1.5 Km.

Status of health infrastructure and distance to the nearest health centres and water source

Name of POE	Availability of special equipment to address health issues of PHEIC	Presence of IHR focal point at POE	Presence of IHR focal point from corresponding country	Presence of community health worker/agent	Availability of water on site	Distance to the nearest health centre [in Km]	Distance from the nearest health centre to the referral centre [in Km]	Distance to the nearest water source [in Km]
Teen Block Int. POE, Okaiti	Not available	Not available	Not available	Not available	Available	7.00	14.00	0.10
Chhabise Int. POE, Chhabise	Not available	Not available	Not available	Not available	Not available	7.00	4.00	
Mechi Bazar Int. POE, Shree Antu	Not available	Not available	Not available	Not available	Available	6.00	12.00	0.00
Gufapatal Int. POE, Gufapatal	Not available	Not available	Not available	Not available	Not available	6.00	15.00	
Sungtung Int. POE, Sungtung	Not available	Not available	Not available	Not available	Available	5.00	5.00	0.01
Odare Arubote POE, Arubote	Not available	Not available	Not available	Not available	Available	5.00	5.00	1.00
Tribeni Chowk POE, Chumbang	Not available	Not available	Not available	Not available	Available	3.00	20.00	1.00
Khola Godam Int. POE, Khola Godam	Not available	Not available	Not available	Not available	Available	3.00	3.00	0.01
Chitrey Int. POE, Chitre	Available	Not available	Not available	Available	Not available	3.00	3.00	
Bhalukhop POE, Bhalukhop	Not available	Not available	Not available	Not available	Not available	3.00	8.00	
Two Mile Int. POE, Tashi Gaun	Available	Not available	Not available	Available	Not available	2.00	2.00	
Jobmai Khosla POE, Sangubasi	Not available	Not available	Not available	Not available	Available	2.00	8.00	0.02
Pashupatinagar Int. POE, Pashupatinagar	Not available	Not available	Available	Available	Not available	1.00	10.00	
Harkate POE, Harkate	Not available	Not available	Not available	Not available	Available	1.00	1.00	0.01
Jure Bhanjyang POE, Jure Bhanjyang	Not available	Not available	Do not know	Not available	Available	0.10	11.00	1.50
Maneybhanjyang Int. POE, Maneybhanjyang	Not available	Not available	Not available	Not available	Available	0.05	0.02	0.01
Samalbung Int. POE, Samalbung	Not available	Not available	Not available	Not available	Available	0.02	18.00	0.00
Chhiruwa Int. POE, Chhiruwa	Not available	Not available	Not available	Not available	Available	0.02	11.00	0.00

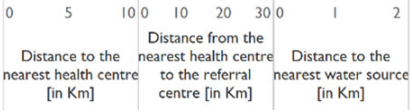


Fig. 1.2: The presence of IHR and PHEIC focal points, and distance to the nearest health/referral centre

At nearly all the POEs (15/18), except for *Mechi Bazar Int. POE, Odare Arubote POE,* and *Teen Block Int. POE*, the respondents are knowledgeable of procedures to follow for suspected COVID-19 cases. The majority of the travellers passing through these BCPs do not wear masks, with reference to the following analysis; less than 10 per cent (17/18) wear masks, except at *Pashupatinagar Int. POE* (between 10-30%). The percentage is particularly low and consequently, concerning, especially at *Bhalukhop POE* (informal) whose population mobility is over 5,000 people per day (see Table 1.3). Most of the sites have an uninterrupted voice communication network (10/18), while the remaining eight (8) POEs have an interrupted network system or none at all (*Sungtung Int. POE*). There is no record of tracking people or contact tracing mechanism across all the POEs as people cross the border, except at *Harkate POE.* Similarly, health screening stations for handwashing with soap and hand sanitizer, as well as IPC personnel are completely absent, except at *Pashupatinagar Int. POE,* with a health screening station and IPC personnel but no necessary equipment to implement IPC measures. This is concerning also considering that 95 per cent of the POEs in Suryodaya Municipality are operational throughout the seasons, except for *Odare Arubote POE* and *Sungtung Int. POE* which are only operational in winter, summer, and spring, and similarly to other municipalities where the study was conducted. According to the respondents, there were four (4) suspected COVID-19 positive cases reported at *Pashupatinagar Int. POE, Jure Bhanjyang POE, Bhalukhop POE,* and *Tribeni Chowk POE.*

Table 1.3: Status of IPC and suspected COVID-19 cases at the POEs

Name of POE	Knowledge of procedures to follow for suspected COVID-19 cases	Suspected COVID-19 cases on site	Estimated percentage wearing mask	Availability of health screening station	Presence of IPC personnel	Availability of record book/device for travellers	Seasonality at POE	Communication status
Chhabise Int. POE, Chhabise	Yes	No	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Bhalukhop POE, Bhalukhop	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Chhiruwa Int. POE, Chhiruwa	Yes	No	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Chitrey Int. POE, Chitre	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Gufapatal Int. POE, Gufapatal	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Harkate POE, Harkate	Yes	No	<10%	Not available	Not available	Available	All seasons	Good (uninterrupted network)
Jobmai Khosla POE, Sangubasi	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Jure Bhanjyang POE, Jure Bhanjyang	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Khola Godam Int. POE, Khola Godam	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Maneybhanjyang Int. POE, Maneybhanjyang	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Mechi Bazar Int. POE, Shree Antu	No	No	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Odare Arubote POE, Arubote	No	No	<10%	Not available	Not available	Not available	Winter only	Bad (interrupted network)
Pashupatinagar Int. POE, Pashupatinagar	Yes	Yes	10%-30%	Available	Available	Do not know	All seasons	Good (uninterrupted network)
Samalbung Int. POE, Samalbung	Yes	No	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Sungtung Int. POE, Sungtung	Yes	No	<10%	Not available	Not available	Not available	Spring only	No network
Teen Block Int. POE, Okaiti	No	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)
Tribeni Chowk POE, Chumbang	Yes	Yes	<10%	Not available	Not available	Not available	All seasons	Bad (interrupted network)
Two Mile Int. POE, Tashi Gaun	Yes	No	<10%	Not available	Not available	Not available	All seasons	Good (uninterrupted network)

3.2.c HEALTH CENTRES

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

According to the results obtained from the participatory mapping exercises and field observations, the health centres in Suryodaya Municipality attract a noticeable number of people from Nepal as well as India. It has been observed that most of the health centres are situated at the *Fikkal* locality, one of the biggest localities in terms of population mobility as well as a junction in the municipality. The study shows that the health centres are operational every day and throughout the year, however, Thursday is documented as the busiest day in terms of higher people's movement. Similarly, the busiest months at the respective health centres are recorded as January, February and March. The population mobility at the respective health centres in Suryodaya Municipality is eminently from *Ilam, Jhapa, Sunsari, Morang, Panchthar, Tehrathum*, and *Taplejung* districts. At the municipality level, visitors and patients accessing these facilities are mainly from *Suryodaya Municipality, Mai Municipality, Rong Rural Municipality, Maijogmai Rural Municipality, Arjundhara Municipality, Kechanakawal Rural Municipality,* and *Ilam Municipality.*

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

As per the analysis from the field observations, the majority of the health centres in Suryodaya Municipality are based in *Fikkal* locality, situated at the junction of *Ilam Bazar, Shree Antu, Kanyam* and *Pashupatinagar* locality, which accounts for a relatively higher population mobility compared to other localities. Also, as per observations, the terrain of Suryodaya Municipality is such that only a few lowlands are available which result in clustered health centres available in *Fikkal* locality. For example, the health centres with the highest population mobility among those investigated are *Fikkal Primary Health Centre* and *Shrijana Medical Hall* and are situated at *Fikkal* locality. Similarly, *Loksom Ayurvedic Clinic, Om Ayurvedic Clinic, Fikkal Hospital Pvt. Ltd., Jhapa Chasma Ghar, Suryodaya Fikkal Polyclinic,* and *Astanga*

Ayurvedic Pharmacy are also located at *Fikkal* locality, which is linked to the *Mechi Highway*. The alternative vehicle route to access these centres is *Fikkal-Pashupatinagar Road*, which connects to *Pashupatinagar Int. POE* (formal). These health centres are easily accessible by all kinds of vehicles, however, people from India use minivans and motorbikes as modes of transport to access these sites. As per the observations, the nearest localities to these health centres are *Kanyam, Panchakanya, Teen Khutte, Aitabare* and *Teen Ghare*. On the other hand, *Suryodaya Primary Health Centre* is situated at *Pashupatinagar* locality and linked to *Fikkal-Pashupatinagar Road,* which is easily accessible by all kinds of vehicles. The nearest localities to this health centre are reported as *Artheytaar, Rungsung, Bouddhadham,* and *Teen Khutte*. Furthermore, *Mechi Ayurvedic Health Facility* is based in *Aitabare* locality, which is associated with the *Mechi Highway* and also accessible by vehicle. This health centre is reachable via other alternative routes as well, such as *Maghe-Aitabare Road, Aitabare-Aathghare Road* and *Kalapani-Maghe Road*. The nearest localities to this health centre are observed as *Teen Ghare, Panchakanya, Fikkal* and *Ilam Bazar*.

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

A total of ten (10) health centres were investigated in Suryodaya Municipality, which is a higher number than those assessed in Biratnagar-Metropolitan City (5) but less than in Mechinagar Municipality (12). Among these ten (10) health centres, only three (3) (*Fikkal Primary Health Centre, Mechi Ayurvedic Health Facility,* and *Suryodaya Primary Health Centre*) are government-owned, whereas the remaining seven (7) are private centres. The average number of people visiting the health centres varies across the respective facilities. *Shrijana Medical Hall, Fikkal Primary Health Centre,* and *Mechi Ayurvedic Health Facility* account for the highest flow with 250 each, and 100 people per day, while on the busiest days the numbers increase to 450, 300, and 250, respectively, which are by far less than in Biratnagar Metropolitan City (3,000 max. per day), but similar to the entry flows in Mechinagar Municipality. The remaining seven (7) health centres have at most 60 people and at least 20 people per day, while on the busiest days the maximum influx is 100 people and the minimum is 50. Most of health centres investigated receive people from India, except for *Astanga Ayurvedic Pharmacy* whose patients are Nepalese nationals. Specifically, 40 per cent of the population at *Mechi Ayurvedic Health Facility* and *Suryodaya Primary Health Centre* (each) mainly comes from India, whereas the remaining (60%) is from within the same municipality and nearby municipalities (see Fig. 2.1). The second highest influx of people from other countries can be found at *Om Ayurvedic Clinic* with a percentage of 30. The remaining six (6) sites receive a far less significant percentage (equal or less than 10%).

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

Name of health centre	Type of health centre	Average entry flow per day	Average entry flow on the busiest day	Average dual flow	Percentage coming from India
Shrijana Medical Hall, Fikkal	Private	250	450	295	10
Fikkal Primary Health Center, Fikkal	Government	250	300	280	1
Mechi Ayurvedic Health Facility, Aitabare	Government	100	250	125	40
Loksom Ayurvedic Clinic, Fikkal	Private	60	100	70	3
Suryodaya Primary Health Center, Pashupatinagar	Government	50	100	60	40
Om Ayurvedic Clinic, Fikkal	Private	50	100	60	30
Suryodaya Fikkal Polyclinic, Fikkal	Private	40	80	48	10
Fikkal Hospital Pvt. Ltd., Fikkal	Private	25	50	30	2
Astanga Ayurvedic Pharmacy, Fikkal	Private	25	50	30	0
Jhapa Chasma Ghar, Fikkal	Private	20	50	25	3
		0 100 200 300	0 200 400 600	0 100 200 300	0 20 40

Fig. 2.1: Mobility patterns at the health centres

Most of the health centres are operational 24/7 (6/10), except for *Shrijana Medical Hall, Astanga Ayurvedic Pharmacy Clinic, Jhapa Chasma Ghar,* and *Om Ayurvedic Clinic,* contrary to Biratnagar Metropolitan City where all the health centres are operational and functioning 24/7 but similar to the analysis obtained in Mechinagar Municipality (half of the health centres operational 24/7 and half are not). The majority of the health centres (6/10) have separate toilets for staffs and patients, except for *Loksom Ayurvedic Clinic, Shrijana Medical Hall, Astanga Ayurvedic Pharmacy Clinic,* and *Jhapa Chasma Ghar.* Among the available separate and non-separate toilet facilities for staffs and patients, the maximum of stalls (drop holes) is 10 each at *Fikkal Primary Health Centre* and *Suryodaya Primary Health Centre,* and the minimum is 1 stall each at *Loksom Ayurvedic Clinic, Shrijana Medical Hall*, and *Jhapa Chasma Ghar*. The analysis shows that the patients to stall (drop hole) ratios are distributed fairly and uniformly in terms of population mobility across the health centre, except for *Shrijana Medical Hall,* similar to Mechinagar Municipality but contrary to the analysis obtained in Biratnagar Metropolitan City where some of the health centres (*Nobel Medical College Teaching Hospital, Biratnagar Hospital* and *Koshi Hospital*) have less than one-third (1/3) of the stalls (50 each) present in other facilities, despite a population mobility (inpatient ward) 11 and 7 times higher, respectively. Only two (2) of the health centres have people in both inpatient and outpatient wards, while the remaining eight (8) only have outpatients, except for *Om Ayurvedic Clinic* with no patients at neither wards. *Fikkal Primary Heath Centre, Loksom Ayurvedic Clinic,* and *Mechi Ayurvedic Health Facility* have the largest amount of people in the outpatient ward (3,500, 3,000, and 1,500 patients, respectively), overall, which is slightly higher than in Mechinagar Municipality (4,500, 2,500, and 0 patients, respectively). Based on the last three months (July-September 2020), it was found that the health centres with fewer inpatients have one of the highest populations in the outpatient ward (see Fig. 2.2). This is probably due to the inadequate capacity of the treatment facilities.

Number of Inpatients and Outpatient based on the last three months from the date of obersvation (October 2020)

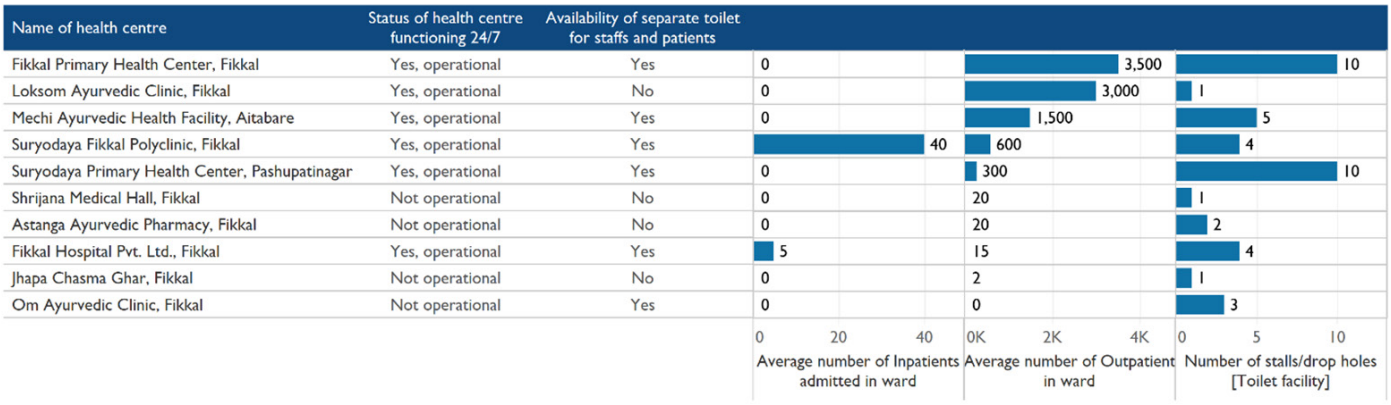


Fig. 2.2: Number of inpatients, outpatients and stalls (toilet facility) at the health centres

Fig. 2.3 shows the distribution of basic hygiene mechanism at the facilities and the distances from the health centre to the nearest water source and referral centre. The farthest distance to the referral centres is 34 and 11 Km from *Mechi Ayurvedic Health Facility* and *Suryodaya Primary Health Centre,* respectively. The remaining eight (8) health centres are at most 1.5 Km away and at least less than 1 meter away. The distance from the health centres to the nearest water source is within a radius of 100 meters. This means that the majority of the health centres have toilets and a water system nearby. Similarly, most of the assessed sites have toilet facilities for both staffs and patients (6/10), except for *Shrijana Medical Hall, Loksom Ayurvedic Clinic, Jhapa Chasma Char,* and *Astanga Ayurvedic Pharmacy*. The maximum number of patients per stall (drop hole) is 50 (*Om Ayurvedic Clinic*) and the minimum is 13 (*Fikkal Hospital Pvt. Ltd.*) based on the average number of patients visiting the health centre per day. The highest number

of staffs per stall can be found at *Fikkal Hospital Pvt. Ltd.* (285), whereas the minimum number of staffs per stall is less than 1 at *Fikkal Primary Health Centre*. This means that the best equipped toilet facilities for staffs are found at *Fikkal Primary Health Centre* compared to other health centres and based on the total population of health personnel at the respective health centres.

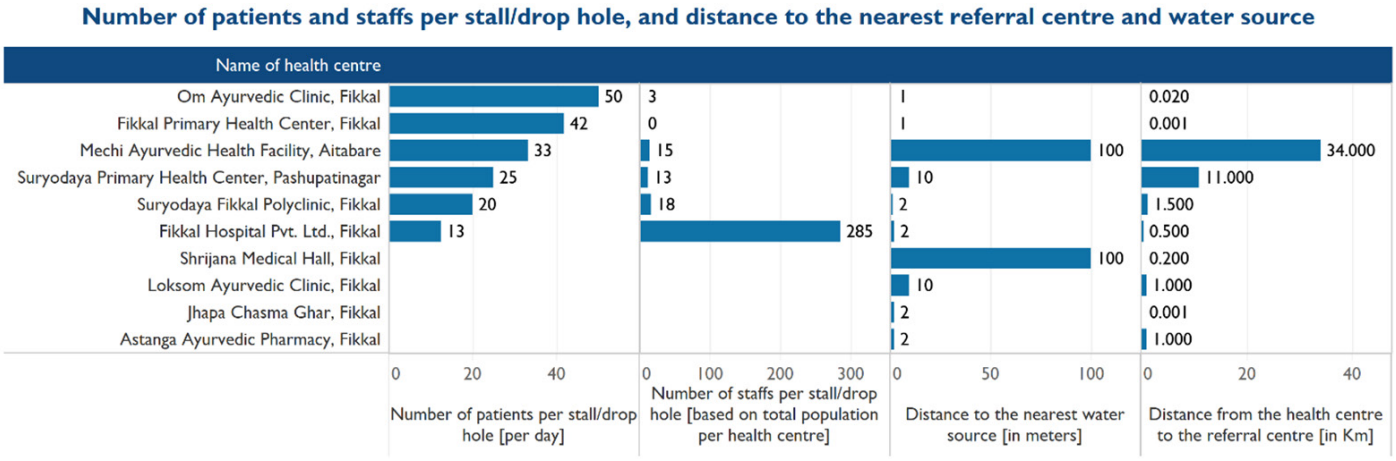


Fig. 2.3: Number of patients and staffs to stall/drop hole ratio, and distances to the nearest health centre and water source

In Suryodaya Municipality, out of ten (10) respondents at the investigated health centres, seven (7) asserted that people who fall ill do seek alternative health treatment before going to the health centres (see Table 2.1). The analysis of these findings is presented as follows in order of percentage magnitude:

- Less than 10 per cent, between 10-30 per cent, and greater than 50 per cent seek healthcare at home
- Less than 10 per cent and between 24-43 per cent seek healthcare at other private hospitals
- Less than 10 per cent and between 25-45 per cent seek healthcare at other public hospitals
- Less than 10 per cent, between 10-30 per cent, and greater than 50 per cent seek healthcare at the pharmacy
- Less than 10 per cent, between 20-40 per cent, and greater than 50 per cent seek healthcare from the religious leaders
- Less than 10 per cent, between 20-40 per cent, and greater than 50 per cent seek healthcare from the traditional healers
- Between 15-35 per cent, less than 10 per cent and greater than 50 per cent seek healthcare somewhere else

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

Name of health centre	Care at home	Care at other private hospital	Care at other public hospital	Care at the pharmacy	Care at the traditional healer	Care at the religious leader	Care at somewhere else
Astanga Ayurvedic Pharmacy, Fikkal	<10%	10%-30%	31%-50%	10%-30%	<10%	<10%	10%-30%
Fikkal Hospital Pvt. Ltd., Fikkal	10%-30%	<10%	<10%	<10%	<10%	<10%	<10%
Loksom Ayurvedic Clinic, Fikkal	10%-30%	31%-50%	31%-50%	10%-30%	10%-30%	10%-30%	31%-50%
Mechi Ayurvedic Health Facility, Aitabare	>50%	31%-50%	31%-50%	>50%	31%-50%	31%-50%	>50%
Om Ayurvedic Clinic, Fikkal	<10%	<10%	<10%	<10%	<10%	<10%	<10%
Suryodaya Fikkal Polyclinic, Fikkal	>50%	<10%	10%-30%	>50%	<10%	<10%	10%-30%
Suryodaya Primary Health Center, Pashupatinagar	<10%	<10%	<10%	<10%	>50%	>50%	10%-30%

In Table 2.2, the population distribution of the medical personnel across the health centres where the study was conducted shows that; *Fikkal Hospital Pvt. Ltd.* and *Suryodaya Primary Health Centre* account for the largest total of medical personnel (285 and 40, respectively). *Fikkal Hospital Pvt. Ltd* has by far the highest number of medical

officers with a population of 261, and it is followed by *Shrijana Medical Hall* with only 5 medical officers. The majority of the health centres investigated have at least one (1), except for *Fikkal Primary Health Centre, Loksom Ayurvedic Clinic,* and *Om Ayurvedic Clinic* (0 each). Additionally, based on the population distribution of inpatients and outpatients, at *Shrijana Medical Hall, Fikkal Primary Health Centre,* and *Mechi Ayurvedic Health Facility,* the population of medical personnel is not equally distributed to the influxes of people (see Fig. 2.1). The remaining health centres account for far less medical personnel, probably due to the lower mobility of patients at these sites. There are no records for *Fikkal Primary Health Centre*, due to the fact that the respondent was unable to provide the required information at the time of field observation, and thus no population was recorded. Consequently, at most of the health centres the presence of health personnel varies for most of the sixteen (16) categories of health indicators, with some parameters completely missing. Hence, by induction, there are inadequate health personnel in Suryodaya Municipality across most of the health centres, except at *Fikkal Hospital Pvt. Ltd.* and *Suryodaya Primary Health Centre*.

Table 2.2: Population of medical personnel at the health centres

	Type of health centre / Name of health centre									
	Government			Private						
	Fikkal Primary Health Center, Fikkal	Mechi Ayurvedic Health Facility, Aitabare	Suryodaya Primary Health Center, Pashupatinagar	Astanga Ayurvedic Pharmacy, Fikkal	Fikkal Hospital Pvt. Ltd., Fikkal	Jhapa Chasma Ghar, Fikkal	Loksom Ayurvedic Clinic, Fikkal	Om Ayurvedic Clinic, Fikkal	Shrijana Medical Hall, Fikkal	Suryodaya Fikkal Polyclinic, Fikkal
Auxiliary Health Worker	0	3	0	0	2	0	0	0	0	1
Auxiliary Nursing Midwifery	0	1	3	0	0	0	0	0	0	0
Female Community Health Volunteer	0	0	31	0	0	0	0	0	0	0
Health Assistant	0	1	1	0	2	0	0	0	2	1
House Keeper	0	0	1	0	1	0	0	0	0	1
Lab Assistant	0	1	0	0	2	0	0	0	0	0
Lab Technician	0	0	1	0	1	0	0	1	1	2
Medical Officer	0	1	1	2	261	1	0	0	5	2
Medical Recorder	0	0	0	0	1	0	1	1	0	1
Nursing Officer	0	0	1	0	6	0	0	0	0	3
Office Helper	0	5	1	0	0	0	0	0	0	1
Pharmacist	0	0	0	0	0	0	1	1	1	2
Pharmacy Assistant	0	0	0	0	1	0	0	0	1	0
Public Health Nurse	0	0	0	0	1	0	0	0	0	0
Radiographer	0	0	0	0	1	0	1	0	0	1
Staff Nurse	0	3	0	0	6	0	0	0	0	3
Total Health Officers	0	15	40	2	285	1	3	3	10	18

Among the ten (10) health centres investigated in Suryodaya Municipality, seven (7) are private and their primary purpose is to deliver special healthcare services. Two (2) of the health centres (*Fikkal Primary Health Centre* and *Suryodaya Primary Health Centre*) are primary healthcare or community health centres, and one (*Mechi Ayurvedic Health Facility*) is the regional or district health centre, which attracts considerable amount of patients in terms of population mobility (see Fig. 2.1 and 2.2). Four (4) health centres have recorded suspected COVID-19 cases (*Fikkal Hospital Pvt. Ltd., Fikkal Primary Health Centre, Mechi Ayurvedic Health Facility* and *Suryodaya Primary Health Centre*). The majority of the health centres (7/10) have conducted training on IPC, except for *Loksom Ayurvedic Clinic, Om Ayurvedic Clinic,* and *Shrijana Medical Hall*. Compared to the health centres in Mechinagar Municipality and Biratnagar Metropolitan City, most of the facilities in Suryodaya Municipality (7/10) do not perform health screening for travellers or patients entering the facilities neither regularly nor 24/7, except for *Fikkal Hospital Pvt. Ltd., Mechi Ayurvedic Health Facility,* and *Suryodaya Fikkal Polyclinic*. The majority of the health centres do not have

emergency preparedness plan (7/10), except for *Fikkal Hospital Pvt. Ltd., Fikkal Primary Health Centre*, and *Suryodaya Fikkal Polyclinic*. Among the sites with an emergency preparedness plan (3/10), only two (2) (*Fikkal Hospital Pvt. Ltd.* and *Fikkal Primary Health Centre*) have tested it less than 3 months or between 6 to 9 months from the date of observation (October 2020). At most of the health centres, people mostly wear masks at a percentage between 18-38 per cent (5/10) or less than 10 per cent (4/10), while only at one (1/10) site it is greater than 50 per cent (see Table 2.3). Overall, less than 40 per cent of people at the health centres in Suryodaya Municipality wear masks, which is lower than the results obtained in other municipalities where the PMM activities were conducted.

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

Name of health centre	Level of health system/service delivery	Suspected COVID-19 cases on site	Status of IPC training	Availability of health screening station	Availability of health screening station 24/7	Availability of emergency preparedness plan	Emergency preparedness plan last tested	Estimated percentage wearing mask
Fikkal Hospital Pvt. Ltd., Fikkal	Private Hospital	Yes	Yes, conducted	Available	Available	Available	Between 3 to 6 months	<10%
Astanga Ayurvedic Pharmacy, Fikkal	Private Clinic	Do not know	Yes, conducted	Not available	Not available	Not available	'	31%-50%
Fikkal Primary Health Center, Fikkal	Primary Healthcare Center	Yes	Yes, conducted	Not available	Not available	Available	Less than 3 months	<10%
Jhapa Chasma Ghar, Fikkal	Private Health Center	No	Yes, conducted	Not available	Not available	Not available	'	<10%
Loksom Ayurvedic Clinic, Fikkal	Private Clinic	No	Not conducted	Not available	Not available	Not available	'	10%-30%
Mechi Ayurvedic Health Facility, Aitabare	Regional/District Hospital	Yes	Yes, conducted	Available	Available	Not available	'	>50%
Om Ayurvedic Clinic, Fikkal	Private Clinic	No	Not conducted	Not available	Not available	Not available	'	31%-50%
Shrijana Medical Hall, Fikkal	Private Clinic	No	Not conducted	Not available	Not available	Not available	'	10%-30%
Suryodaya Fikkal Polyclinic, Fikkal	Private Clinic	No	Yes, conducted	Available	Available	Available	'	<10%
Suryodaya Primary Health Center, Pashupatinagar	Primary healthcare Center	Yes	Yes, conducted	Not available	Not available	Not available	'	10%-30%

Most of the health centres have functional thermometers to check body temperature (7/10) for both patients and visitors, except for *Fikkal Primary Health Centre, Mechi Ayurvedic Clinic,* and *Suryodaya Primary Health Centre*. There is the availability of water and toilet facilities across all the facilities. Most of the health centres (6/10) are busier on Monday, Thursday, Friday, and Sunday, while the remaining four (4) sites are busy throughout the week. Similarly, most of the health centres are busy throughout the year (8/10), except for *Loksom Ayurvedic Clinic* and *Suryodaya Primary Health Centre* whose busiest months are March, and September and October, respectively (see Table 2.4). Most of the health centres do not have tracking matrix (record book/device) for patients and visitors entering the sites (6/10), except for *Fikkal Primary Health Centre, Mechi Ayurvedic Health Facility, Shrijana Medical Hall,* and *Suryodaya Primary Health Centre*, which is important for contact tracing mechanism.

Table 2.4: Availability of water and toilet facility, tracking matrix, and the busiest days/months at the health centres

Name of health centre	Status of body temperature checking	Availability of water on site	Availability of toilet nearby	Busiest day of the week	Busiest month of the year	Availability of record book/device for patients/visitors
Astanga Ayurvedic Pharmacy, Fikkal	Not available	Available	Available	Thursday	Every month	Not available
Fikkal Hospital Pvt. Ltd., Fikkal	Not available	Available	Available	Every day	Every month	Not available
Fikkal Primary Health Center, Fikkal	Available	Available	Available	Every day	Every month	Available
Jhapa Chasma Ghar, Fikkal	Not available	Available	Available	Every day	Every month	Not available
Loksom Ayurvedic Clinic, Fikkal	Not available	Available	Available	Thursday	September, October	Not available
Mechi Ayurvedic Health Facility, Aitabare	Available	Available	Available	Thursday, Sunday	Every month	Available
Om Ayurvedic Clinic, Fikkal	Not available	Available	Available	Thursday	Every month	Not available
Shrijana Medical Hall, Fikkal	Not available	Available	Available	Thursday, Friday	Every month	Available
Suryodaya Fikkal Polyclinic, Fikkal	Not available	Available	Available	Every day	Every month	Not available
Suryodaya Primary Health Center, Pashupatinagar	Available	Available	Available	Monday	March	Available

Two (2) main assessments were done to determine the modes of transport for emergency cases to the nearest POEs, and the most common means of transport to access the health centres. The findings revealed that public

transport (car, bus, or flight) and ambulance are mostly used to access the POEs, especially during emergency cases, with a percentage distribution of 20.6 each, respectively, contrary to the analysis obtained in Mechinagar Municipality (private transport (motorbike or 3-wheel) and public transport (rickshaw)) and similar to Biratnagar Metropolitan City (private transport (motorbike or 3-wheel and ambulance). These are followed by public transport (rickshaw), private transport (motorbike, 3-wheel) and travel by foot, with a percentage distribution of 17.6 each, respectively (see Fig. 2.4). On the other hand, the health centres are mostly accessed by foot and motorbike (23.5% and 22.4%, respectivley), followed by car and minivan (19.9% and 16.7%, respectively), similarly to most of the sites investigated in the PMM project.

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

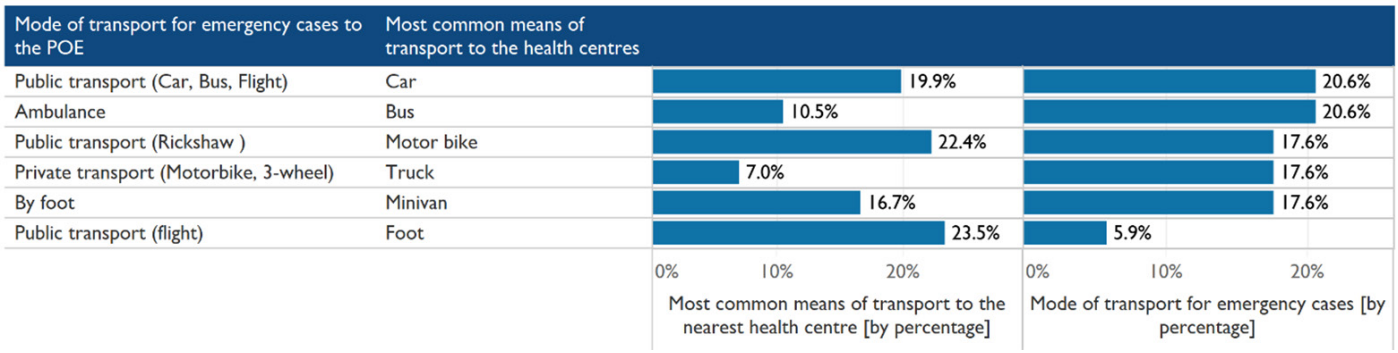


Fig. 2.4: Most common modes of transport to access the POEs during emergency cases from the health centres

In Fig. 2.5, the bars (right side) show the main purposes patients visit the health centres and the main reasons for visitors to come from India (left). The analysis shows that typhoid and diarrhea (26.5% and 20.6%, respectively) are the major factors for people to seek healthcare, contrary to Biratnagar Metropolitan City (surgery and maternal delivery) and similar to Mechinagar Municipality (diarrhea and typhoid). These are followed by immunization, surgery, and influenza (11.8% each and 8.8%, respectively). On the other hand, people coming from India mostly visit the health centres in Suryodaya Municipality to treat patients and other reasons, with a percentage distribution of 90 and 10, respectively. This means that people from India going to the health centres are medical practitioners whose primary objective is to treat sick individuals and support the health service delivery in Nepal (see Fig. 2.5).

Main purpose patients visiting the health centres and visitors from India to the health centre

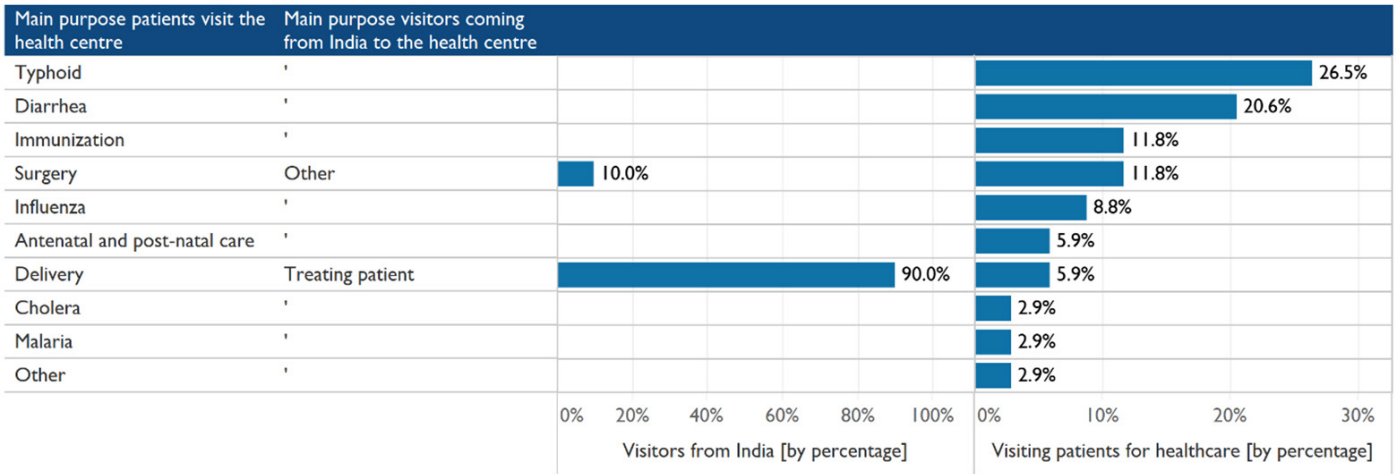


Fig. 2.5: Main reasons for patients and visitors' entry to the health centres

The analysis shows that there are nine (9) wards present at the health centres, with percentage distributions of; emergency room, laundry, laboratory, and kitchen (14.3% each), surgical, medical, outpatient, pediatric (9.5%), and maternal/delivery (4.8%) (see Fig. 2.6). Therefore, the largest wards at the health centres in Mechinagar Municipality are emergency room, laboratory, kitchen, and laundry.

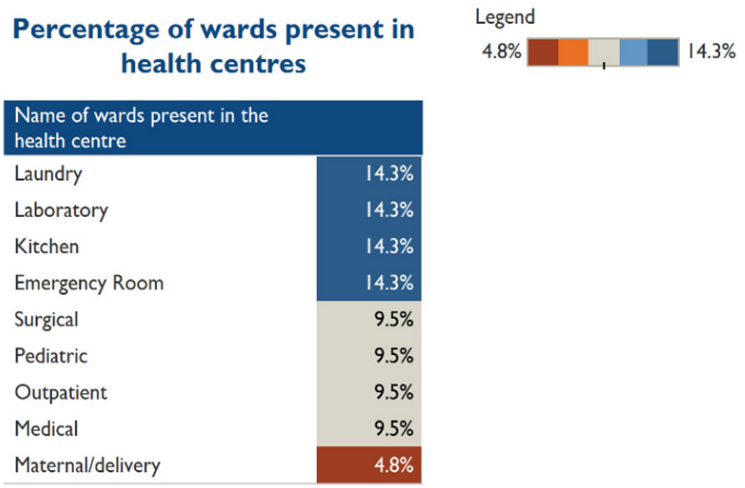


Fig. 2.6: Percentage distribution of wards present at the health centres

Fig. 2.7 shows the method of waste disposal and the type of toilet facilities at the various health centres in Suryodaya Municipality. According to the chart, waste bins are available and regularly emptied, and account for the most common technique for disposal of waste (38.5% and 26.9%, respectively). These are followed by incinerator and burning pit (15.4% and 11.5%, respectively), ash pit and placenta pit, which carry a small percentage distribution of 3.8 each, respectively. Concerning the toilet facilities; pour-flush latrine and flushing toilet are the available types of toilet facilities at the health centres (85.7% and 14.3%, respectively). Therefore, the most adopted techniques for waste disposal at the health centres are waste bins (regularly emptied), and the available types of toilet facilities are pour-flush latrines and flushing toilets.

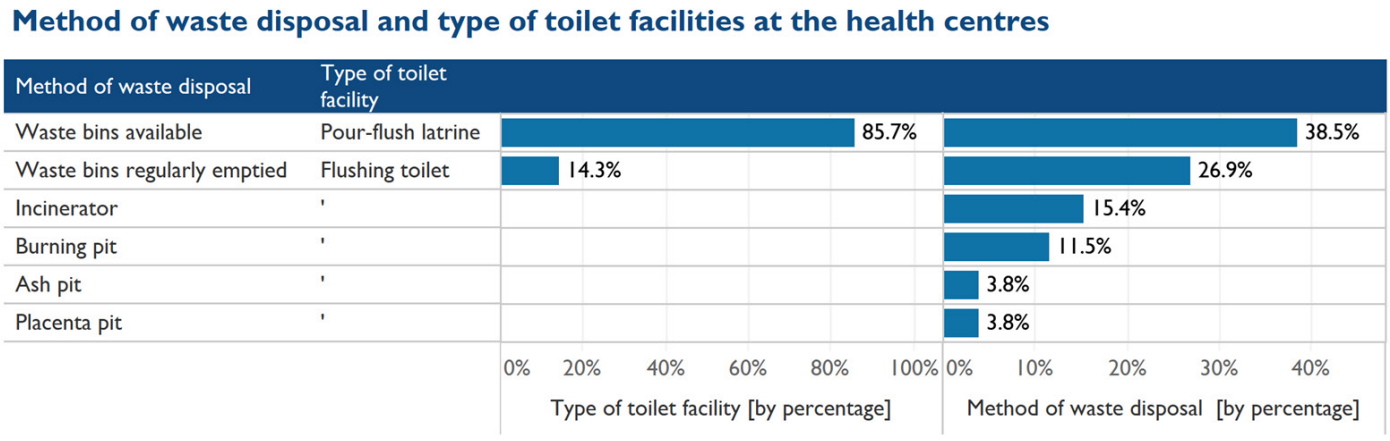


Fig. 2.7: Method of waste disposal and type of toilet facilities at the health centres

3.2.d TRADITIONAL HEALERS

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

The analysis shows that the identified traditional healers in Suryodaya Municipality attract a noticeable number of people from Nepal and India, among which, *Gairigaun Guru (TK)* accounts for the highest population mobility. As per the study, the investigated traditional healers' compounds are open to visitors and patients every day and throughout the year, however, Saturday is reported as the busiest day in terms of higher population mobility. Similarly, the busiest months are recorded as January and April. The study suggests that the population mobility at the respective traditional healers are predominantly from *Ilam, Jhapa, Panchthar, Taplejung, Tehrathum* and *Morang* districts. At the municipality level, the people's movement to these sites mostly originates from *Suryodaya Municipality, Ilam Municipality, Rong Rural Municipality, Mai Municipality, Kankai Municipality, Mangsebung Rural Municipality,* and *Maijogmai Rural Municipality.*

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

According to the results obtained from the direct field observations and the participatory mapping exercises, *Gairigaun Guru (TK)* and *Gairigaun Guru* are situated at *Gairigaun* locality, which is connected to *Fikkal-Pashupatinagar Road*. These sites are accessible by several other alternative routes as well, such as *Barbote-Melbote Road* and *Fikkal-Nayabazar-Namsaling Road*. The study shows that these traditional healers' sites are accessible by minivan, car and motorbike, however, visitors mostly use motorbikes to reach the compounds. The nearest localities to these sites are reported as *Barbote, Fikkal,* and *Panchakanya*. Correspondingly, *Teen Khutte Lama Guru* is located at *Teen Khutte* locality, which is associated with *Fikkal-Pashupatinagar Road* and is accessible by all kinds of vehicles, although there are other walkways to access this compound. The nearest localities to this site are observed as *Pothukatla, Pashupatinagar Sundarpani, Baudhhadham*, and *Gorkhe*. Likewise, *Pashupatinagar Mata* is based in *Pashupatinagar* locality, which is linked to *Fikkal-Pashupatinagar Road* as well as *Pashupatinagar Int. POE* (formal), with good accessibility by vehicle. However, people from India mainly use cars, minivans and motorbikes. The nearest localities are *Artheytaar, Rungsung, Bouddhadham*, and *Teen Khutte*. On the other hand, *Artheytaar Baba* is located at *Artheytaar* locality, close to *Pashupatinagar* locality. As per the analysis, this site is not accessible by kinds of vehicles, except motorbikes, due to the gravel road and difficult terrain. Furthermore, *Harkate Mata* is based in *Harkate* locality, which is associated with the *Mechi Highway*, with good accessibility by vehicle. Several alternative small routes are reported to access this site from localities nearby, *Kanyam, Fajeegaun, Kolbong*, and *Marse*.

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

Six (6) traditional healers at their respective localities were investigated in Suryodaya Municipality, which is less than in Biratnagar Metropolitan City (8) and Mechinagar Municipality (13). The largest population mobility of both patients and visitors can be found at *Gairigaun Guru (TK)* with an average entry flow of 60 people per day, while on the busiest day the number increases to 100 people, which is less than in Biratnagar Metropolitan City and Mechinagar Municipality (100 people per day each, respectively). This is followed by *Harkate Mata* and *Pashupatinagar Mata* with an average entry flow of 30 and 29 people, and 65 and 40 people on the busiest days, respectively. The remaining three (3) localities receive a minimum of 15 people and a maximum of 20 people per day, while on the busiest days, the minimum entrance is 30 people and the maximum is 40. The majority of the traditional healers (5/6) treat people from other countries, notably India, except *Harkate Mata*, only accessed by Nepalese nationals. The highest influx of people from India can be found at *Pashupatinagar Mata* with a percentage of 10, while the remaining four

(4) sites receive 5 per cent each, and the extra fraction of the population (95%) comprises people from the surrounding municipalities (see Fig. 3.1).

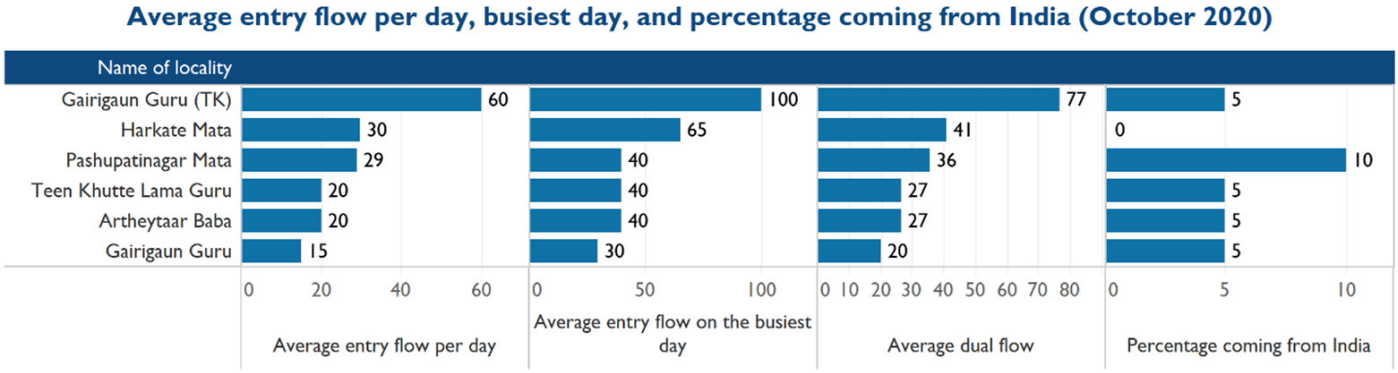


Fig. 3.1: Mobility patterns at the traditional healers' compounds

According to all the respondents (6/6), patients seek alternative health care before visiting the traditional healers. The traditional healers' compounds are operational throughout the seasons and open to every denomination, except at *Gairigaun Guru*. Most of the sites investigated are only open during the day (4/6), except for *Artheytaar Baba* and *Teen Khutte Lama Guru*, whose compounds are open day and night. The distance to the nearest health centre varies across each locality (see Fig. 3.2). *Gairigaun Guru* and *Artheytaar Baba* are the farthest away at about 3 Km each, while the remaining four (4) localities are located at a minimum radius of 300 meters and a maximum 1 Km. The distance between the nearest health centre and referral centre is equal to the distance from the compound to the nearest health centre across the localities, except for *Harkate Mata, Pashupatinagar Mata,* and *Teen Khutte Lama Guru*. The latter two are the farthest with a distance distribution of 10 and 4 Km, respectively. The closest distance is found at *Gairigaun Guru (TK)* and *Harkate Mata* (1 Km each).

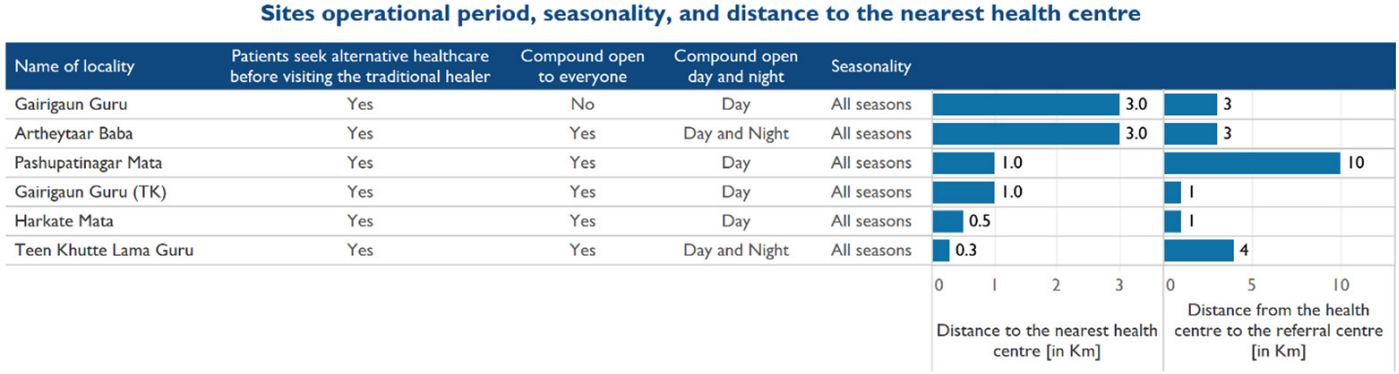


Fig. 3.2: Operational period, and distance to the nearest health/referral centre

Waste management systems are an essential factor to determine the spaces of vulnerability of a specific site or general localities in relation to public health risks and capacity (see Table 3.1). Most of the respondents asserted that the compounds have a waste management system in place (5/6), except at *Pashupatinagar Mata*, and the following indicates the vulnerability spaces:

- No stagnant water on the floor across all the traditional healers' compounds.
- No trash in the open, except at *Pashupatinagar Mata.*
- Most of the sites (5/6) have unwanted animals/insects visible in limited quantity, except at *Harkate Mata.*

This shows that in Suryodaya Municipality, the traditional healers' compounds investigated are by far tidier when compared to other municipalities where the PMM activities were conducted, except for the visibility of unwanted animals/insects which is eminent across all sites. The majority of the respondents asserted that less than 10 per cent (5/6) wear masks and only at one (1) site the percentage is between 31-50. Overall, less than 12 per cent of people at these compounds wear masks, which means that greater than 85 per cent of the population does not follow mask-wearing practices. According to the KIs, the most used health centre in Suryodaya Municipality varies across most of the localities, based on their proximity to the nearest facility, except for *Artheytaar Baba* and *Pashupatinagar Mata* whose closest health centre is *Pashupatunagar Primary Health Centre*, and *Gairigaun Guru (TK)* and *Gairigaun Guru* whose closest health centre is *Fikkal Primary Health Centre*.

Table 3.1: Waste management, environmental condition, and estimated percentage wearing masks at the traditional healers' compounds

Name of locality	Name of the nearest health centre	Estimated percentage wearing mask	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Artheytaar Baba	Pashupatinagar Primary Health Center	<10%	Available	No	No	Yes, limited
Gairigaun Guru	Fikkal Primary Health Center	<10%	Available	No	No	Yes, limited
Gairigaun Guru (TK)	Fikkal Primary Health Center	31%-50%	Available	No	No	Yes, limited
Harkate Mata	Harkate Health Post	<10%	Available	No	No	No
Pashupatinagar Mata	Pashupatinagar Primary Health Center	<10%	Not available	Yes, limited	No	Yes, limited
Teen Khutte Lama Guru	Panchakanya Health Post	<10%	Available	No	No	Yes, limited

The busiest days and months of the year vary across each locality. However, most of the localities are busier on Saturday (6/6), while the other days are Monday, Tuesday, and Friday. Similarly, the busiest months at the majority of the sites are January, April, October and November (4/6), whereas *Gairigaun Guru (TK)* and *Artheytaar Baba* are busy throughout the year. There is the availability of water and toilet facilities at all the sites investigated, with most of the sites (4/6) having 1 stall/drop hole and the remaining two (2) sites with 2 stalls/drop holes, except at *Gairigaun Guru (TK)* where there is no water facility on site. Almost all the sites are equipped with pour-flush latrines (5/6), except for *Teen Khutte Lama Guru* locality with available both pour-flush latrine and flushing toilet. Most of the localities have water facilities nearby for handwashing with soap, within a radius of 500 meters. In terms of the number of visitors per stall/drop hole ratio, it is higher in the following localities; *Gairigaun Guru (TK)* and *Harkate Mata,* with a patients/visitors per stall/drop hole distribution ratio of 60:1 and 30:1, respectively. The remining four (4) localities have a minimum of 10:1 and a maximum of 20:1 ratio (see Fig. 3.3).

Water and toilet facilities, busiest days/months, patients/visitors per stall (drop hole) ratio, and distance to the nearest water source

Name of locality	Busiest day of the week	Busiest month of the year	Availability of water on site	Availability of toilet nearby	Type of toilet available
Gairigaun Guru (TK)	Saturday	Every month	Not available	Available	Pour-flush latrine
Harkate Mata	Saturday	January	Available	Available	Pour-flush latrine
Artheytaar Baba	Saturday, Tuesday	Every month	Available	Available	Pour-flush latrine
Gairigaun Guru	Monday, Saturday	October, November	Available	Available	Pour-flush latrine
Pashupatinagar Mata	Tuesday, Saturday	April	Available	Available	Pour-flush latrine
Teen Khutte Lama Guru	Monday, Friday, Saturday	April	Available	Available	Pour-flush latrine, Flushing Toilet

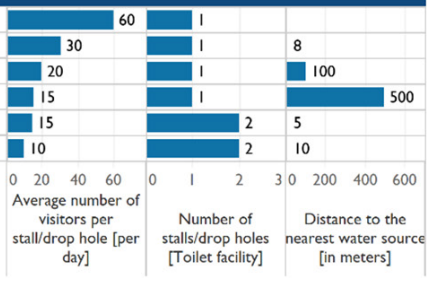


Fig. 3.3: Water and toilet facilities, the busiest days/months, and patients to stall/drop hole ratio

The majority of the traditional healers do use protective gears during their practices (5/6), except at *Pashupatinagar Mata* locality, contrary to the analysis obtained in Mechinagar Municipality but similar to Biratnagar Metropolitan City (all the traditional healers use protective gears). Most of the traditional healers' compounds are not organized in sectors (4/6), except at *Gairigaun Guru (TK)* and *Teen Khutte Lama Guru,* which show adequate treatment of people seeking alternative healthcare, be it related to health or other. According to the respondents, half of the traditional healers do not have an isolated room to conduct their health practices (3/6), while the remaining half have it available (3/6). Furthermore, among the six (6) traditional healers, only two (2) are uncertain whether advising patients to seek alternative healthcare (*Artheytaar Baba* and *Gairigaun Guru*). Almost all the traditional healers interviewed do advice their patients to seek alternative health treatment after visiting the respective compounds in at least in three (3) cases, namely; when the situation is too critical, when the disease cannot be cured, and when the patient cannot recover promptly. The majority of the traditional healers' localities have a good or uninterrupted network for voice communication (4/6), except at *Pashupatinagar Mata* and *Teen Khutte Lama Guru* (bad network). Only one (1) suspected COVID-19 positive case was found on site at *Artheytaar Baba* (see Table 3.2).

Table 3.2: Use of protective gears, suspected COVID-19 cases, isolated room, sites organisation, and status of voice communication system at the traditional healers' compounds

Name of locality	Suspected COVID-19 case on site	Use of protective materials during practices	Organisation of traditional healer's compound in sectors	Availability of isolated room during practices	Status of voice communication system	Traditional healer advices patients to seek alternative healthcare	Situation the traditional healer advice patients to seek alternative healthcare
Artheytaar Baba	Yes	Yes	Not organised	Not available	Good (uninterrupted network)	Do not know	When the situation is too critical
Gairigaun Guru	No	Yes	Not organised	Not available	Good (uninterrupted network)	Do not know	If cannot recovered timely
Gairigaun Guru (TK)	No	Yes	Yes, organised	Available	Good (uninterrupted network)	Yes	Disease cannot be cured
Harkate Mata	No	Yes	Not organised	Available	Good (uninterrupted network)	Yes	When the situation is too critical
Pashupatinagar Mata	No	No	Not organised	Not available	Bad (interrupted network)	Yes	Disease cannot be cured
Teen Khutte Lama Guru	No	Yes	Yes, organised	Available	Bad (interrupted network)	Yes	When the situation is too critical

Fig. 3.4 shows the common diseases and practices performed by the traditional healers, as well as the main reasons people visit their compounds. According to the analysis, headache, mental illness, and fever (17.4% each) are the most common diseases treated by the traditional healers, which is similar to the analysis from Mechinagar Municipality. These are followed by yellow fever and abdominal pain (13.0% each), lower abdominal pain (8.7%), skin diseases, other related diseases, and snake bite (4.3% each, respectively). The types of practices performed by the traditional healers, which account for the main reasons of patients' visits, in order of importance, include; disease cure and mental illness (23.8% each), divination and protection (19.0% and 14.3%, respectively). Therefore, the most common diseases cured by the traditional healers in Suryodaya Municipality are headache, mental illness, and fever, and the most adopted health practices are disease cure, mental illness, divination, and protection.

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

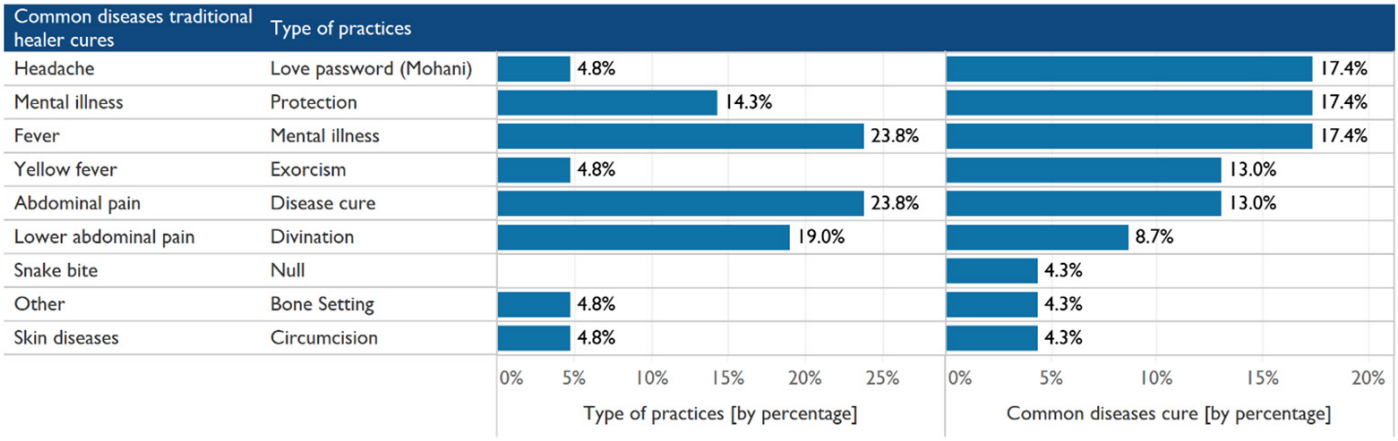


Fig. 3.4: Common diseases and health practices at the traditional healers' compounds

3.2.e SCHOOLS AND COLLEGES

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

Similar to other municipalities analysed, the study shows that the investigated schools and colleges in Suryodaya Municipality largely attract students from the same locality or those nearby. However, some students from other municipalities and districts come to attend the colleges. Regarding the population mobility at the identified schools and colleges, these are open to the public every day and throughout the year, except on Saturdays and other public holidays.

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

Regarding the connectivity of the investigated schools and colleges, *Everland International Academy, Sunrise English School,* and *Fikkal Secondary School* are located at *Fikkal* locality, and connected to the *Mechi Highway* with good accessibility by vehicle. The major alternative vehicle route to access these sites is recorded as *Fikkal-Pashupatinagar Road.* The nearest localities to the respective schools are documented as *Aitabare, Karfok, Panchakanya* and *Kanyam*. In the same way, *Karfok Bidhyamandir Secondary School* and *Karfok Multiple Campus* are situated at *Karfok* locality, which is linked to the *Mechi Highway,* and accessible by all kinds of vehicles. These schools are also accessible by several other routes, such as *Kalapani-Maghe Road, Aitabare-Aathghare Road,* and *Maghe-Aitabare Road.* The nearest localities to these schools are reported as *Aitabare, Panchakanya, Ilam Bazar* and *Fikkal*. Correspondingly, *Krishna Asram Madhyamik Vidhalaya* is based in *Kanyam* locality, which accounts for the highest population mobility among those investigated. This school is linked to the *Mechi Highway,* with good accessibility by vehicle, and the nearest localities being *Fikkal, Harkate, Kolbong, Marse* and *Fajeegaun*. Furthermore, *Janak Ma. Vi.* lies in *Shree Antu* locality which is connected to the *Mechi Highway* via *Shree Antu Road*, and it is easily accessible by all kinds of vehicles. The nearest localities

to this school are *Samalbung, Takpath, Uniyutar,* and *Chhiruwa*. According to the analysis from the field observations, overall, the investigated schools are accessible by all kinds of vehicles, however, the majority of the students reach their destinations by foot.

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

A total of seven (7) schools/colleges were investigated in Suryodaya Municipality, which is equal to those assessed in Biratnagar Metropolitan City (7) and less than in Mechinagar Municipality (10). Among the schools and colleges, six (6) are secondary schools and only one (1) is a tertiary educational institution (*Karfok Multiple Campus*). The average attendance differs across the schools/colleges. *Krishna Asram Madhyamik Vidhalaya* and *Fikkal Secondary School* (both secondary schools) account for the highest mobility with 1,200 and 800 attendance per day, while on the busiest days the attendance of pupils/students increases to 1,500 and 1,000, respectively. These are followed by three (3) large secondary institutions; *Everland International Academy, Sunrise English School,* and *Karfok Bidhyamandir Secondary School,* with a population distribution of 700, and 600 people each per day, while on the busiest days the attendance increases to 800, 750, and 700 pupils, respectively. At the remaining two (2) schools and colleges, the daily average attendance ranges from 250 up to 400 (*Karfok Multiple Campus* and *Janak Ma.Vi.*), whereas on the busiest days, they have a distribution of 300 and 500 pupils/students, respectively. Four (4) out of seven (7) schools/colleges have citizens from India as pupils/students, although not in significant numbers (between 1-5%). *Everland International Academy, Sunrise English School,* and *Janak Ma.Vi.* are only attended by pupils from within Suryodaya Municipality (see Fig. 4.1).

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

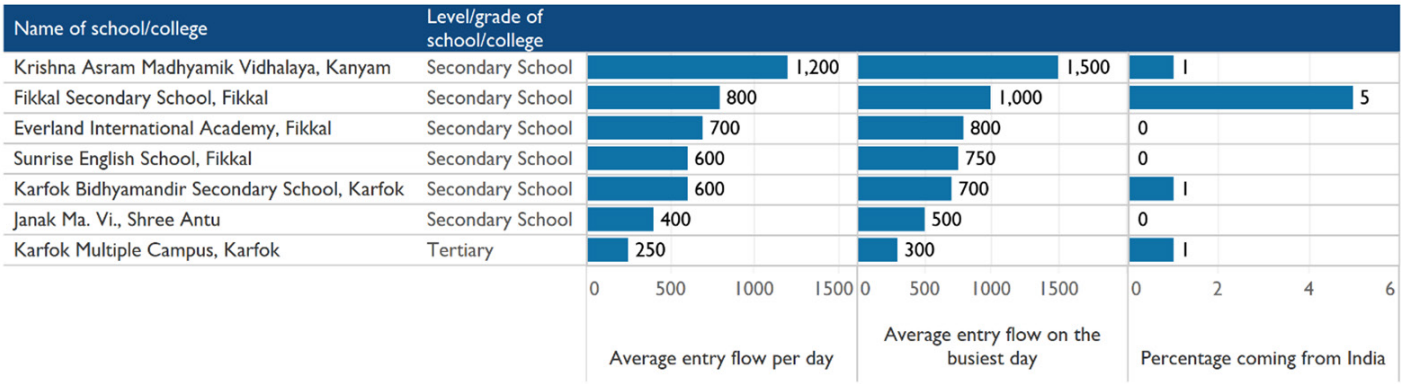


Fig. 4.1: Population mobility at the schools/colleges

All the schools and college investigated (7/7) lack health agents or volunteers to address health related issues especially during emergency cases. The nearest health centre differs across the respective schools, except for *Sunrise English School* and *Fikkal Secondary School,* whose nearest health centre is *Fikkal Primary Health Centre*. There is the availability of water at all the schools and college investigated. The distance to the nearest water source ranges from a minimum of 1 meter (*Fikkal Secondary School*) to a maximum of 500 meters (*Karfok Multiple Campus* and *Karfok Bidhyamandir Secondary School*). The farthest distance to the nearest health centre is from *Janak Ma.Vi.* and *Krishna Asram Madhyamandir Secondary School,* which are 12 and 6 Km away, respectively, followed by two (2) schools; *Karfok Multiple Campus, Karfok Bidhyamandir Secondary School,* with a distance distribution of 4 and 3 Km, respectively. The closest is *Fikkal Secondary School,* at only 100 meters distance (see Fig. 4.2).

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

Name of school/college	Name of the nearest health centre	Availability of community health worker/agent	Availability of water on site	Distance to the nearest health centre [in Km]	Distance to the nearest water source [in meters]
Janak Ma. Vi., Shree Antu	Shree Antu Health Post	Not available	Available	12.0	3
Krishna Asram Madhyamik Vidhalaya, Kanyam	Kanyam Health Post	Not available	Available	6.0	2
Karfok Multiple Campus, Karfok	Pashupatinagar Primary Health Center	Not available	Available	4.0	500
Karfok Bidhyamandir Secondary School, Karfok	Panchakanya Health Post	Not available	Available	3.0	500
Sunrise English School, Fikkal	Fikkal Primary Health Center	Not available	Available	0.5	10
Everland International Academy, Fikkal	Sreejana Medical	Not available	Available	0.2	10
Fikkal Secondary School, Fikkal	Fikkal Primary Health Center	Not available	Available	0.1	1

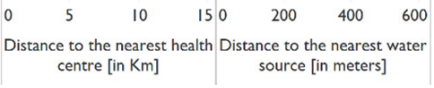


Fig. 4.2: Availability of health agent, and distances to the nearest health centre and water source

The number of classrooms varies across the schools and college. *Krishna Asram Madhyamik Vidhalaya, Fikkal Secondary School,* and *Sunrise English School* account for the largest number of desks due to their high influx of pupils, with 800, 500, and 360 desks, respectively (see Fig. 4.3). On the other hand, *Fikkal Secondary School, Sunrise English School,* and *Karfok Bidhyamandir Secondary School* have the largest number of classrooms, with a distribution of 30 each, and 26 classrooms, respectively. The minimum number of pupils/students per desk is 1 (*Krishna Asram Madhyamik Vidhalaya*), whereas the maximum is 3 at *Janak Ma. Vi.* and *Karfok Bidhyamandir Secondary School* (both government). *Fikkal Secondary School* has the largest number of pupils per classroom (31), this is followed by *Krishna Asram Madhyamik Vidhalaya, Everland International Academy* and *Janak Ma. Vi.* with a distribution of 27, and 25 each, respectively. The remaining schools/colleges have at most 21 pupils/students, and at least 11 students/pupils per classroom. The number of desks per classroom accounts for the highest at *Krishna Asram Madhyamik Vidhalaya* (42), while the remaining schools/colleges have at most 17 desks, and at least 5 desks per classroom (see Fig. 4.3).

Number of classrooms, desks, and pupils/students per desk/classroom ratio (2019)

Name of school/college	Type of school/college	Number of desks	Number of classrooms	Number of pupils/students per desk	Number of pupils/students per classroom	Number of desks per classroom
Krishna Asram Madhyamik Vidhalaya, Kanyam	Government	800	19	1	27	42
Fikkal Secondary School, Fikkal	Government	500	30	2	31	17
Sunrise English School, Fikkal	Private	360	30	2	18	12
Everland International Academy, Fikkal	Private	264	22	2	25	12
Karfok Bidhyamandir Secondary School, Karfok	Government	220	26	3	21	8
Janak Ma. Vi., Shree Antu	Government	120	16	3	25	8
Karfok Multiple Campus, Karfok	Government	90	18	2	11	5

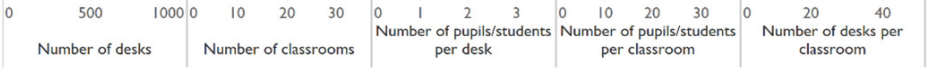


Fig. 4.3: Number of students/pupils, classrooms, and desk ratio

All the schools have separate toilet facilities for students/pupils, and most of the schools have separate toilets for their teachers (5/7), except for *Fikkal Secondary School* and *Janak Ma. Vi.* where there is only one (1) stall/drop hole for both male and female teachers. *Karfok Bidhyamandir Secondary School* and *Fikkal Secondary School* have the largest toilet facilities for both male and female students, with 5 each for female, and 5 and 4 for male pupils, respectively. This is followed by *Everland International Academy* and *Sunrise English School,* with 4 and 3 for females, and 3 each for males, respectively. The remaining educational institutions have at least 1 stall/drop hole, and at most 2 stalls/drop holes for each sex. As for the teachers, most of the sites have equal toilet facilities (1 stall/drop hole each), except for *Karfok Bidhyamandir Secondary School* and *Sunrise English School* with 1 and 2 stalls/drop holes, and 3 and 2, respectively (see Fig. 4.4).

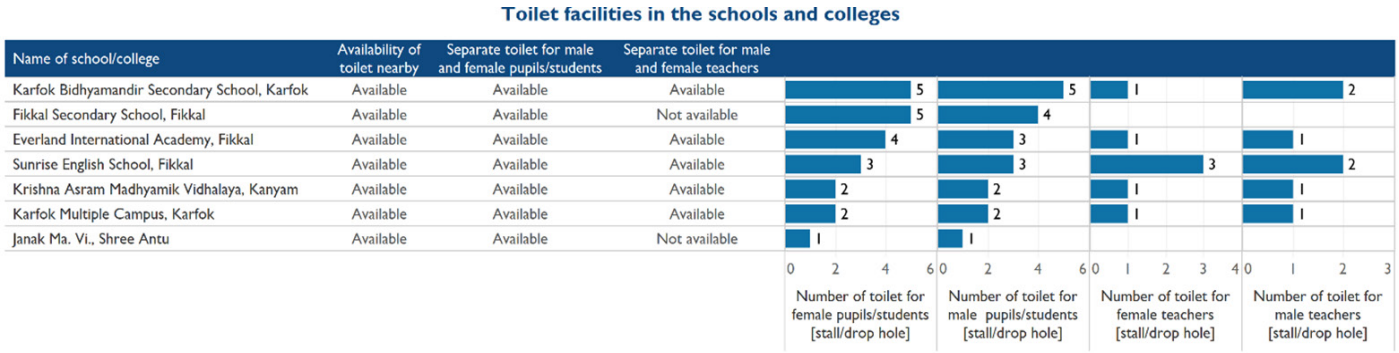


Fig. 4.4: Categories of toilet facilities at the schools/colleges

Fig. 4.5 shows the average number of students/pupils and teachers per stall/drop hole as of October 2020. *Janak Ma. Vi.* and *Krishna Asram Madhyamik Vidhalaya* (both government schools) account for the highest number of male pupils/students per stall with 150 and 113, respectively, and female pupils/students per stall with 242 and 142, respectively. At the remaining five (5) schools, the maximum number of males per stall is 83, and the minimum number of female students/pupils per stall is 40 (*Karfok Multiple Campus*). Overall, there are more female students/pupils per stall than male students/pupils at the schools investigated, except at *Everland International Academy*. This is as a result of the higher population of female than male pupils/students (see Fig. 4.3), contrary to the analysis obtained in Biratnagar Metropolitan City and Mechinagar Municipality. The overall maximum number of students/pupils per stall is 196 (*Janak Ma. Vi.*), while the minimum is 50 (*Karfok Multiple Campus*). As for the teachers, the maximum number per stall is 16 (*Krishna Arsram Madhyamik Vidhalaya*), and the minimum is 5 (*Sunrise English School*). *Janak Ma. Vi.* and *Fikkal Secondary School* do not have separate toilets for male and female teachers. The analysis shows that the government schools have generally limited toilet facilities, and that in Suryodaya Municipality there are more government than private institutions compared to Mechinagar Municipality and Biratnagar Metropolitan City.

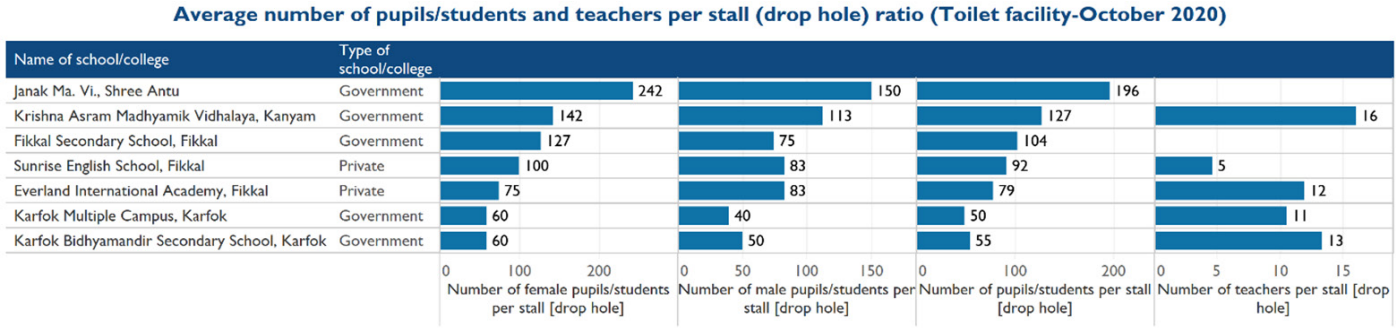


Fig. 4.5: Population of pupils/students and teachers per stall (drop hole) ratio

Fig. 4.6 shows the population distribution at the respective schools/colleges for the 2019/2020 academic year. *Fikkal Secondary School* is the most populated school in Suryodaya Municipality, with a population of 932 pupils/students enrolled in 2019, which is less than in Biratnagar Metropolitan City (between 2,244 to 3,150 pupils enrolled in 2019) and Mechinagar Municipality (between 1,000 to 2,513 pupils enrolled in 2019). This is followed by *Sunrise English School, Karfok Bidhyamandir Secondary School, Everland International Academy,* and *Krishna Asram Madhyamik Vidhalaya* with a student population distribution of 550 each, and 508, respectively. According to the study, overall, the government institutions have a higher population compared to the private institutions. In regard to male to female ratio, there are more female candidates than male across all the schools, and at *Fikkal Secondary School* female students are

double the size than their male counterpart. The gender ratio is at least 50 (*Sunrise English School, Karfok Bidhyamandir Secondary School, Everland International Academy,* and *Krishna Asram Madhyamik Vidhalaya*), with a maximum of 336 more females than males (*Fikkal Secondary School*). In descending order, there are 37 pupils per teacher at *Fikkal Secondary School*, 24 pupils per teacher at *Sunrise English School*, 23 pupils per teacher at *Everland International Academy,* 16 pupils per teacher at *Krishna Asram Madhyamik Vidhalaya,* 14 pupils per teacher at *Karfok Bidhyamandir Secondary School,* 12 pupils per teachers at *Jank Ma. Vi.,* and 10 students per teacher at *Karfok Multiple Campus.*

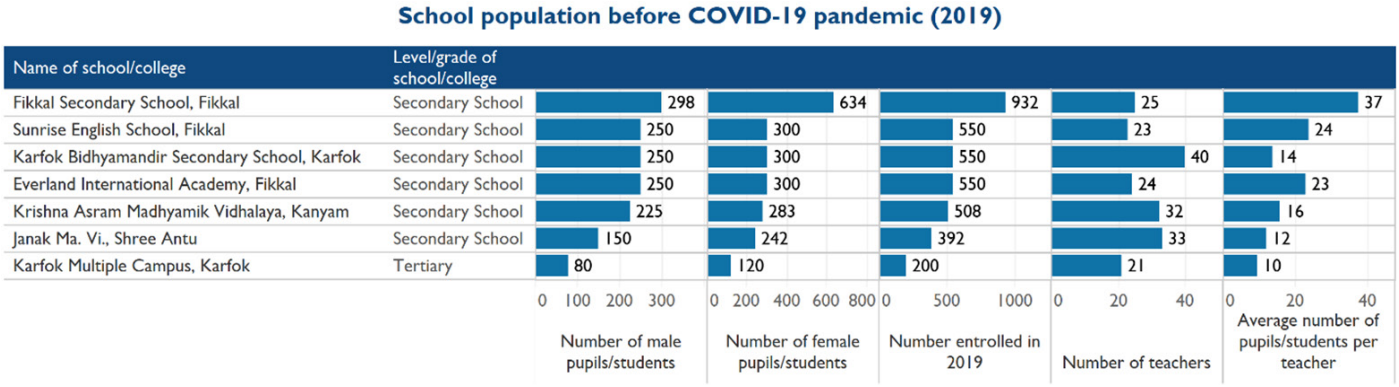


Fig. 4.6: Population distribution at the schools/colleges

In regard to mask-wearing practices, less than 10 per cent (4/7) and between 10-30 percent (3/7) of the pupils/students wear masks. All the schools have isolated places dedicated for pupils/students when they get sick (7/7), which is similar to Mechingar Municipality and different from the analysis in Biratnagar Metropolitan City. All the schools and college are busy throughout the week (except on the weekends), and most of them are busy throughout the months (5/7), except for *Janak Ma. Vi.* and *Sunrise English School* whose busiest months are January, May, June, August, and October (see Table 4.1). All the sites are operational throughout the four seasons; summer, winter, spring, and rainy season. There were three (3) suspected COVID-19 positive cases found in *Karfok Bidhyamandir Secondary School, Karfok Multiple Campus,* and *Krishna Asram Madhyamik Vidhalaya.* The majority of the schools and college do not have tracking matrix for contact tracing mechanism for visitors (5/7), except for *Everland International Academy* and *Sunrise English School.* All the sites (7/7) do not have health screening stations (handwashing with soap, hand sanitizer, and body temperature checking).

Table 4.1: Health checks, tracking matrix, and the schools/colleges seasonality

Name of school/college	Estimated percentage wearing mask	Availability of health screening station	Suspected COVID-19 cases on site	Isolated place dedicated for sick pupils/students	Busiest day of the week	Busiest month of the year	Seasonality	Availability of record book/device for visitors
Everland International Academy, Fikkal	<10%	Not available	No	Available	Every day	Every month	All seasons	Available
Fikkal Secondary School, Fikkal	10%-30%	Not available	No	Available	Every day	Every month	All seasons	Not available
Janak Ma. Vi., Shree Antu	<10%	Not available	No	Available	Every day	October, August, January	All seasons	Not available
Karfok Bidhyamandir Secondary School, Karfok	10%-30%	Not available	Yes	Available	Every day	Every month	All seasons	Not available
Karfok Multiple Campus, Karfok	10%-30%	Not available	Yes	Available	Every day	Every month	All seasons	Not available
Krishna Asram Madhyamik Vidhalaya, Kanyam	<10%	Not available	Yes	Available	Every day	Every month	All seasons	Not available
Sunrise English School, Fikkal	<10%	Not available	No	Available	Every day	May, June	All seasons	Available

Based on the PMM findings, vulnerability can be determined by poor health systems and/or in terms of health infrastructure, and in particular hygiene management. Waste management systems are available at all the schools and college but not adequate, according to eye findings and the following parameters;

- The schools' environment is tidy, except at *Krishna Asram Madhyamik Vidhalaya* where there is visibility of trash in the open in limited quantity.

- Visibility of stagnant water on the floor in limited quantity (5/7) especially during the rainy season, except at *Karfok Bidhyamandir Secondary School* and *Sunrise English School*, used by mosquitoes as a breeding place.
- Visibility of unwanted animals/insects (7/7) in limited quantity at all the sites investigated.

The most used health centres from the respective schools and college are *Fikkal Primary Health Centre* (5/7) and *Pathibhara Medical Hall* (2/7). Most of the schools and college have cafeterias or food services for their pupils/students and teachers, except for *Fikkal Secondary School* (Table 4.2).

Table 4.2: Waste management, food service, and the most used health centre

Name of school/college	Availability of waste management system	Visibility of stagnant water on the floor	Visibility of trash in the open	Visibility of unwanted animals/insects	Availability of cafeteria/food service	Name of the most used health centre
Everland International Academy, Fikkal	Available	Yes, limited	No	Yes, limited	Yes	Fikkal Primary Health Center
Fikkal Secondary School, Fikkal	Available	Yes, limited	No	Yes, limited	No	Fikkal Primary Health Center
Janak Ma. Vi., Shree Antu	Available	Yes, limited	No	Yes, limited	Yes	Fikkal Primary Health Center
Karfok Bidhyamandir Secondary School, Karfok	Available	No	No	Yes, limited	Yes	Pathibhara Medical Hall
Karfok Multiple Campus, Karfok	Available	Yes, limited	No	Yes, limited	Yes	Pathibhara Medical Hall
Krishna Asram Madhyamik Vidhalaya, Kanyam	Available	Yes, limited	Yes, limited	Yes, limited	Yes	Fikkal Primary Health Center
Sunrise English School, Fikkal	Available	No	No	Yes, limited	Yes	Fikkal Primary Health Center

3.2.f ENTERTAINMENT CENTRES

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

The study reveals that the entertainment centres in Suryodaya Municipality account for a noticeable population mobility among the other investigated categories. The respective entertainment sites attract people from Nepal, India and Japan, in a significant daily average number. The study suggests that the identified entertainment centres are open to the public every day and throughout the year, except for federal or local government's restriction orders during disease outbreak conditions or others. However, in normal times, the busiest days in terms of higher population mobility are documented as Friday and Saturday. In the same way, August to November are recorded as the busiest months for people's movement to the respective entertainment centres. The analysis shows that the population mobility at the investigated entertainment centres are predominantly from *Ilam, Jhapa, Morang, Sunsari, Dhankuta, Bhojpur, Khotang, Panchthar,* and *Taplejung* districts. At the municipality level, people's movement to the respective sites is mostly from *Suryodaya Municipality, Mangsebung Rural Municipality, Rong Rural Municipality, Ilam Municipality, Sandakpur Rural Municipality, Maijogmai Rural Municipality, Arjundhara Municipality,* and *Mai Municipality.*

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

Regarding the connectivity of the investigated entertainment centres in Suryodaya Municipality, *Pashupatinagar View Point* accounts for the highest population mobility, and is located at *Pashupatinagar* locality. This site is near *Pashupatinagar Int. POE* (formal), connected to *Fikkal-Pashupatinagar Road* and easily accessible by all kinds of vehicles.

However, people who come to visit this place mainly use cars, minivans and motorbikes as modes of transport. The nearest localities to these sites are observed as *Artheytaar, Rungsung, Bouddhadham,* and *Teen Khutte*. Correspondingly, *Kanyam View Point* is situated at *Kanyam* locality, which is linked to the *Mechi Highway* with other several small routes connecting localities nearby. As per the observations, this entertainment centre is accessible by all kinds of vehicles, however, people mainly use cars, minivans and motorbikes to reach the site. The nearest localities to this entertainment centre are observed as *Harkate, Fajeegaun Kolbong*, and *Fikkal*. Similarly, *Antu Pond* lies in *Shree Antu* locality, which is connected to the *Mechi Highway* via *Shree Antu Road*, with good accessibility by vehicle, although people mainly use motorbikes. The nearest localities to this entertainment centre are documented as *Samalbung, Takpath, Uniyutar,* and *Chhiruwa*. Furthermore, *Karfok Play Ground* is based in *Karfok* locality, which is linked to the *Mechi Highway*, accessible by vehicle. The study suggests that there are several alternative routes, such as *Kalapani-Maghe Road, Aitabare-Aathghare Road* and *Maghe-Aitabare Road.* The nearest localities to this site are reported as *Aitabare, Panchakanya, Teen Ghare* and *Fikkal.*

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

According to the matrix analysis, four (4) main entertainment centres in Suryodaya Municipality fall under the localities with the largest influx of people, which is less than in Biratnagar Metropolitan City (13) and Mechinagar Municipality (10). Apparently, at all the entertainment centres investigated in Suryodaya Municipality the mobility pattern is significant. *Pashupatinagar View Point* accounts for the largest influx of people with 3,000 per day, and on the busiest day, the number increases to 4,000, which is half the flow in Biratnagar Metropolitan City (8,000 people per day) and 4 times higher than in Mechinagar Municipality (1,000 people per day). These are followed by *Karfok Play Ground, Antu Pond,* and *Kanyam View Point,* with a population mobility of 2,500 each, and 1,500 people per day, and 5,000, 4,000 and 2,000 people, respectively, on the busiest day (see Fig. 5.1). Surprisingly, at *Karfok Play Ground* the daily mobility pattern is lesser than at *Pashupatinagar View Point,* however, on the busiest day, the population size at *Karfok Play Ground* (5,000 people) is higher than *Pashupatinagar View Point* and *Antu Pond* (4,000 people each). All the entertainment centres investigated receive people from other countries, of which the biggest fraction is from India. Only *Kanyam View Point* receives people from India, Japan, and USA, while the other entertainment centres (3/4) are only visited by people from India. *Pashupatinagar View Point* is accessed by the highest percentage of people from India (about 75%). The remaining three (3) sites receive a maximum of 20 per cent (*Antu Pond*) and a minimum of 10 per cent (*Karfok Paly Ground*). This shows that among all the sites investigated for the PMM activities, Province 1 receives one of the largest influxes of people from India, with a minority coming from other countries (Afghanistan, Bangladesh, Bhutan, USA, and Japan).

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

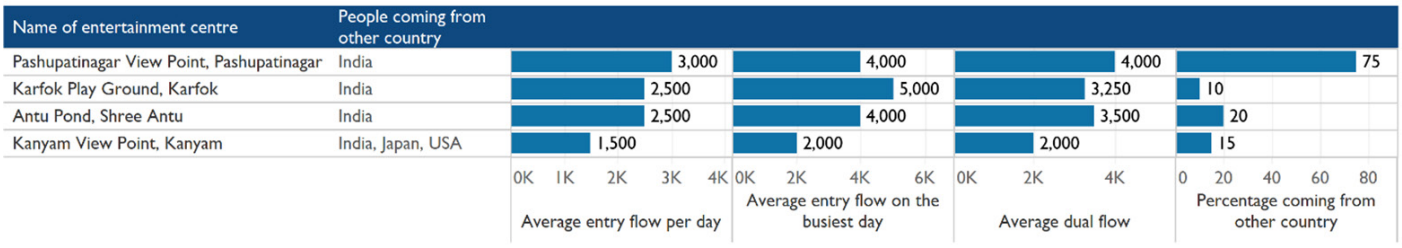


Fig. 5.1: Population mobility at the entertainment centres

Most of the entertainment centres are operational throughout the seasons, except for *Karfok Play Ground* and *Kanyam View Point* whose seasonality is summer and spring, and winter only, respectively. All the sites investigated do not check body temperature nor have health screening stations for handwashing with soap and hand sanitizer before entrance (see Fig. 5.2). There is availability of both water and toilet facilities nearby for most the sites investigated, with at least 1 stall/drop hole (*Antu Pond*) and at most 2 stalls/drop holes for visitors and staffs (*Kanyam View Point* and *Pashupatinagar View Point*), except at *Karfok Play Ground* and *Kanyam View Point* where there is no toilet and water facility, respectively. The distance to the nearest water source is limited, with the farthest being 4 Km (*Karfok Play Ground*) and the closest 10 meters (*Antu Pond*). Similarly, the distance to the nearest health centre differs across the four (4) entertainment centres, the most distant being *Antu Pond, Karfok Play Ground*, and *Kanyam View Point* (11, and 4 Km each, respectively) and the closest being *Pashupatinagar View Point* (500 meters away).

Availability of health screening station, water and toilet facilities, and distance to the nearest health centre and water source

Name of entertainment centre	Availability of health screening station	Body temperature checking status	Availability of toilet facility nearby	Availability of water on site	Seasonality
Antu Pond, Shree Antu	Not available	Not available	Available	Available	All seasons
Karfok Play Ground, Karfok	Not available	Not available	Not available	Available	Summer and spring only
Kanyam View Point, Kanyam	Not available	Not available	Available	Not available	Winter only
Pashupatinagar View Point, Pashupatinagar	Not available	Not available	Available	Available	All seasons

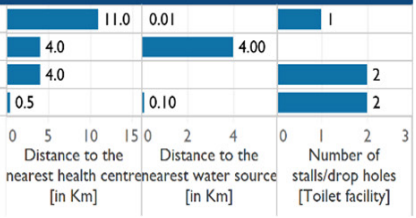


Fig. 5.2: Availability of health screening stations, water and toilet facilities, and distances to the nearest health centre and water source

Table 5.1 shows the availability of community health workers or agents, presence of isolated rooms dedicated for sick people, the busiest days/months, and the most used and nearest health centres. There is no presence of community health workers/volunteers nor isolated places dedicated for sick people at most of the entertainment centres (3/4), except at *Karfok Play Ground.* The busiest days and months vary across most of the sites, except for *Karfok Play Ground* and *Pashupatinagar View Point*, which are busy throughout the week and the year (Karfok Play Ground). The nearest and most used health centres differ across each site, except for *Karfork Play Ground* and *Pashupatinagar View Point* whose nearest health centre is *Pashupatinagar Primary Health Centre*; and *Antu Pond* and *Karfok Play Ground* whose most used health centre is *Fikkal Primary Health Centre*.

Table 5.1: Availability of health worker, isolated room, the busiest days/months and the nearest and most used health centre

Name of entertainment centre	Presence of community health worker/agent for emergency case	Busiest day of the week	Busiest month of the year	Isolated place dedicted for sick people	Name of the nearest health centre	Name of the most used health centre
Antu Pond, Shree Antu	Not available	Friday, Saturday	July, August	Not available	Chhiruwa Primary Health Center	Fikkal Primary Health Center
Kanyam View Point, Kanyam	Not available	Saturday, Friday	October, November, September	Not available	Kanyam Health Post	Fikkal Hospital
Karfok Play Ground, Karfok	Available	Every day	Every month	Available	Pashupatinagar Primary Health Center	Fikkal Primary Health Center
Pashupatinagar View Point, Pashupatinagar	Not available	Every day	March, January, February	Not available	Pashupatinagar Primary Health Center	Pashupatinagar Primary Health Center

Three (3) of the entertainment centres have a waste management system, except for *Antu Pond.* Less than 10 per cent (3/4) and between 10-30 percent of the people visiting the entertainment centres wear masks, similar to the analysis obtained in Biratnagar Metropolitan City and Mechinagar Municipality. Despite the availability of waste

management systems (3/4), the following indicators are inadequate; visibility of unwanted animals/insects in limited quantity (4/4), visibility of trash in the open (2/4), and visibility of stagnant water on the floor (1/4). Similarly, there is inadequate tracking of migrants and visitors across the sites (3/4), except for *Karfok Play Ground* where the respondent was uncertain, which is problematic especially for contact tracing and for COVID-19 suspected cases (see Table 5.2).

Table 5.2: Hygiene and travellers' status at the entertainment centres

Name of entertainment centre	Estimated percentage wearing mask	Availability of record book/device for visitors	Availability of waste management system	Visibility of stagnant water on the floor	Visibility of trash in the open	Visibility of unwanted animals/insects
Antu Pond, Shree Antu	<10%	Not available	Not available	No	Yes, limited	Yes, limited
Kanyam View Point, Kanyam	<10%	Not available	Available	No	Yes, limited	Yes, limited
Karfok Play Ground, Karfok	10%-30%	Do not know	Available	Yes, limited	No	Yes, limited
Pashupatinagar View Point, Pashupatinagar	<10%	Not available	Available	No	No	Yes, limited

3.2.g MARKET CENTRES

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

According to the results obtained from the participatory mapping exercises and field observations, the investigated markets in Suryodaya Municipality attract people from Nepal as well as a noticeable number of people from India. The studied markets are open to the public every day and throughout the year, however, the busiest days in terms of higher people's movement are recorded as Thursday and Saturday. Similarly, the population mobility at the observed markets is recorded in higher numbers in September, October and November. As per the analysis, people visiting the identified markets in Suryodaya Municipality are documented eminently from *Ilam, Jhapa, Panchthar, Taplejung*, and *Tehrathum* districts. At the municipality level, people's movement mostly originates from *Suryodaya Municipality, Ilam Municipality, Rong Rural Municipality, Mai Municipality, Maijogmai Rural Municipality,* and *Sandakpur Rural Municipality.*

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

Regarding the connectivity of the markets in Suryodaya Municipality, *Fikkal Market,* which lies in *Fikkal* locality, accounts for the highest population mobility among all the investigated markets. This market is connected to the *Mechi Highway* and *Fikkal-Pashupatinagar Highway*. The alternative vehicle routes to access this site are *Premjung-Namsalilng-Ilam Road, Fikkal-Arubote Road,* and *Old Street Road*. The nearest localities to this market are observed as *Kanyam, Premjung, Aitabare, Karfok,* and *Panchakanya*. According to the study, this market is accessible by all kinds of vehicles, however, people mainly use motorbike as the main mode of transport. Similarly, *Pashupatinagar Market* is situated at *Pashupatinagar* locality, and connected to *Pashupatinagar Int. POE* (formal). This market is associated with *Fikkal-Pashupatinagar Road* and linked to several small routes connecting localities nearby, such as *Artheytaar, Rungsung, Bouddhadham*, and *Teen Khutte*. This market is also accessible by all kinds of vehicles, however, people from India commute to the market by motorbike. Correspondingly, *Maneybhanjyang Market* is based in *Maneybhanjyang* locality and connected

to *Maneybhanjyang POE*. According to the field observations, this market is not accessible by vehicle, except motorbikes, due to the difficult terrain and unavailability of black top road. In the same way, *Gorkhe Market* is located at *Gorkhe* locality, which is linked to *Fikkal-Pashupatinagar Road* via *Barbote-Melbote Road*. According to the analysis obtained from the field observations, this market is accessible only by minivan and motorbike due to the absence of black top road. The nearest localities to this market are recorded as *Timure, Dhap,* and *Melbote*. Conversely, *Harkate Market* is situated at *Harkate* locality, which is connected to the *Mechi Highway*. This market is accessible by all kinds of vehicles, however, people who comes from localities close by mainly use minivan and motorbikes. The nearest localities to this market are reported as *Kanyam, Fajeegaun, Kolbong,* and *Marse*. Likewise, *Shanti Market* is located at *Shanti Chowk* which is linked to *Mechi Highway* via *Shree Antu Road*. This market is accessible by all kinds of vehicles, however, people mostly use minivans and motorbikes to access the site. The nearest localities are observed as *Samalbung, Takpath, Uniyutar,* and *Chhiruwa*. Furthermore, *Teenghare Market* and *Kattuse Market* are situated at *Teenghare* and *Kattuse* localities, respectively, and connected to the *Mechi Highway*. These markets are accessible by all kinds of vehicles. The nearest localities to *Kattuse Market* are *Devisthan, Laxmipura* and *Chisapani*. Similarly, *Fikkal, Aitabare* and *Panchakanya* are observed as the nearest localities to *Teenghare Market*.

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

A total of eight (8) market centres were investigated in Suryodaya Municipality, which is higher than the analysis obtained in both Biratnagar Metropolitan City (5) and Mechinagar Municipality (5). Among these, *Fikkal Market* attracts the largest congregation of people with 600 people entering per day, and on the busiest day the numbers increase to 3,000, which is by far less compared to the flow in Biratnagar Metropolitan City (10,000 and 15,000 per day and on the busiest day, respectively) and Mechinagar Municipality (20,000 and 30,000 per day and on the busiest day, respectively). These are followed by *Harkate Market* and *Teenghare Market* with an average entry flow of 300 and 200 people, and 1,200 and 600 people on the busiest day, respectively (see Fig. 6.1). The remaining five (5) market centres receive a minimum of 50 people (*Shanti Market* and *Maneybhaniyang Market*) and a maximum of 150 people (*Pashupatinagar Market*) per day, and on the busiest day a minimum of 150 people and a maximum of 500 people (*Gorkhe Market*). Overall, comparing the population mobility at the market centres in Mechinagar Municipality, Biratnagar Metropolitan City and Suryodaya Municipality, this is far less in the latter municipality. Furthermore, most of the marketplaces are visited by people from India, except for *Kattuse Market*, which only receives Nepalese nationals. The highest percentage from India can be found at *Pashupatinagar Market* and *Maneybhanjyang Market* (70% and 25%, respectively). The remaining five (5) sites from India receive a minimum of 2 per cent and a maximum of 10 per cent.

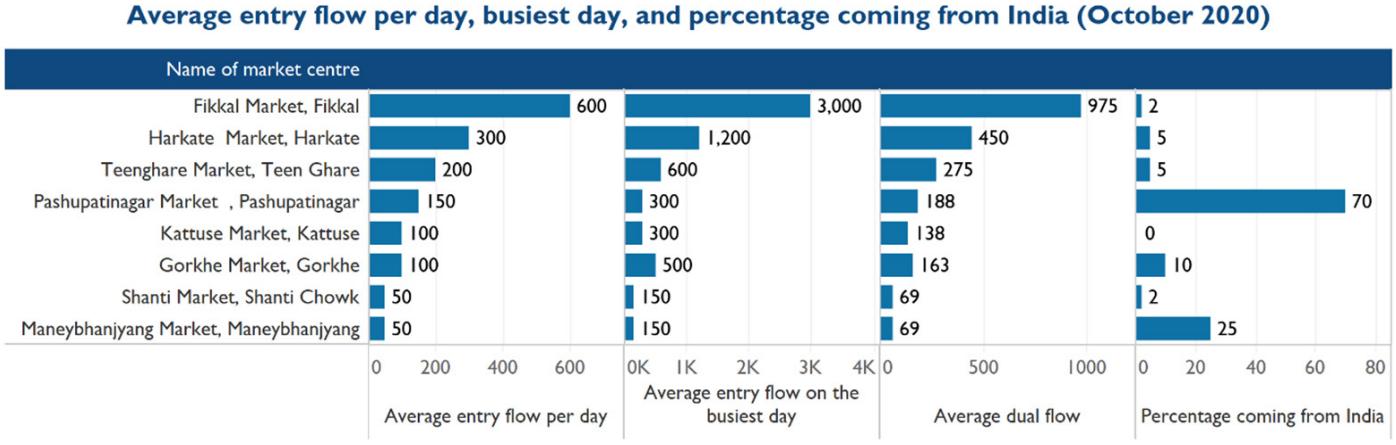


Fig. 6.1: Population mobility at the market centres

The waste management system was investigated as a determinant of vulnerability and capacity to respond to health threats across the various market centres. Most of the respondents (6/8) asserted that a waste management is in place, except for *Gorkhe Market* and *Maneybhanjyang Market.* However, the following indicators show that the environment is untidy; visibility of unwanted animals/insects in limited and large quantity (8/8), trash in the open in limited quantity (7/8), and stagnant water on the floor in limited quantity (4/8). This shows that, although the majority of the respondents agreed on the availability of a waste management system, this is not adequately managed, and thus facilitates the spread of contagious diseases among the community. Furthermore, most of the market centres do not have an isolated place dedicated to sick people (7/8), except for *Kattuse Market*, especially worrying during a pandemic (see Table 6.1). On the other hand, the majority of the market centres do not have a health authority or community health worker or volunteer for emergency cases (7/8), except for *Gorkhe Market.* At the market centres in Suryodaya Municipality, similarly to some other municipalities, the majority of the people do not wear masks (mostly less than 10%).

Table 6.1: Waste management system, health authority, and estimated percentage wearing masks at the market centres

Name of market centre	Isolated place dedicated for sick people	Presence of community health worker/agent for emergency cases	Estimated percentage wearing mask	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Fikkal Market, Fikkal	Not available	Not available	<10%	Available	Yes, limited	No	Yes, limited
Gorkhe Market, Gorkhe	Not available	Available	<10%	Not available	Yes, limited	Yes, limited	Yes, in large quantity
Harkate Market, Harkate	Not available	Not available	<10%	Available	Yes, limited	Yes, limited	Yes, limited
Kattuse Market, Kattuse	Available	Not available	>50%	Available	Yes, limited	Yes, limited	Yes, limited
Maneybhanjyang Market, Maneybhanjyang	Not available	Not available	<10%	Not available	Yes, limited	Yes, limited	Yes, limited
Pashupatinagar Market , Pashupatinagar	Not available	Not available	<10%	Available	No	No	Yes, limited
Shanti Market, Shanti Chowk	Not available	Not available	<10%	Available	Yes, limited	No	Yes, limited
Teenghare Market, Teen Ghare	Not available	Not available	10%-30%	Available	Yes, limited	No	Yes, limited

The study shows that most of the market centres have water and toilet facilities (5/8), with a minimum of 1 stall/drop hole and a maximum of 4 stalls/drop holes (*Kattuse Market*). *Gorkhe Market* has no toilet facility nor water facility on site, *Teenghare Market* and *Fikkal Market* have no water facility on site, and *Harkate Market* and *Shanti Market* have no toilets. Most of the market centres investigated do not have health screening stations for handwashing with soap, hand sanitizer, and body temperature checking (7/8), except for *Pashupatinagar Market* with a screening station without thermometer for body temperature checking. The farthest distance to the nearest health centre from *Kattuse Market* is equal to 15 Km, this is followed by *Pashupatinagar Market, Gorkhe Market,* and *Maneybhanjyang Market,* with a distance distribution of 12 Km each, and 10 Km, respectively, while the remaining four (4) sites have a maximum of 5 Km and a minimum of 40 meters away (*Fikkal Market*). The distance to the nearest water source from the market centres is not too significant when water is available on site, at a minimum of 1 meter and a maximum of 500 meters (see Fig. 6.2).

Availability of health screening station, basic hygiene, and distance to the nearest health centre and water source

Name of market centre	Body temperature checking status	Availability of health screening station	Availability of water on site	Availability of toilet nearby
Kattuse Market, Kattuse	Not available	Not available	Available	Available
Pashupatinagar Market , Pashupatinagar	Available	Available	Available	Available
Gorkhe Market, Gorkhe	Not available	Not available	Not available	Not available
Maneybhanjyang Market, Maneybhanjyang	Not available	Not available	Available	Available
Teenghare Market, Teen Ghare	Not available	Not available	Not available	Available
Harkate Market, Harkate	Not available	Not available	Available	Not available
Shanti Market, Shanti Chowk	Not available	Not available	Available	Not available
Fikkal Market, Fikkal	Not available	Not available	Not available	Available

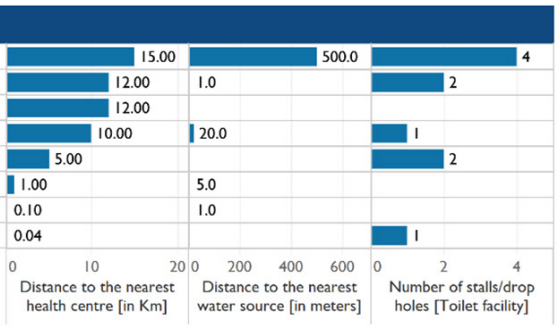


Fig. 6.2: Availability of health screening stations, water and toilet facilities, and distances to the nearest health centre and water source

The busiest days at the market centres vary and most of the sites are busy throughout the year (5/8), except for *Maneybhanjyang Market, Shanti Market,* and *Pashupatinagar Market*, whose busiest months are January, February, June, July, and September. There is no availability of record book/device or technique for tracking visitors or buyers at the respective market centres, and thus increases the chances for affected patients with COVID-19 to spread the virus or other diseases. All the sites are busy throughout the four seasons (winter, summer, spring, and rainy season). The nearest and most used health centre differs across the market centres, based on their location. However, *Fikkal Primary Health Centre* (4/8 markets) accounts for the most used health centre, likely due to its proximity to the market centres and because being government owned, the cost of medication is cheaper compared to other health centres. The remaining respondents (4) mentioned different health centres (see Table 6.1).

Table 6.1: Tracking matrix, the busiest days/months, and name of the most used and nearest health centre

Name of market centre	Availability of record book/device for buyers/sellers	Busiest day of the week	Busiest month of the year	Market seasonality	Name of the most used health centre	Name of the nearest health centre
Fikkal Market, Fikkal	Not available	Thursday	Every month	All seasons	Fikkal Primary Health Center	Fikkal Primary Health Center
Gorkhe Market, Gorkhe	Not available	Wednesday	Every month	All seasons	Fikkal Primary Health Center	Gorkhe Health Post
Harkate Market, Harkate	Not available	Tuesday, Saturday	Every month	All seasons	Harkate Health Post	Harkate Health Post
Kattuse Market, Kattuse	Not available	Saturday	Every month	All seasons	Fikkal Primary Health Center	Katuse Health post
Maneybhanjyang Market, Maneybhanjyang	Not available	Friday	June, July	All seasons	Gorkhe Health Post	Bhuda Clinic
Pashupatinagar Market , Pashupatinagar	Do not know	Monday	January, February, September, June	All seasons	Fikkal Hospital	Pashupatinagar Primary Health Center
Shanti Market, Shanti Chowk	Not available	Saturday	June, July	All seasons	Samalbung Primary Health Center	Samalbung Primary Health Center
Teenghare Market, Teen Ghare	Not available	Sunday, Thursday	Every month	All seasons	Fikkal Primary Health Center	Friends Medico

According to the analysis, there are five (5) main layers of bars indicating food or goods sold at the various market centres. The first layer shows that goods/merchandise, fruits/vegetables, and canned food/drinks account for the highest percentage (17.5% each). The second layer includes prepared foods and meat/poultry (12.5% each). In the third layer, fish is the most prevalent (10.0%), in the fourth, sand is present (5.0%), and lastly, in the fifth layer, there are; timber, minerals and other items (2.5% each). These findings reveal that goods/merchandise, fruits/vegetables, and canned food/drinks are the most sold items at the market centres in Suryodaya Municipality (see Fig. 6.3).

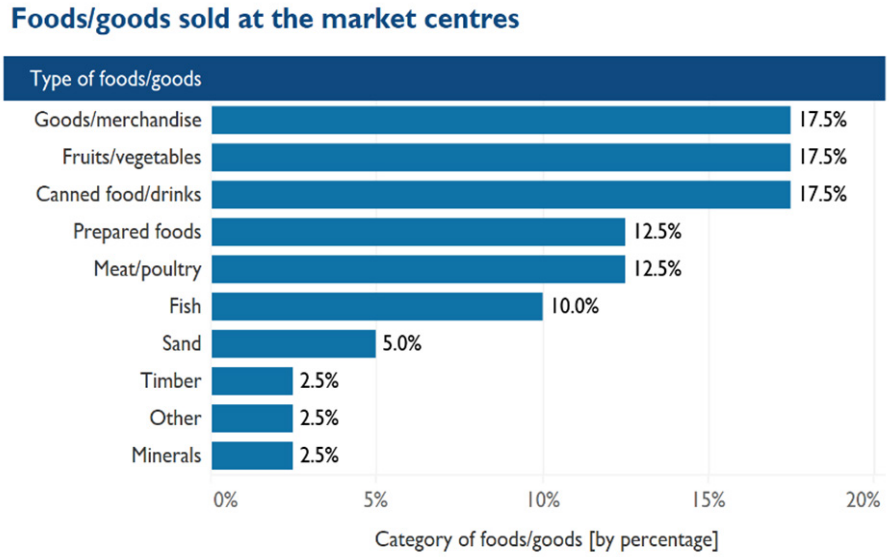


Fig. 6.3: Common foods/goods sold at the market centres

3.2.h MIGRANT WORKSITES

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

The study depicts that the migrant worksites in Suryodaya Municipality attract people from Nepal as well as India. The identified migrant worksites are open or operational every day and throughout the year, however, the busiest day in terms of entry flow is Sunday. Similarly, March and April account for the busiest months in terms of people accessing the respective worksites. The analysis reveals that the population mobility at the investigated migrant worksites is predominantly from *Jhapa, Ilam, Tehrathum, Taplejung* and *Panchthar* districts. At the municipality level, people's movement mainly originates from *Suryodaya Municipality, Maijogmai Rural Municipality, Ilam Municipality, Chulachuli Rural Municipality, Mai Municipality, Rong Rural Municipality, Birtamode Municipality,* and *Mechinagar Municipality.*

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

In terms of connectivity of the assessed migrant worksites, *Kanyam Tea State* is situated at *Kanyam* locality, which is connected to the *Mechi Highway* and accessible by all kinds of vehicles. There are other small alternative routes to access this worksite from localities nearby. The nearest localities to this site are documented as *Harkate, Fajeegaun, Kolbong,* and *Fikkal*. Similarly, *Samal Valley Tea State* is located at *Samalbung* locality, also linked to the *Mechi Highway* via *Shree Antu Road.* Small alternative routes were reported to access this worksite which have no names and barely used by vehicles. The nearest localities to this worksite are observed as *Shree Antu, Samalbung, Takpath, Uniyutar,* and *Chhiruwa*. Likewise, *Lucky Cheese Factory* lies in *Teen Khutte* locality, which is associated with *Fikkal-Pashupatinagar Road* and accessible by all kinds of vehicles. The nearest localities to this migrant worksite are *Pashupatinagar*,

Sundarpani, Baudhhadham, and *Pothukatla*. On the other hand, *Ilam Tea Producer* is situated at *Aitabare* locality, which is close to *Panchakanya* locality and linked to the *Mechi Highway*. This site is accessible by all kinds of vehicles, however, people mostly travel by motorbikes and minivans. The alternative vehicle routes to access this site are observed as *Kalapani-Maghe Road, Maghe-Aitabare Road* and *Aitabare-Aathghare Road*. The nearest localities to these sites are reported as *Ilam Bazar, Panchakanya*, and *Fikkal*. Furthermore, *The New Pradhan Hotel* and *Bindhyabasini Eco Brick Industry* are located at *Teen Ghare* locality, where *The New Pradhan Hotel* accounts for highest population mobility among the investigated sites. These two (2) sites are associated with the *Mechi Highway* and accessible by all kinds of vehicles, however, people from localities close by mostly use motorbikes to reach these sites. As per the analysis, the nearest localities to these worksites are documented as *Ilam Bazar, Aitabare, Panchakanya* and *Fikkal*.

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

In Suryodaya Municipality, a total of six (6) migrant worksites were investigated, which is less than in Biratnagar Metropolitan City (12) and Mechinagar Municipality (8). The largest influx of people can be found at *The New Pradhan Hotel* and *Kanyan Tea State*, with an average entry flow of 400 and 200 people per day, while on the busiest day, the number increases to 500 and 200 people (staffs and visitors), respectively. These are followed by *Ilam Tea Producer* and *Samal Valley Tea State,* with a population mobility of 55 and 42 people per day, and 100 and 42 people, respectively, on the busiest day. The remaining two (2) sites have a minimum population mobility of 25 people (*Bindhyabasini Eco Brick Industry*) and a maximum of 30 (*Lucky Cheese Factory*). On the busiest day, the minimum influx is 35 people (*Bindhyabasini Eco Brick Industry*) and the maximum is 100 (*Lucky Cheese Factory*). Most of the migrant worksites investigated receive people from India, except for *Bindhyabasini Eco Brick Industry* whose staffs members are Nepalese nationals. The highest percentage from India is found at *Lucky Cheese Factory* (5%), while the remaining four (4) sites, receive a limited percentage distribution ranging between 1-2 per cent (see Fig. 7.1).

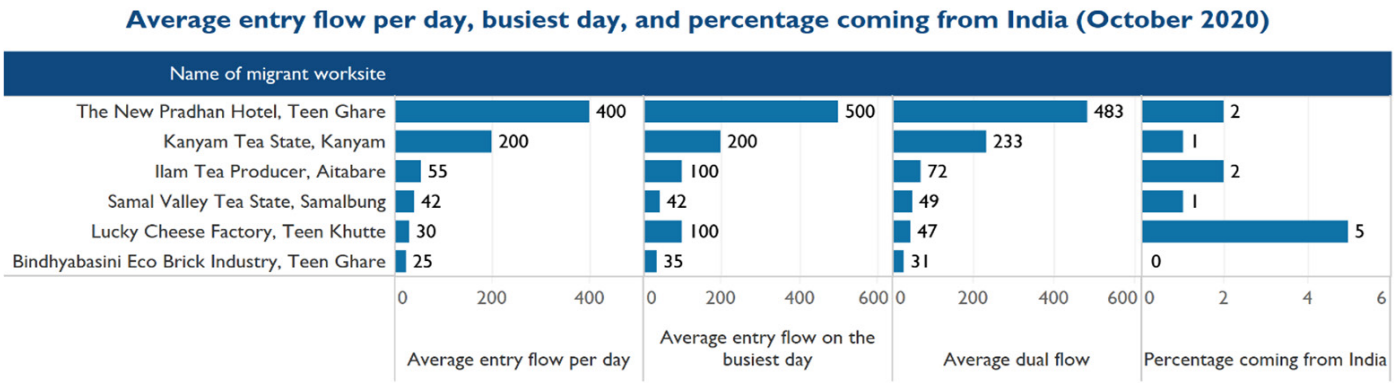


Fig. 7.1: Population mobility at the migrant worksites

According to the findings, out of the six (6) migrant worksites, the majority (4/6) do not have a health screening station nor body temperature checking, except for *Ilam Tea Producer* and *Kanyam Tea State* with available health screening stations, *Bindhyabasini Eco Brick Industry* and *Samal Valley Tea State* which check body temperature. The majority of the migrant worksites have a living accommodation for staff (5/6), except for *The New Pradhan Hotel*. The most used health centre from the respective migrant worksites differs, however, *Suryodaya Polyclinic* (2/6) and *Fikkal Primary Health Centre* (2/6) account for the most used, while for the remaining two (2) sites, it varies across the locality. Most of these sites are busy throughout the week (5/6), except for *The New Pradhan Hotel* whose busiest day is Sunday. Similarly, all the migrant worksites are busy throughout the year.

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

Name of migrant worksite	Availability of health screening station	Body temperature checking status	Availability of accommodation for staffs	Name of the most used health centre	Busiest day of the week	Busiest month of the year
Bindhyabasini Eco Brick Industry, Teen Ghare	Not available	Available	Available	Suryodaya Polyclinic	Every day	Every month
Ilam Tea Producer, Aitabare	Available	Not available	Available	Suryodaya Polyclinic	Every day	Every month
Kanyam Tea State, Kanyam	Available	Not available	Available	Kanyam Health Post	Every day	Every month
Lucky Cheese Factory, Teen Khutte	Not available	Not available	Available	Fikkal Primary Health Center	Every day	Every month
Samal Valley Tea State, Samalbung	Not available	Available	Available	Fikkal Primary Health Center	Every day	Every month
The New Pradhan Hotel, Teen Ghare	Not available	Not available	Not available	Fikkal Hospital	Sunday	Every month

According to the analysis, all the migrant worksites investigated have water and toilet facilities nearby (6/6), with a minimum of 2 stalls/drop holes (*The New Pradhan Hotel* and *Bindhyabasini Eco Brick Industry*) and a maximum of 12 stalls/drop holes (*Ilam Tea Producer*). The nearest health centre differs across the sites investigated, with *Fikkal Primary Health Centre* being in close proximity to two (2) sites (see Fig. 7.2). The distance to the nearest health centres is significant across most of the migrant worksites, except for *Kanyam Tea State* (100 meters away). The farthest distance to the nearest health centres can be found from *Samal Valley Tea State* at about 12 Km, followed by *The New Pradhan Hotel* and *Lucky Cheese Factory* at about 6 Km each. *Ilam Tea Producer* and *Bindhyabasini Eco Brick Industry* share an equal distance distribution of 5 Km each. The investigated migrant worksites have water nearby, within a radius of 800 meters. The staffs/visitors to stall/drop hole ratio differs across the sites, with a minimum of 5:1 (*Ilam Tea Producer*) and a maximum of 200:1 (*The New Pradhan Hotel*).

Availability of water and toilet facilities, staffs/visitors per stall/drop hole ratio, and distance to the nearest health centre and water source (October 2020)

Name of migrant worksite	Name of the nearest health centre	Availability of toilet nearby	Availability of water on site
Samal Valley Tea State, Samalbung	Luv Kumar Clinic	Available	Available
The New Pradhan Hotel, Teen Ghare	Friends Medico	Available	Available
Lucky Cheese Factory, Teen Khutte	Fikkal Primary Health Center	Available	Available
Ilam Tea Producer, Aitabare	Fikkal Primary Health Center	Available	Available
Bindhyabasini Eco Brick Industry, Teen Ghare	Kalil Medical	Available	Available
Kanyam Tea State, Kanyam	Kanyam Health Post	Available	Available

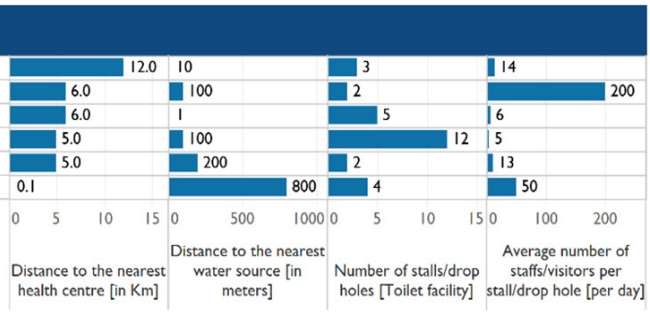


Fig. 7.2: Availability of water and toilet facilities, staffs/visitors to stall/drop hole ratio, and distances to the nearest health centre and water source

Most of the migrant worksites have a waste management system in place (4/6), except for *Bindhyabasini Eco Brick Industry* and *The New Pradhan Hotel*. Therefore, the waste management system is only partially available, and according to the respondents and eye findings, the following are inadequate;

- Visibility of trash in the open in limited quantity (3/6).
- Visibility of unwanted animals/insects in limited quantity at most of the sites investigated (5/6), except for *Bindhyabasini Eco Brick Industry.*

However, there is no visibility of stagnant water on the floor, contrary to most of the sites assessed in Suryodaya Municipality and other municipalities. People at these worksites rely on alternative treatment when they get sick, such as; clinic or hospital, pharmacy, home treatment, traditional healer, and religious leader, in order of importance (see Table 7.2).

Table 7.2: Waste management and places people go to when they get sick

Name of migrant worksite	Availability of waste management system	Places people go to when they get sick	Visibility of stagnant water on the floor	Visibility of trash in the open	Visibility of unwanted animals/insects
Bindhyabasini Eco Brick Industry, Teen Ghare	Not available	Pharmacy	No	Yes, limited	No
Ilam Tea Producer, Aitabare	Available	Clinic or Hospital	No	No	Yes, limited
Kanyam Tea State, Kanyam	Available	Clinic or Hospital	No	No	Yes, limited
Lucky Cheese Factory, Teen Khutte	Available	Clinic or Hospital, Pharmacy	No	No	Yes, limited
Samal Valley Tea State, Samalbung	Available	Clinic or Hospital, Home Treatment, Traditional Healer, Religious leader	No	Yes, limited	Yes, limited
The New Pradhan Hotel, Teen Ghare	Not available	Pharmacy, Clinic or Hospital	No	Yes, limited	Yes, limited

The majority of the migrant worksites do not have a tracking matrix, such as a record book or device for visitors (5/6), except for *Ilam Tea Producer.* Most of the respondents (3/6) agreed that less than 10 per cent of people wear masks on site, whereas two (2) respondents (2/6) reported 20-40 per cent, and only one (1) site reported a percentage greater than 50 (see Table 7.3). Most of these sites are operational throughout the seasons, except for *Ilam Tea Producer* and *Samal Valley Tea State*, which are operational in summer and spring only. Most the of the migrant worksites do not have a community health worker/agent for emergency cases on site (4/6), except for *Ilam Tea Producer* and *Lucky Cheese Factory.*

Table 7.3: Tracking visitors/travellers and estimated percentage wearing masks at the migrant worksites

Name of migrant worksite	Estimated percentage wearing mask	Availability of record book/device for visitors	Seasonality	Availability of community health worker/agent for emergency cases
Bindhyabasini Eco Brick Industry, Teen Ghare	<10%	Do not know	All seasons	Not available
Ilam Tea Producer, Aitabare	>50%	Available	Summer and spring only	Available
Kanyam Tea State, Kanyam	<10%	Not available	All seasons	Not available
Lucky Cheese Factory, Teen Khutte	<10%	Not available	All seasons	Available
Samal Valley Tea State, Samalbung	10%-30%	Do not know	Summer and spring only	Not available
The New Pradhan Hotel, Teen Ghare	31%-50%	Not available	All seasons	Not available

The main activities conducted at the migrant worksites in Suyodaya Municipality are factory, other related activities, and agriculture. Among these, factory accounts for the largest percentage with 55.6, similar to the majority of the municipalities where the study was conducted, followed by other related activities and agriculture with a percentage distribution of 33.3 and 11.1, respectively, and thus contrary to the majority of the municipalities where the study was conducted. There are only two (2) types of accommodation for staffs at the migrant worksites, zinc and concrete, with a percentage distribution of 60 and 40, respectively, contrary to the results obtained in most of the municipalities where the PMM was conducted (wooden house) and similar to the analysis obtained in Biratnagar Metropolitan City, with the exception of tarpaulin, and Mechinagar Municipality (see Fig. 7.3).

Type of migrant activities and available accommodation at the migrant worksites

Type of migrant activity	Type of available accommodation
Factory	Concrete
Other activities	'
Agriculture	Zinc

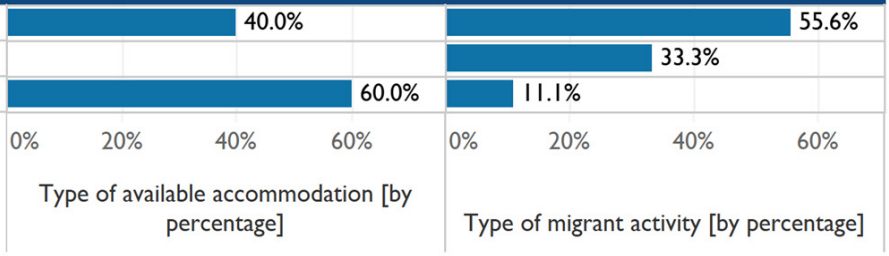


Fig. 7.3: Type of activity and accommodation at the migrant worksites

3.2.i TRANSPORT STATIONS

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

According to the results obtained from the participatory mapping exercises and field observations, the transport stations account for a significant population mobility among other investigated categories. The study shows that *Fatak Taxi Stand* at *Pashupatinagar* have the highest population mobility. These identified transport stations are open or operational every day and throughout the year, however, Thursday, Friday and Saturday are observed as the busiest days in terms of higher population mobility. Similarly, the busiest months are reported as October, November, and December. The study suggests that the population mobility at the respective transport stations is eminently from *Jhapa, Ilam, Morang, Sunsari, Panchthar, Taplejung, Tehrathum, Dhankuta* and *Bhojpur* districts. At the municipality level, people's movement mostly originates from *Suryodaya Municipality, Mai Municipality, Rong Rural Municipality, Mangsebung Rural Municipality, Ilam Municipality, Haldibari Rural Municipality, Arjundhara Municipality, Maijogmai Rural Municipality,* and *Kechanakawal Rural Municipality.*

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

In terms of connectivity of the investigated transport stations in Suryodaya Municipality, the majority of the transport stations are found in *Fikkal* and *Pashupatinagar* localities, which are considered as the biggest localities or junctions in the municipality. According to the study, *Antu Taxi Stand, Jhapa Taxi Stand, Pashupatinagar Taxi Stand,* and *Ilam Taxi Stand* are situated at *Fikkal* locality, and connected to the *Mechi Highway.* These transport stations are located in close proximity to each other and are accessible by all kinds of vehicles. The nearest localities to these sites are reported as *Barbote, Kanyam, Panchakanya,* and *Aitabare*. Similarly, *Pashupatinagar Buspark, Fatak Taxi Stand,* and *Pashupatinagar Taxi Stand* are located at the *Pashupatinagar* locality with the close distance to each other in connectivity of *Fikkal-Pashupatinagar Road* and *Pashupatinagar Int. POE* (formal). These sites are easily accessible by all kinds of vehicles and the nearest localities are observed as *Artheytaar, Rungsung, Bouddhadham,* and *Teen Khutte*. Likewise, *Kanyam Taxi Stand* is based in *Kanyam* locality, and linked to the *Mechi Highway.* Several small

alternative routes that connect localities nearby are also observed at this site with good accessibility by vehicle. The nearest localities are documented as *Harkate, Fajeegaun, Kolbong,* and *Marse*. Similarly, *Harkate Taxi Stand* is situated in *Harkate* locality, which is associated with the *Mechi Highway.* The nearest localities to this site are observed as *Kanyam, Fajeegaun, Kolbong*, and *Marse*. Furthermore, *Antu Taxi Stand* and *Samalbung Taxi Station* are situated at *Shree Antu* and *Shanti Bazar* localities. These sites are accessible by all kinds of vehicles and connected to the *Mechi Highway* via *Shree Antu Road,* which also connects to *Samalbung* locality. On the other hand, *Teen Ghare Taxi Stand* is located at *Teen Ghare* locality, in connectivity with the *Mechi Highway* via several alternative routes, such as *Kalapani-Maghe Road, Maghe-Aitabare Road,* and *Aitabare-Aathghare Road,* with the nearest localities reported as *Aitabare, Panchakanya, Ilam Bazar* and *Fikkal*.

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

Twelve (12) transport stations were investigated in Suryodaya Municipality, which is higher than in Biratnagar Metropolitan City (5) and Mechinagar Municipality (5) combined. *Fatak Taxi Stand, Kanyam Taki Stand,* and *Antu Taxi Stand* have the largest mobility with 3,000, 2,500, and 2,000 people per day, while on the busiest day, the numbers add up to 4,000, 3,000, and 2,500 people, respectively (see Fig. 8.1). Surprisingly, at *Ilam Taxi Stand* (300 people per day) the mobility is less than *Fatak Taxi Stand, Kanyam Taki Stand, Antu Taxi, Pashupatinagar Taxi Stand* (500 to 3,000 people per day), however, on the busiest day, the average entry flow nearly doubles the size of the latter (5,000 people). At the remaining eight (8) transport stations, people's movement is at most 500 and at least 50 people per day, and on the busiest days, the mobility is at most 700 people and at least 100 people. Most of these sites receive people from India (11/12), except for *Samalbung Taxi Station*, which is only accessed by Nepalese nationals. The highest influx of people coming from India is found at *Fatak Taxi Stand, Pashupatinagar Taxi Stand,* and *Pashupatinagar Buspark,* with a percentage distribution of 75 each, and 70, respectively. Apart from *Fatak Taxi Stand, Antu Taxi Stand (Fikkal), Ilam Taxi Stand,* and *Harkate Taxi Stand*, whose population from other countries includes India, USA, and Japan, the remaining seven (7) sites are accessed by people coming from India only (between 3-30%). This further supports the hypothesis the researchers made in Sudurpashchim Province and Lumbini Province that the majority of the transport stations investigated have the highest population mobility across various sites, except for some POEs where the population mobility is greater.

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

Name of transport station	People coming from other country	Average entry flow per day	Average entry flow on the busiest day	Average dual flow	Percentage coming from other country
Fatak Taxi Stand, Pashupatinagar	India	3,000	4,000	3,333	75
Kanyam Taxi Stand, Kanyam	India, USA, Japan	2,500	3,000	2,750	10
Antu Taxi Stand, Shree Antu	India	2,000	2,500	2,208	30
Antu Taxi Stand, Fikkal	India, USA, Japan	1,000	3,000	1,250	3
Pashupatinagar Taxi Stand, Pashupatinagar	India	500	700	558	75
Pashupatinagar Taxi Stand, Fikkal	India	300	500	342	5
Ilam Taxi Stand, Fikkal	India, USA, Japan	300	5,000	717	3
Jhapa Taxi Stand, Fikkal	India	200	400	233	5
Harkate Taxi Stand, Harkate	India, USA	200	250	221	5
Teen Ghare Taxi Stand, Teen Ghare	India	60	250	81	5
Pashupatinagar Buspark, Pashupatinagar	India	60	100	68	70
Samalbung Taxi Station, Shanti Bazar	'	50	100	58	0

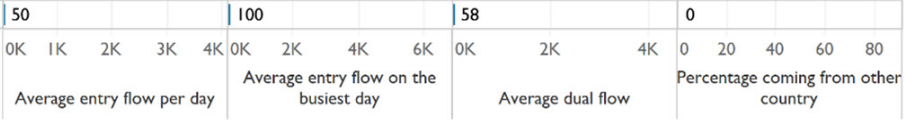


Fig. 8.1: Population mobility at the transport stations

Basic facilities, such as the availability of toilet and water on site, as well as the busiest days/months, and the tracking matrix to trace people that might be affected by the COVID-19 pandemic were investigated. The analysis shows that majority of the stations do not have water nor toilet facilities (10/12), except for *Harkate Taxi Stand* and *Antu Taxi Stand* with available water facilities, and *Kanyam Taxi Stand* and *Pashupatinagar Taxi Stand*, with available toilet facilities and a distribution of stalls/drop holes of 2 and 1, respectively. The farthest distance to the nearest health centre is from *Samalbung Taxi Station* and *Pashupatinagar Buspark* with a distribution distance of 17 and 12 Km, respectively. These are followed by *Pashupatinagar Taxi Stand* and *Fatak Taxi Stand* (11 Km away each). The remaining sites are at a minimum distance of 500 meters (*Ilam Taxi Stand*) and a maximum distance of 7 Km (*Harkate Taxi Stand*). The distance to the nearest water source is limited, within a radius of 20 meters. A suspected COVID-19 positive case was reported at *Ilam Taxi Stand* (see Fig. 8.2).

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

Name of transport station	Busiest day of the week	Busiest month of the year	Availability of water on site	Availability of toilet nearby	Suspected COVID-19 case on site
Samalbung Taxi Station, Shanti Bazar	Saturday	June, July	Not available	Not available	No
Pashupatinagar Buspark, Pashupatinagar	Monday	June, July	Not available	Not available	No
Pashupatinagar Taxi Stand, Pashupatinagar	Thursday	Every month	Not available	Not available	No
Fatak Taxi Stand, Pashupatinagar	Monday	Every month	Not available	Not available	No
Harkate Taxi Stand, Harkate	Thursday	October, November, September	Available	Not available	No
Teen Ghare Taxi Stand, Teen Ghare	Every day	Every month	Not available	Not available	No
Kanyam Taxi Stand, Kanyam	Saturday	September, October, November	Not available	Available	No
Antu Taxi Stand, Shree Antu	Friday, Saturday	January, December, October	Available	Not available	No
Pashupatinagar Taxi Stand, Fikkal	Thursday	January, December, October	Not available	Available	No
Jhapa Taxi Stand, Fikkal	Thursday	September, October, November	Not available	Not available	No
Antu Taxi Stand, Fikkal	Friday, Thursday	September, October, November	Not available	Not available	No
Ilam Taxi Stand, Fikkal	Thursday	January, December, October	Not available	Not available	Yes

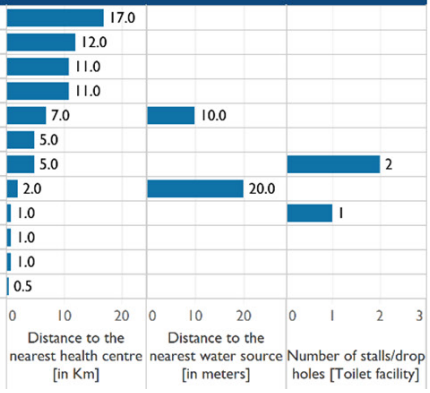


Fig. 8.2: Availability of water and toilet facilities, the busiest days/months, and distances to the nearest health centre and water source

The nearest health centre from the respective sites varies across their locations, however, *Fikkal Hospital* (4/12) and *Pashupatinagar Primary Health Centre* (3/12) account for the nearest health centres across most sites. There is no availability of isolated places for sick people (11/12), except at *Kanyam Taxi Stand,* nor presence of community health workers/agents, especially for emergency cases (11/12), except at *Antu Taxi Stand.* The following indicators are completely absent at the transport stations; availability of health screening stations, such as handwashing stations and hand sanitizer (12/12), and body temperature checking (12/12). The majority of the sites are operational throughout the four seasons, namely; summer, spring, winter, and rainy season, except for *Harkate Taxi Stand,* whose seasonality is summer only. Similarly, none of the transport stations investigated have a record book/device for travellers or visitors (12/12), and hence make it much difficult for contact tracing mechanism if someone is affected by the COVID-19 pandemic (see Table 8.1).

Table 8.1: Health screening and tracking travellers' status at the transport stations

Name of transport station	Name of the nearest health centre	Isolated place dedicated for sick people	Availability of health screening station	Body temperature checking status	Availability of community health worker/agent for emergency cases	Seasonality	Availability of record book/device for travellers
Antu Taxi Stand, Fikkal	Fikkal Hospital	Not available	Not available	Not available	Not available	All seasons	Not available
Antu Taxi Stand, Shree Antu	Chhiruwa Primary Health Center	Not available	Not available	Not available	Available	All seasons	Not available
Fatak Taxi Stand, Pashupatinagar	Pashupatinagar Primary Health Center	Not available	Not available	Not available	Not available	All seasons	Not available
Harkate Taxi Stand, Harkate	Harkate Health Post	Not available	Not available	Not available	Not available	Summer only	Not available
Ilam Taxi Stand, Fikkal	Fikkal Hospital	Not available	Not available	Not available	Not available	All seasons	Not available
Jhapa Taxi Stand, Fikkal	Fikkal Hospital	Not available	Not available	Not available	Not available	All seasons	Not available
Kanyam Taxi Stand, Kanyam	Kanyam Health Post	Available	Not available	Not available	Not available	All seasons	Not available
Pashupatinagar Buspark, Pashupatinagar	Pashupatinagar Primary Health Center	Not available	Not available	Not available	Not available	All seasons	Not available
Pashupatinagar Taxi Stand, Fikkal	Fikkal Hospital	Not available	Not available	Not available	Not available	All seasons	Not available
Pashupatinagar Taxi Stand, Pashupatinagar	Pashupatinagar Primary Health Center	Not available	Not available	Not available	Not available	All seasons	Not available
Samalbung Taxi Station, Shanti Bazar	Samalbung Health Post	Not available	Not available	Not available	Not available	All seasons	Not available
Teen Ghare Taxi Stand, Teen Ghare	Friends Medico	Not available	Not available	Not available	Not available	All seasons	Not available

The majority of the transport stations have waste management systems in place (10/12), except for *Antu Taxi Stand* and *Harkate Taxi Stand*. However, there are still challenges in controlling waste, such as the visibility of trash in the open (8/12), stagnant water on the floor (1/12), and visibility of unwanted animals/insects (12/12), which contribute to the transmission of diseases from animals to humans. Less than 10 per cent (8/12) and between 10-30 per cent of people at these sites wear masks (4/12). Overall, and by induction, only between 5-10 per cent wear masks at the investigated transport stations. The most used health centre from the respective sites differs, however, *Fikkal Hospital* (7/12) and *Fikkal Primary Health Centre* (4/12) account for the most used health centre (see Table 8.2).

Table 8.2: Waste management and estimated percentage wearing mask at the transport stations

Name of transport station	Estimated percentage wearing mask	Name of the most used health centre	Availability of waste management system	Visibility of stagnant water on the floor	Visibility of trash in the open	Visibility of unwanted animals/insects
Antu Taxi Stand, Fikkal	<10%	Fikkal Hospital	Available	No	Yes, limited	Yes, limited
Antu Taxi Stand, Shree Antu	<10%	Chhiruwa Primary Health Center	Not available	No	No	Yes, limited
Fatak Taxi Stand, Pashupatinagar	10%-30%	Fikkal Hospital	Available	Yes, limited	No	Yes, limited
Harkate Taxi Stand, Harkate	<10%	Fikkal Hospital	Not available	No	Yes, limited	Yes, limited
Ilam Taxi Stand, Fikkal	<10%	Fikkal Primary Health Center	Available	No	Yes, limited	Yes, limited
Jhapa Taxi Stand, Fikkal	<10%	Fikkal Hospital	Available	No	Yes, limited	Yes, limited
Kanyam Taxi Stand, Kanyam	<10%	Fikkal Hospital	Available	No	Yes, limited	Yes, limited
Pashupatinagar Buspark, Pashupatinagar	10%-30%	Fikkal Hospital	Available	No	No	Yes, limited
Pashupatinagar Taxi Stand, Fikkal	10%-30%	Fikkal Primary Health Center	Available	No	Yes, limited	Yes, limited
Pashupatinagar Taxi Stand, Pashupatinagar	<10%	Fikkal Hospital	Available	No	No	Yes, limited
Samalbung Taxi Station, Shanti Bazar	<10%	Fikkal Primary Health Center	Available	No	Yes, limited	Yes, limited
Teen Ghare Taxi Stand, Teen Ghare	10%-30%	Fikkal Primary Health Center	Available	No	Yes, limited	Yes, limited

3.2.j PLACES OF WORSHIP

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

According to the results obtained from the field observations, the places of worship in Suryodaya Municipality attract a noticeable number of people from both Nepal and India, among which, *Shiva Temple* at *Barbote* locality accounts for the highest population mobility among all those investigated. The identified places of worship are open to pilgrims or visitors every day and throughout the year, however, Saturday is reported as the busiest day in terms of higher people's movement. In the same way, the busiest months in terms of population mobility are observed as June and July. The study suggests that the population mobility at the identified places of worships is eminently from *Ilam, Jhapa, Morang, Sunsari, Taplejung, Bhojpur, Panchthar* and *Dhankuta* districts. Similarly, at the municipality level, people's movement mostly originates from *Suryodaya Municipality, Rong Rural Municipality, Ilam Municipality, Mangsebung Rural Municipality, Sandakpur Rural Municipality, Maijogmai Rural Municipality, Arjundhara Municipality, Mai Municipality,* and *Kankai Municipality.*

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

Regarding the connectivity of the investigated places of worship in Suryodaya Municipality, *Shree Krishna Pranami Temple* and *Fensol Monastery* are located at *Fikkal* locality, within close distance from each other, and are associated with the *Mechi Highway*. These sites are accessible by all kinds of vehicles, however, people from localities nearby mainly access these sites by motorbike or by foot. The nearest localities to these places of worship are documented as *Panchakanya, Barbote, Aitabare,* and *Teen Ghare*. Similarly, *Panchakanya Temple* is situated at *Panchakanya* locality, which is also linked to the *Mechi Highway* via several other alternative routes, such as *Maghe-Aitabare Road, Aitabare-Aathghare Road,* and *Kalapani-Maghe Road*. As per the analysis, the nearest localities to this site are documented as *Fikkal, Aitabare, Teen Ghare* and *Ilam Bazar*. Correspondingly, *Shiva Temple* and *Believers Church* are based in *Barbote* locality, which is linked to *Fikkal-Pashupatinagar Road* via *Barbote-Melbote Road* and *Fikkal-Nayabazar-Namsaling Road.* These places of worship are accessible by all kinds of vehicles and the nearest localities are reported as *Fikkal, Melbote, Panchakanya* and *Aitabare*. In a similar way, *Mangal Temple* lies in *Melbote* locality, which is linked to *Fikkal-Pashupatinagar Road* via *Barbote-Melbote Road* with good accessibility by vehicle. The nearest localities to this temple are documented as *Barbote, Fikkal, Aitabare* and *Panchakanya*. On the other hand, *Pashupatinath Temple* is based in *Pashupatinagar* locality, which is near *Pashupatinagar Int. POE* (formal), and connected to *Fikkal-Pashupatingar Road.* The study suggests that this site is also accessible by all kinds of vehicles, however, visitors from India mostly use cars, minivans and motorbikes. Likewise, *Urgen Chholing Yolmo Monastery* is situated at *Teen Khutte* locality, connected to *Fikkal-Pashupatinagar Road,* with good accessibility by vehicle. As per the study, the nearest localities to this place of worship are observed as *Pashupatinagar, Sundarpani, Baudhhadham* and *Pothukatla*. Furthermore, *Chitrey Monastery* is located at *Maneybhanjyang* locality, and near *Maneybhanjyang POE.* According to the field observations, this site is poorly accessible by vehicle, except motorbikes, due to the geographical location as well as the unavailability of black top road. The nearest localities to this site are observed as *Manglabare, Chhaghare,* and *Chhedi Khola.*

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

Nine (9) places of worship were investigated in Suryodaya Municipality, which is equal to Biratnagar Metropolitan City (9) and more than in Mechinagar Municipality (7), as determined by the matrix analysis. Among the assessed sites, the largest population is found at *Shiva Temple, Panchakanya Temple*, and *Chitrey Monastery,* with a population

distribution of 50, and 25 each per day, and 150 and 50 each on the busiest day, respectively (see Fig. 9.1). At the remaining six (6) sites, the highest influx of people per day is 20 (*Shree Krishna Pranami Temple*) and the lowest is 10 (*Urgen Chholing Yolmo Monastery, Fensol Monastery*, and *Believers Church*). On the busiest day, the minimum entry flow is 20 people and the maximum is 100 people. The majority of the places of worship are visited by people from India, except for *Believers Church,* only visited by Nepalese nationals. The largest influx of people from India can be found at *Chitrey Monastery* (50%) and the lowest at *Shiva Temple* (2%).

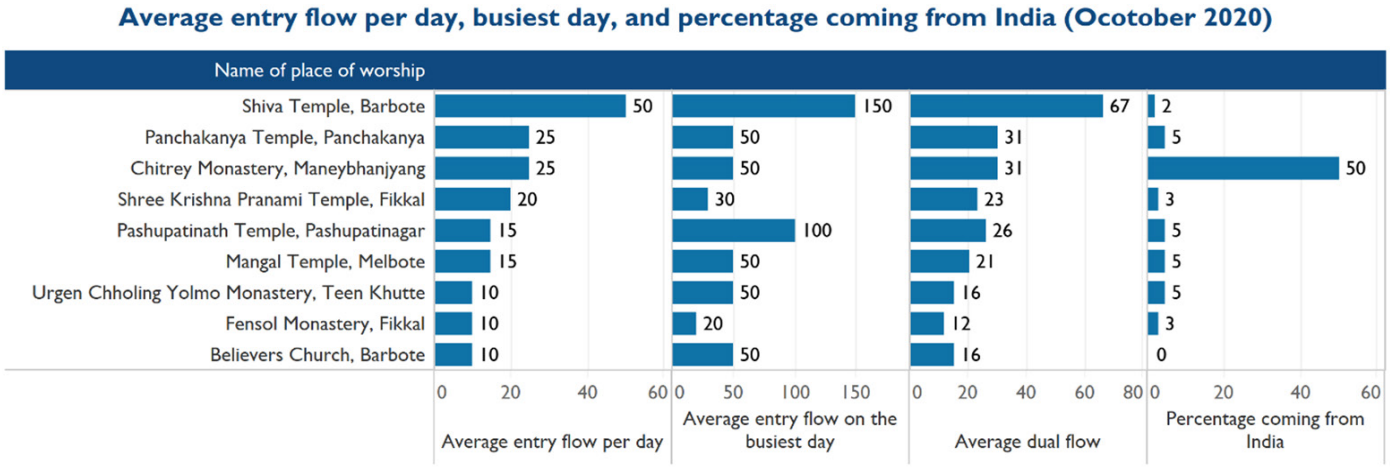


Fig. 9.1: Population mobility at the places of worship

According to the analysis, the nearest health centre from the places of worship differs across their locations, however, *Fikkal Primary Health Centre* (3/9) and *Suryodaya Polyclinic* (2/9) account for the nearest. At none of the places of worship investigated, there is a tracking matrix for visitors (record book/device), nor health screening, nor hand washing stations, nor the availability of body temperature checking before entrance (see Table 9.1). Overall, the estimated percentage of people wearing masks at these sites is less than 10 and between 10-30. This shows that more than half of the people do not wear masks when visiting the respective places of worship. The busiest days and months of the year vary across all the places of worship, except for *Pashupatinath Temple* and *Urgen Chholing Yolmo Monastery,* which are busy throughout the week, and the latter also throughout the year. In terms of seasonality, all the sites are operational throughout the seasons (winter, summer, spring, and rainy season), except for *Shree Krishna Pranami Temple* whose seasonality is winter only.

Table 9.1: Health screening, tracking matrix, and the busiest days/months at the places of worship

Name of place of worship	Name of the nearest health centre	Availability of record book/device for visitors	Availability of health screening station	Body temperature checking status	Estimated percentage wearing mask	Seasonality	Busiest day of the week	Busiest month of the year
Believers Church, Barbote	Fikkal Primary Health Center	Not available	Not available	Not available	10%-30%	All seasons	Saturday	December
Chitrey Monastery, Maneybhanjyang	Bhanjyang Clinic	Not available	Not available	Not available	<10%	All seasons	Sunday, Saturday, Tuesday	May
Fensol Monastery, Fikkal	Suryodaya Polyclinic	Not available	Not available	Not available	<10%	All seasons	Sunday, Friday, Tuesday	April, May, March
Mangal Temple, Melbote	Gorkhe Health Post	Not available	Not available	Not available	<10%	All seasons	Saturday, Tuesday	April, November
Panchakanya Temple, Panchakanya	Panchakanya Health Post	Not available	Not available	Not available	10%-30%	All seasons	Saturday, Tuesday	June, July, August
Pashupatinath Temple, Pashupatinagar	Pashupatinagar Primary Health Center	Not available	Not available	Not available	<10%	All seasons	Every day	April
Shiva Temple, Barbote	Fikkal Primary Health Center	Not available	Not available	Not available	>50%	All seasons	Monday	April
Shree Krishna Pranami Temple, Fikkal	Suryodaya Polyclinic	Not available	Not available	Not available	<10%	Winter only	Saturday	August, September
Urgen Chholing Yolmo Monastery, Teen Khutte	Fikkal Primary Health Center	Not available	Not available	Not available	<10%	All seasons	Every day	Every month

According to the findings, a suspected COVID-19 positive case was reported at *Mangal Temple*. Furthermore, water and toilet facilities are available at all the sites, except at *Shiva Temple,* where there is no toilet facility. Among the sites with toilet facilities, there are at most 8 stalls/drop holes (*Chitrey Monastery*) and at least 1 stall/drop hole (*Believers Church* and *Pashupatinath Temple*), probably due to the fewer mobility at this site. People at these sites seek alternative healthcare when they get sick, such as clinic or hospital, traditional healer, pharmacy, and home treatment, in ascending order. The longest distance to the nearest health centre can be found from *Believers Church* and *Chitrey Monastery,* about 47 and 30 Km away, respectively. These are followed by *Pashupatinath Temple* and *Mangal Temple* with a distance distribution of 10 and 6 Km way, respectively (see Fig. 9.2). The remaining places of worship are at most 5 Km and at least less than 100 meters away. The distance to the nearest water source from all the sites investigated is limited (less than 100 meters), except for *Chitrey Monastery* (3 Km).

Water and toilet facilities, places people go to when they get sick, suspected COVID-19 case, and distance to the nearest health centre and water source

Name of place of worship	Suspected COVID-19 case on site	Places people go to when they get sick	Isolated place dedicated for sick people	Availability of toilet nearby	Availability of water on site
Believers Church, Barbote	No	Clinic or Hospital	Not available	Available	Available
Chitrey Monastery, Maneybhanjyang	No	Pharmacy Traditional Healer, Home Treatment, Clinic or Hospital	Available	Available	Available
Pashupatinath Temple, Pashupatinagar	No	Traditional Healer, Clinic or Hospital, Pharmacy	Not available	Available	Available
Mangal Temple, Melbote	Yes	Clinic or Hospital	Not available	Available	Available
Urgen Chholing Yolmo Monastery, Teen Khutte	No	Clinic or Hospital, Traditional Healer, Pharmacy	Not available	Available	Available
Panchakanya Temple, Panchakanya	No	Clinic or Hospital	Not available	Available	Available
Shiva Temple, Barbote	No	Pharmacy, Clinic or Hospital	Not available	Not available	Available
Fensol Monastery, Fikkal	No	Clinic or Hospital	Not available	Available	Available
Shree Krishna Pranami Temple, Fikkal	No	Clinic or Hospital	Not available	Available	Available

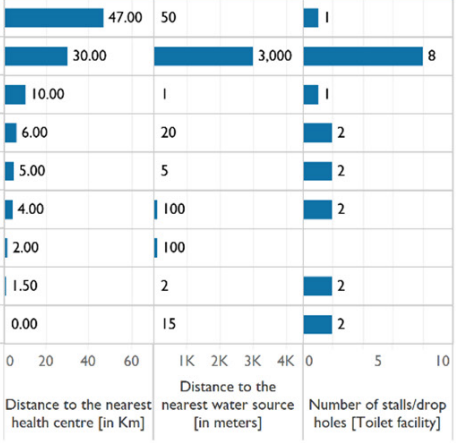


Fig. 9.2: Availability of water and toilet facilities, suspected COVID-19 cases, and distances to the nearest health centre and water source

At the places of worship, there are waste management systems on site, however, these are not completely adequate due to the visibility of unwanted animals/insects in large quantity at most of the sites investigated (7/9), except for *Chitrey Monastery* and *Shiva Temple*. Contrary to most of the other categories investigated, the places of worship are tidier, with no trash visible in the open nor stagnant water on the floor, except for *Mangal Temple*. Furthermore, the name of the most used health centre differs across the sites, however, *Fikkal Hospital* and *Fikkal Primary Health Centre*. The majority of the assessed sites do not have community health worker or agent, especially for emergency cases, except for *Urgen Chholing Yolmo Monastery* (see Table 9.2).

Table 9.2: Waste management, the most used health centre, and availability of community health worker/agent

Name of place of worship	Name of the most used health centre	Availability of community health worker/agent for emergency cases	Availability of waste management system	Visibility of trash in the open	Visibility of stagnant water on the floor	Visibility of unwanted animals/insects
Believers Church, Barbote	Fikkal Hospital	Not available	Available	No	No	Yes, limited
Chitrey Monastery, Maneybhanjyang	Gorkhe Health Post	Not available	Available	No	No	No
Fensol Monastery, Fikkal	Fikkal Primary Health Center	Not available	Available	No	No	Yes, limited
Mangal Temple, Melbote	Fikkal Hospital	Not available	Available	No	Yes, limited	Yes, limited
Panchakanya Temple, Panchakanya	Fikkal Primary Health Center	Not available	Available	No	No	Yes, limited
Pashupatinath Temple, Pashupatinagar	Fikkal Hospital	Not available	Available	No	No	Yes, limited
Shiva Temple, Barbote	Fikkal Hospital	Not available	Available	No	No	No
Shree Krishna Pranami Temple, Fikkal	Fikkal Hospital	Not available	Available	No	No	Yes, limited
Urgen Chholing Yolmo Monastery, Teen Khutte	Fikkal Primary Health Center	Available	Available	No	No	Yes, limited

3.2.k OTHER PLACES

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

According to the results obtained from the participatory mapping exercises and field observations, some other sites were identified where people's congregations take place. The study suggests that some of these sites are open every day and throughout the year. However, the busiest days in terms of higher population mobility are reported as Friday and Saturday. Similarly, October, November and December are the busiest months of the year. The population mobility at the respective sites is mainly from *Ilam, Jhapa, Morang, Sunsari, Panchthar, Taplejung* and *Tehrathum* districts. At the municipality level, people mostly originate from *Suryodaya Municipality, Mangsebung Rural Municipality, Rong Rural Municipality, Ilam Municipality, Sandakpur Rural Municipality, Maijogmai Rural Municipality,* and *Arjundhara Municipality*.

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

Regarding the connectivity of other sites identified in Suryodaya Municipality, *Laakhe Dance Exhibition, Krishna Janmasthami Festival,* and *Fikkal Festival Celebration* are situated at *Fikkal* locality, and connected to the *Mechi Highway*. These sites have seasonal or nomadic congregations, whereas *Suryodaya Municipality Office* accounts for people's movement every day and throughout the year. The alternative vehicle route to access these sites is observed as *Fikkal-Arubote Road*, and the nearest localities are *Karfok, Aitabare, Teen Ghare* and *Panchakanya*. Similarly, *Kanyam Festival* is situated at *Kanyam* locality, which is linked to the *Mechi Highway* and accessible by all kinds of vehicles. The nearest localities to this site are recorded as *Harkate, Kolbonog, Marse* and *Fajeegaun*. Futhermore, *Harkate Lila Hotel* is situated at *Harkate* locality, also connected to the *Mechi Highway*, with the nearest localities reported as *Kanyam, Kolbong, Fajeegaun* and *Marse*. On the other hand, *Lamatar Junction* is based in *Lamatar* locality, which is associated with the *Mechi Highway* via *Shree Antu Road,* and is accessible by all kinds of vehicles. The nearest localities to this site are recorded as *Shree Antu, Sungtung,* and *Lambagauda*.

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

Seven (7) 'other places' were identified by the KIs and assessed during the field observations conducted in October 2020, which is higher than in Biratnagar Metropolitan City (2) and in Mechinagar Municipality (4). Among them, *Kanyam Festival,* and *Fikkal Festival Celebration* account for the largest population with 16,000 and 1,500 people per day, and 24,000 and 5,000 people on the busiest day, respectively. These are followed by *Laakhe Dance Exhibition* and *Krishna Janmastanmi Festival,* with about 800 and 700 people per day and 800 and 1,500 people, respectively, on the busiest day (see Fig. 10.1). However, Suryodaya Municipality presents the second most populated 'other places' after Mechinagar Municipality (100,000 people on average). The remaining three (3) sites receive a minimum of 10 people (*Lamatar Junction*) and a maximum of 200 people (*Harkate Lila Hotel*) per day. Apart from *Kanyam Festival* which receives people from India, Japan, and China, three (3) out of seven (7) sites are visited by people from India, except for *Laakahe Dance Exhibition, Krishna Janmasthami* and *Suryodaya Municipality Office*. The number of Indian visitors is, however, limited with a percentage ranging between 1 and 3 per cent.

Average entry flow per day, busiest day, and percentage coming from other country (October 2020)

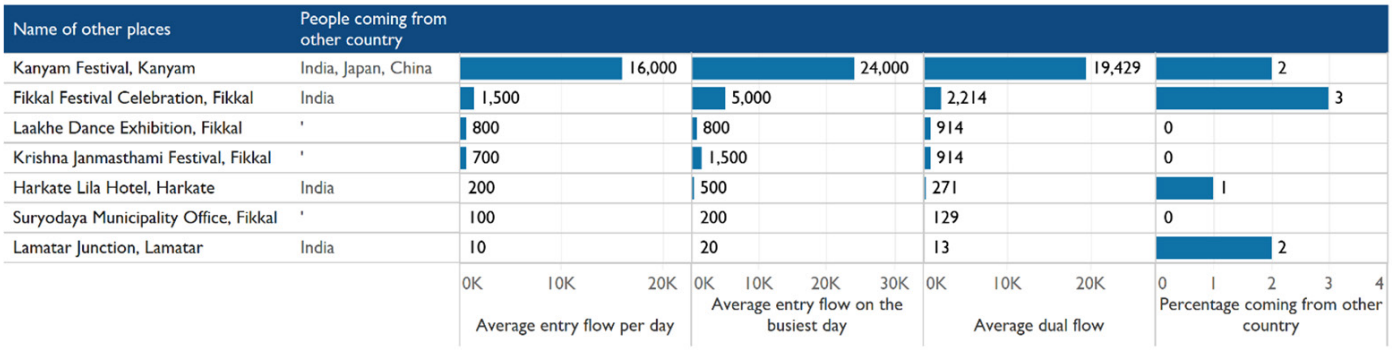


Fig. 10.1: Population mobility at other places

Fig. 10.2 shows the condition of basic hygiene at these localities. There is the availability of water (handwashing and use after toilet), except at *Lamatar Junction, Laakhe Dance Exhibition,* and *Krishna Jamasthamin Festival,* and toilet facilities nearby, except at *Harkate Lila Hotel* and *Laakhe Dance Exhibition*. In terms of toilet capacity, there are a maximum of 8 stalls/drop holes (*Suryodaya Municipality Office*) and a minimum of 1 (*Lamatar Junction, Krishna Jamasthamin Festival,* and *Fikkal Festival Celebration*), and hence account for a proportionate distribution in terms of population mobility, except for *Kanyam Festival* and *Fikkal Festival Cerebration* (16,000-24,000 and 1,500-5,000 people in nomadic days). The nearest health centre from the respective sites varies, with the farthest distance being 18 and 7 Km (*Lamatar Junction* and *Kanyam Festival*), and the shortest distance being 20 meters (*Suryodaya Municipality Office*). Similarly, the distance to the nearest water source across all the sites is limited, within a radius of 3 meters (see Fig.10.2).

Water and toilet facilities and distance to the nearest health centre and water source

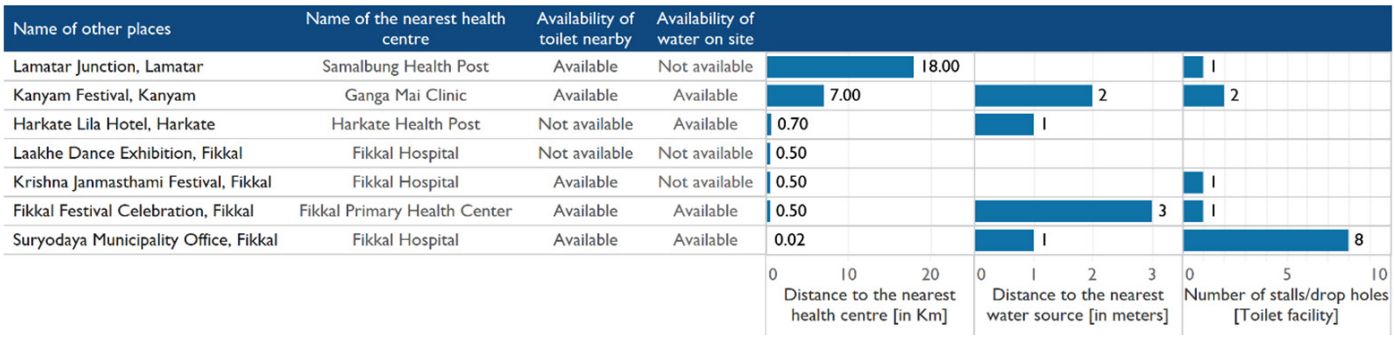


Fig. 10.2: Availability of water and toilet facilities, and distances to the nearest health centre and water source

Table 10.1 shows the availability of basic health screening stations (handwashing and hand sanitizer) and tracking matrix for people's movement. Among the seven (7) sites, on average less than 10 per cent of people wear masks at the sites investigated. The busiest months and day of the week differ across the sites, however, the busiest months are generally May, July, August, October, November, and December, except for *Harkate Lila Hotel* and *Kanyam Festival,* which are busy throughout the year. There is inadequate availability of record book/device for visitors regarding contact tracing, community health workers or agents, especially for emergency cases (2/7), as well as thermometers for body temperature checking across the sites, except at *Suryodaya Municipality Office* (health screening station is available). A suspected COVID-19 positive case was found at *Suryodaya Municipality Office*. Considering the proximity of *Kanyam Festival* and *Fikkal Festival Celebration* to the bordering country (India) and their high

population mobility, it is even more important to institute a contact tracing mechanism which would help mitigate the COVID-19 transmission rate or other communicable diseases.

Table 10.1: Health screening, tracking matrix status, and the busiest days/months at other places

Name of other places	Estimated percentage wearing mask	Busiest day of the week	Busiest month of the year	Suspected COVID-19 case on site	Availability of community health worker/agent for emergency cases	Body temperature checking status	Availability of health screening station	Availability of record book/device for travellers/visitors
Fikkal Festival Celebration, Fikkal	<10%	Saturday	December	No	Available	Do not know	Do not know	Do not know
Harkate Lila Hotel, Harkate	<10%	Tuesday	Every month	No	Not available	Not available	Not available	Not available
Kanyam Festival, Kanyam	<10%	Saturday, Friday	Every month	No	Available	Not available	Not available	Not available
Krishna Janmasthami Festival, Fikkal	<10%	Sunday	May	No	Not available	Not available	Not available	Not available
Laakhe Dance Exhibition, Fikkal	<10%	Wednesday	September, October, August	No	Not available	Not available	Not available	Not available
Lamatar Junction, Lamatar	<10%	Saturday	July, August	No	Not available	Not available	Not available	Not available
Suryodaya Municipality Office, Fikkal	<10%	Sunday, Thursday	November, October, July	Yes	Not available	Do not know	Available	Do not know

3.3 GENERAL ANALYSIS

This section of the report indicates the general analysis of all common variables or indicators where 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
7. Common infectious diseases affecting people
8. Main purposes people travel across the sites

Fig. 11.1 shows the percentage distribution of various indicators for all the sites in Suryodaya Municipality, related to the concept of vulnerability capacity analysis. The pie charts show the communication system (top left), the presence of unwanted animals/insects (bottom left), various sources of water (top right), and the most used modes of transport (bottom right).

The most common means of voice communication system (GSM) involves phones or text messages (56.6%), followed by the use of internet to access emails and social media technologies (42.1%). 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 better communication are the majority of the health centres, entertainment centres, transport stations, and some places of worship. The main source of water is the public water system, which accounts for the highest percentage (53.7%), followed by pumps (19.5%) and river/lake (12.2%), which is in direct opposite to the analysis obtained in Biratnagar Metropolitan City but similar to Mechinagar Municipality. The remaining

14.6 per cent is shared by other sources of water, such as delivery by truck or vehicle, river water, well, and rain catchment. 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 buffalos. As a result, these animals fall into the category of 'wanted animals' as people commonly live with them, and also in terms of proportion, it varies across each municipality. Ants/beetles, mosquitoes, flies/months, and cockroaches carry the largest share in the chart, with a percentage of 28.4, 26.9, 24.6, and 17.9, respectively. According to the analysis, the sites are mainly reached by foot and motorbike, with a percentage distribution of 21.5 and 21.0, respectively, and thus similar to the results obtained in the other municipalities in Sudurpashchim Province, Lumbini Province, and Province 1. Other modes of transport include minivans (17.3%), cars (18.8%), buses (11.6%), and trucks (9.9%). At some sites, especially the POEs, places of worship, and traditional healers' compounds, accessibility by foot or vehicle is difficult and, in most cases, people walk long distances to reach their respective destinations.

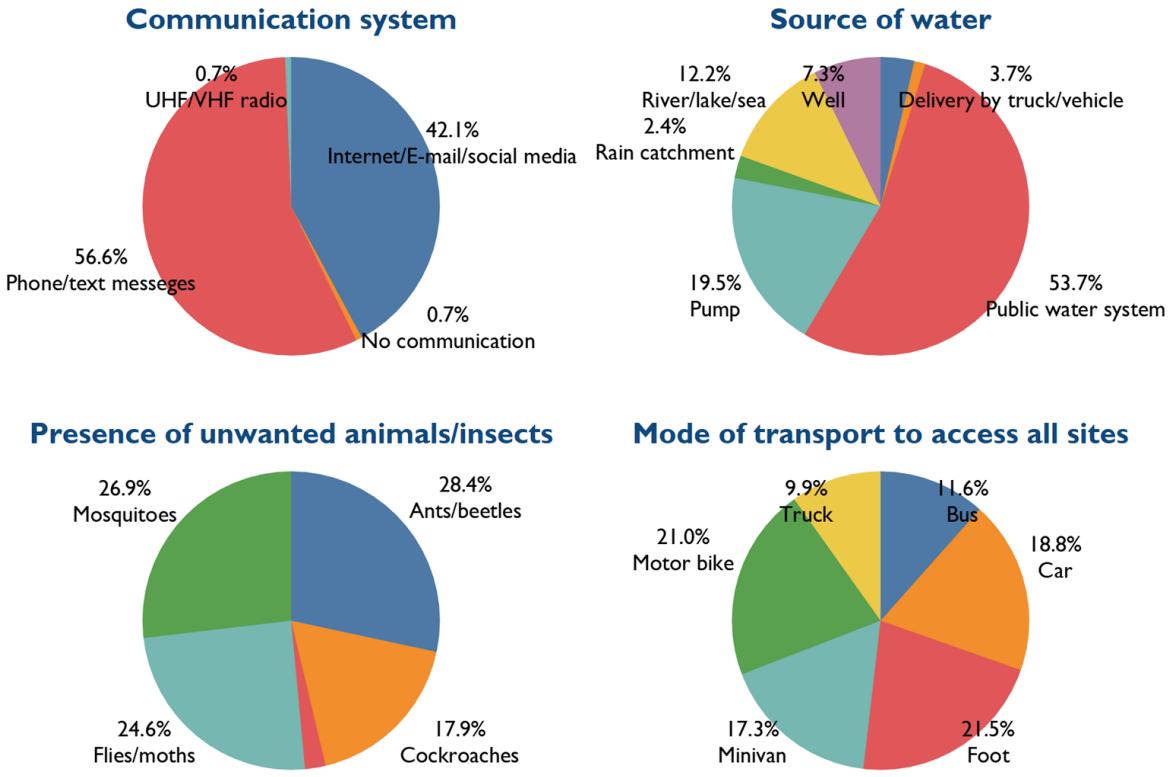


Fig. 11.1: Communication system, source of water, mode of transport, and unwanted animals/insects for all sites

Fig. 11.2 shows the places from which people seek alternative healthcare when they fall ill. Most people seek help from clinics or hospitals, pharmacy, home treatment, traditional healers, and religious leaders, in order of importance, with a percentage distribution of 44.7, 17.0 each, 14.9, and 6.4, respectively, which is similar to the results obtained in Biratnagar Metropolitan City and Mechinagar Municipality. It is worth noting that, although most people do seek support from health professionals, in areas where the accessibility to health centres is difficult or there is unavailability of health infrastructure along closest corridors, people tend to rely on immediate alternative treatment (traditional healers and home treatment), as well as other alternative means. Equally, the main reasons behind the population influxes were investigated at the respective sites. The findings revealed that congregations of people are due to the following; market day (sporadic or nomadic) (21.0%), cultural festivals (17.8%), religious festivals (17.4%), markets set up in the locality (permanent or temporal basis) (15.5%), and worship services at either Temples,

Churches, or Mosques (9.6%). This shows that the population mobility pattern in Suryodaya Municipality is highly affected by economic and cultural/religious activities, places of worship, and cultural and religious festivals, and thus consistent with the analysis obtained in Biratnagar Metropolitan City and in Mechinagar Municipality.

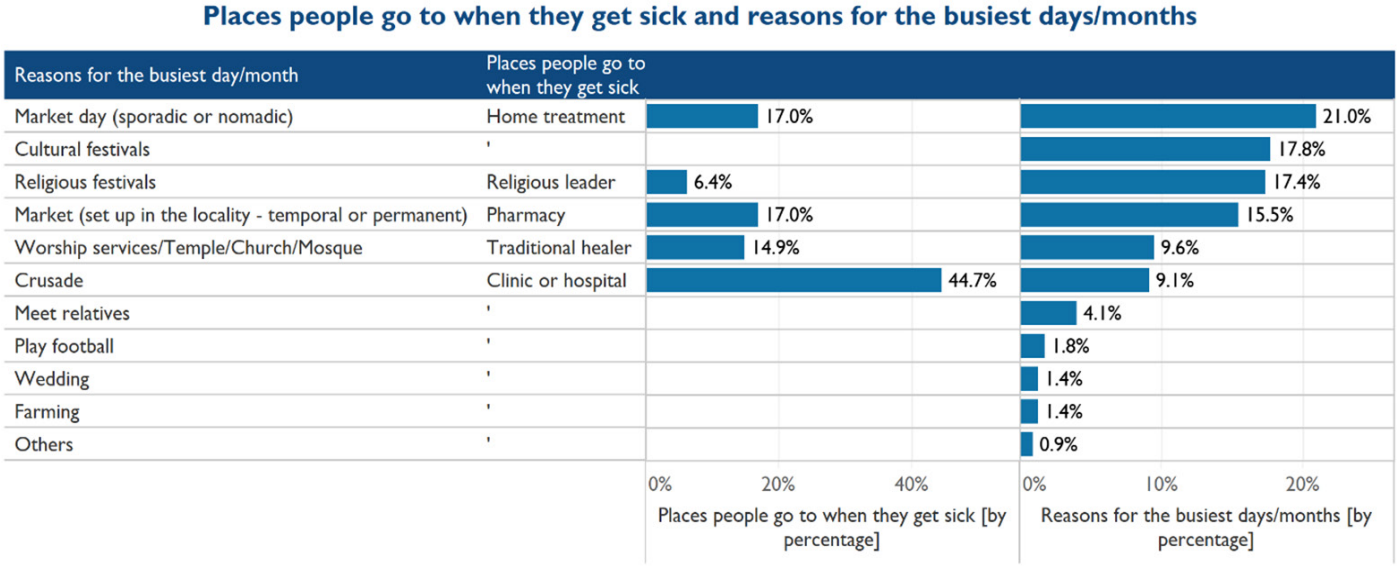


Fig. 11.2: Major reasons for the busiest days/months and places people go to when they get sick

Fig. 11.3 shows the common infectious diseases affecting people in Suryodaya Municipality, and some of the procedures to follow for COVID-19 suspected cases. During a pandemic or an outbreak, there are always concerns on how people should respond to emergency cases of affected people. The list of procedures was evaluated in percentage based on respondents' feedback as follows; call or notify on-site authorities (30.6%), call the emergency hotline (24.3%), isolate the patient (23.8%), and counsel and calm the patient (20.9%) (see Fig. 11.3). Overall, this means that people are generally aware of the techniques or procedures to follow if someone is affected by COVID-19. Although we have analysed some of the common diseases affecting people at specific sites, such as the health centres, the aim was to find out what is the proportion for the entire municipality. The study revealed that typhoid and COVID-19 are the major diseases affecting people in Suryodaya Municipality, with a percentage distribution of 34.5 and 13.8, respectively. These are followed by measles, influenza, dengue, and cholera (10.3% each). Therefore, typhoid and COVID-19 are the most prevalent diseases prior to and during the pandemic, as of October 2020, and thus indicate that Province 1 (Biratnagar Metropolitan City, Mechinagar Municipality, and Suryodaya Municipality) is the most affected province by the COVID-19 pandemic when compared to other municipalities in Sudurpashchim Province and Lumbini Province.

Procedures to follow for suspected COVID-19 cases and common infectious diseases affecting people in Suryodaya Municipality (October 2020)

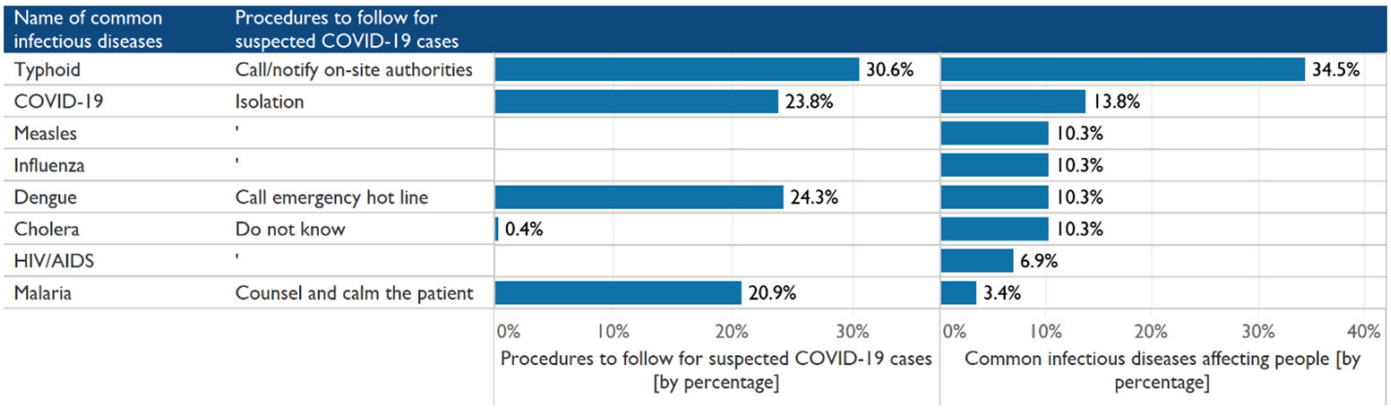


Fig. 11.3: Procedures for COVID-19 and common infectious diseases affecting people in the municipality

The major reasons for people's movement across the BCPs/POEs and other sites with high mobility were also explored and identified as follows; trade/market/commerce, visit of relatives and/or friends, employment, transportation, and education account for the highest, with a percentage distribution of 22.2 each, 15.3, 11.1, and 8.3 respectively, similar to the findings obtained in other municipalities, except for employment and visit of relatives or friends. This shows that the main reasons migrants travel across the POEs and other sites are for economic activities, visit of relatives and or friends, and employment (see Fig. 11.4). Furthermore, although the sites' seasonality was analysed by category, the researchers wanted to know the overall distribution of sites' seasonality. The vast majority of the sites are operational throughout the four seasons (85.1%), with only a minority open in summer and spring, summer only, winter only (3.4% each), winter and summer, or spring only (2.3% each).

Sites seasonlity and the main reasons migrant travel across all the sites

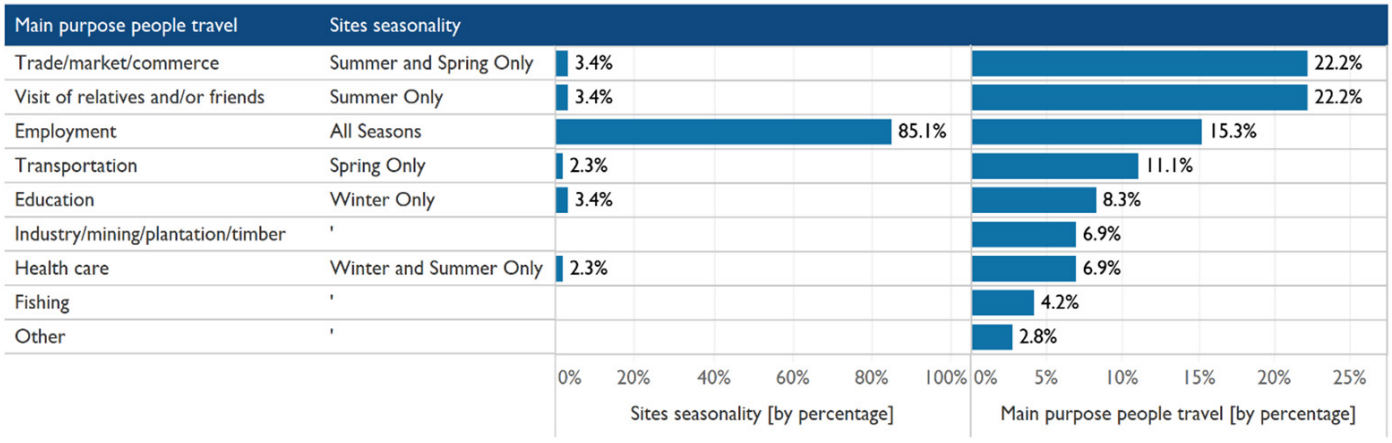


Fig. 11.4: Main purposes for people's mobility across all the sites

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)

Eighteen (18) POEs were investigated in Suryodaya Municipality, with only one (1) water landing site (*Suntung Int. POE*) and seventeen (17) land border points. Among them, only one (1) is a formal crossing point (*Pashupatinagar Int. POE*), while the remaining nineteen (17) are informal. *Bhalukhop POE* (informal) has by far the largest population mobility, with 5,000 people crossing daily and up to 15,000 on the busiest day. All the POEs are crossed by people coming from India, with the lowest percentage being 1 per cent (*Tribeni Chowk POE*) and the highest found at *Pashupatinagar Int. POE* (95%), similar in size to *Bhalukhop POE* (10%/ 500 per day). Some POEs are also crossed by people from Bhutan, China, Malaysia, Nigeri and USA. According to the respondents, the most used health centres are *Fikkal Primary Health Centre, Pashupatinagar Primary Health Centre* and *Fikkal Hospital.* Most of the POEs are busy throughout the week and the year but people's movement is often higher in the weekend (Friday-Sunday) and between June and December. It is concerning that, despite the high population mobility, almost one-third of the POEs (6/18) do not have water (drinking, handwashing and use after toilet) almost none has toilet facilities present on site (17/18). Contrary to Mechinagar Municipality, almost all the POEs assessed have electricity available (15/18). However, there is no IHR focal point based at the POEs or municipality level nor in the correspond country, India (except for *Pashupatinagar Int. POE*), nor community health workers or volunteers (except at *Pashupatinagar Int. POE* and *Chitrey Int. POE*). The distance to the nearest health centre ranges from a maximum of 7 Km to a minimum of 20 meters. All the POEs lack health screening stations (except for *Pashupatinagar Int. POE*) and a tracking matrix to record travellers (except for *Harkate POE*). Despite being generally operational throughout the seasons and having reported suspected COVID-19 positive cases at four (4) POEs, the estimated percentage of people wearing masks is extremely inadequate at less than 10 per cent at nearly all the sites.

Health centres

Among the ten (10) health centres assessed in Suryodaya Municipality, only three (3) are government owned (*Fikkal Primary Health Centre, Suryodaya Primary Health Centre* and *Mechi Ayurvedic Health Facility*), whereas the remaining are private health facilities. The entry flow at the health centres is lower compared to other other municipalities, with the highest found at *Shrijana Medical Hall* and *Fikkal Primary Health Centre* (250 people each per day, and 450 and 300 on the busiest day respectively). All the facilities are visited by people from India, except for *Astanga Ayurvedic Pharmacy.* The highest percentage of people coming from India is found at *Mechi Ayurvedic Health Facility, Suryodaya Primary Health Centre* and *Om Ayurvedic Clinic* (40% each and 30%, respectively). The majority of the facilities (6/10) are operational 24/7. Based on the last three months (July-September 2020), outpatients are in higher numbers compared to inpatients, with the highest figures found at *Fikkal Primary Health Centre* (3,500), *Loksom Ayurvedic Clinic* (3,000) and *Mechi Ayurvedic Health Facility* (1,500). The status of toilet facilities depends on whether the number of stalls/drop holes are assessed for patients or staffs. The most poorly equipped toilet facilities for

patients are found at *Om Ayurvedic Clinic, Fikkal Primary Health Centre*, and *Mechi Ayurvedic Health Facility* (50:1, 42:1, and 33:1, respectively). Instead, in terms of staffs to stall/drop hole ratio, the least equipped is *Fikkal Hospital Pvt. Ltd.* (285:1). The sources of water are generally situated close-by, within a radius of 100 meters. Instead, the distance from the respective health centre to the nearest referral centre reaches up to 34 and 11 Km for *Mechi Ayurvedic Health Facility* and *Suryodaya Primary Health Centre,* respectively. The health centre with the highest population of medical personnel is *Fikkal Hospital Pvt. Ltd.* (285), while at the remaining facilities the population ranges between 1-40 personnel. The majority of the health centres have conducted IPC training (7/10), however, only three (3) have an emergency preparedness plan in place (3/10). Based on the analysis, the health infrastructure and screening stations are not fully adequate since only three (3) facilities have regular health screening station and 24/7, and four (4) keep a tracking matrix for visitors and patients. According to the findings, people from India accessing the health centres in Suryodaya Municipality are mostly medical practitioners treating patients in Nepal, similarly to the results obtained in other municipalities where the study was conducted. In terms of wards, the largest at the facilities assessed are emergency room, laboratory, kitchen, and laundry.

Traditional Healers

A total of six (6) traditional healers' compounds were investigated, with a population mobility ranging from 15-60 per day, and 30-100 on the busiest days. The majority of the compounds (5/6) are visited by people from India, although in limited numbers (between 5-10%). Contrary to other municipalities, the distance to the nearest health centres from the traditional healers is less significant (up to 3 Km), while the distance between the health centre and the nearest referral centre is generally higher (up to 10 Km). Despite the availability of waste management systems (5/6), these are not fully adequate, proved by the visibility of trash in the open (1/6), and unwanted animals/insects (5/6). The estimated percentage of people wearing masks is not satisfactory, mostly below 10 per cent. All the traditional healers' compounds assessed have toilet facilities available (mainly pour-flush latrine) and water, except for *Gairigaun Guru (TK)* (no water). The highest number of visitors per stall/drop hole can be found at *Gairigaun Guru (TK)* (60:1), followed by *Harkate Mata* (30:1) and *Artheytaar Baba* (20:1). The majority of the interviewed traditional healers reported to use protective materials during their practices (5/6), contrary to the results obtained in other municipalities (except for Biratnagar Metropolitan City). In terms of diseases, the most common treated by the traditional healers are headache, mental illness, and fever; whereas, the practices mostly performed are disease cure, mental illness and divination.

Schools and Colleges

Seven (7) schools were assessed in Suryodaya Municipality, of which six (6) are secondary schools, and only one (1) a tertiary educational institution. Among them, the most populated are *Krishna Asram Madhyamik Vidhalaya* and *Fikkal Secondary School,* with an average daily attendance of 1,200 and 800, respectively. Although four (4) schools are attended by people from India, the percentage distribution is not significant (between 1-5%). None of the schools and college have health community workers or agents available on site. The distance to the nearest health centre from the respective schools varies, generally within a radius of 6 Km, except for Janak Ma. Vi. which is 12 Km away. The highest numbers of desks are found at *Krishna Asram Madhyamik Vidhalaya* (800) and *Fikkal Secondary School* (500), with 19 and 30 classrooms, respectively. These two (2) schools also have the largest numbers of pupils/students per classroom, with 27 and 31, respectively. Toilet facilities are present on site at all the educational institutions and are separate for male and female pupils/students,

while two (2) lack gender-divided toilets for teachers. Poorly equipped toilet facilities in terms of students to stall ratio, both female and male, are found at *Janak Ma.Vi.* (242:1 for female students, 150:1 for male students) and *Krishna Asram Madhyamik Vidhalaya* (142:1 for female students, 113:1 for male students). In terms of male to female pupils/students ratio, all the assessed schools have more female than male pupils (50-336 difference), contrary to the findings in other municipalities (except for Mechinagar Municipality). Despite being operational throughout the four seasons (winter, summer, spring and rainy season) and generally busy throughout the year, only two (2) schools have availability of tracking matrix which can be used for contact tracing for visitors suspected for COVID-19 cases. Similarly, health screening stations (handwashing and hand sanitizer) are completely absent (7/7). However, all the schools and colleges have isolated places for sick pupils/students, similar to the results obtained in Biratnagar Metropolitan City and Mechinagar Municipality. Waste management systems are widely available, however, there is the visibility of stagnant water on the floor (5/7), trash in the open (1/7), and unwanted animals/insects across all the sites (7/7).

Entertainment Centres

A total of four (4) entertainment centres were assessed in Suryodaya Municipality, with a population mobility ranging from 1,500-3,000 per day, and 2,000-5,000 on the busiest days. All the assessed entertainment centres are visited by people from India (between 15-75%), and a minority comes from Japan and USA (*Kanyam View Point*). Despite the high population mobility, all the centres lack health screening stations (handwashing and hand sanitizer), body temperature checking, and a tracking matrix for visitors. Similarly, community health workers/agents and isolated places dedicated for sick people are absent across the centres, except at *Karfok Play Ground.*

Market Centres

Eight (8) market centres were identified, with a population mobility ranging from 50-600 per day, which is by far less significant compared to the entry flows in Biratnagar Metropolitan City (up to 10,000 daily entrance) and Mechinagar Municipality (up to 20,000 daily entrance). Nearly all the markets are visited by people from India (between 2-70% of total flow), except for *Kattuse Market.* Health authorities in charge of emergency cases are absent across the majority of the sites, together with isolated places dedicated for sick people, health screening stations and body temperature checking (87.5% for each indicator). Although waste management systems are generally available (75%), there is visibility of trash (87.5%), stagnant water (50%) and unwanted animals/insects across the sites (100%). Water and toilet facilities are absent at three (3) markets out of eight (8). Different kinds of food and goods are sold at the marketplaces, in order of relevance; goods/merchandise, fruits/vegetables, canned food/drinks, prepared foods, and meat/poultry.

Migrant Worksites

Six (6) migrant worksites were invested in Suryodaya Municipality, with the largest in terms of population mobility being *The New Pradhan Hotel* and *Kanyan Tea State* (400 and 200 people per day, and 500 and 200 on the busiest day, respectively). The majority of the sites (5/6) are accessed by people from India, with a limited percentage ranging from 1 to 5 per cent. Health screening stations (handwashing with soap and hand sanitizer) and body temperature checking are available only at two (2) migrant worksites. Water and toilet facilities are widely available, although the visitors to stall/drop hole ratio is not adequate (up to 200:1). Similar to other sites, waste management systems are mostly available (4/6), and despite no water found on the floor, trash was visible in the open (50%) as well as unwanted animals/insects (83.3%). Community health workers/agents for emergency cases are only present

at two (2) sites, *Lucky Cheese Factory* and *Ilam Tea Producer,* the latter also the only site with a tracking matrix system (record book/devices for contact tracing mechanism). The majority of the migrant worksites (5/6) have living accommodation for their staff and the most common types are zinc and concrete.

Transport Stations

A large number of transport stations were investigated in Suryodaya Municipality (12), which is more than double the size of those assessed in Biratnagar Metropolitan City (5) and Mechinagar Municipality (5) combined. Similar to other municipalities, these sites present a high population mobility, with a maximum of 3,000 per day (*Fatak Taxi Stand*) and 5,000 on the busiest day (*Ilam Taxi Stand*). Nearly all the stations (11/12) are visited by travellers from India (between 3-75% of total flow), except for *Samalbung Taxi Station,* with a minority also coming from Japan and USA. Water and toilet facilities are widely unavailable, with only two (2) sites provided with such facilities (12.2%). Similar to other sites, the distance to the nearest health centre is generally significant, with the farthest distances being 17 (*Samalbung Taxi Station*), 12 (*Pashupatinagar Buspark*) and 11 Km (*Pashupatinagar Taxi Stand* and *Fatak Taxi Stand*). A suspected COVID-19 positive case was reported at one (1) site (*Ilam Taxi Stand*). None of the stations have health screening stations (handwashing with soap and hand sanitizer), nor tracking matrix for travellers, nor body temperature checking, nor community health workers/agents present on site (except at *Antu Taxi Stand*), nor isolated places dedicated for sick individuals (except at *Kanyam Taxi Stand*). Similar to the findings obtained in Mechinagar Municipality, nearly all the stations have a waste management system available (10/12), however, this is deficient due to the visibility of stagnant water (8.3%), trash (60%), and unwanted animals/insects (100%).

Places of Worship

Nine (9) places of worship were investigated in Suryodaya Municipality, with a population mobility ranging from 10-50 per day, which is less significant compared to the entry flows in Biratnagar Metropolitan City (up to 800 daily entrance) and Mechinagar Municipality (up to 500 daily entrance). Nearly all the assessed places of worship are visited by people coming from India, with a percentage distribution between 2-50, while the remaining visitors come from Nepal. None of the sites have health screening stations (handwashing with soap and hand sanitizer), nor body temperature checking, nor do they keep records of their visitors, despite being generally operational throughout the four seasons. Water (drinking or handwashing with soap or use after toilet) and toilet facilities are widely available, with a maximum of 8 stalls (*Chitrey Monastery*) and a minimum of 1 (*Believers Church* and *Pashupatinath Temple*), except for Shiva Temple with no toilets on site.

Other Places

Seven (7) other places were assessed. Among them, *Kanyam Festival* stands out with a remarkable number of visitors on a daily basis (16,000), which on the busiest day increases to 24,000. Four (4) sites are visited by people from India, although the percentage is not significant (between 1-3%). Toilets and water facilities for drinking or handwashing with soap or use after toilet are partially available, with three (3) sites lacking water and two (2) sites with no toilets on site. The distance to the nearest health centre reaches up to 18 Km (*Lamatar Junction*). None conducts body temperature checking, nor do they keep records of visitors, and the majority of the sites have no community health worker/agent for emergency cases (5/7), nor health screening stations (6/7). The overall estimated percentage of people wearing masks at these sites is below 10 per cent.

4.1.a ADDITIONAL FINDINGS

The analysis shows that 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 health centre is Fikkal Hospital, Pashupatinagar Primary Health Centre and Fikkal Primary Health Centre, despite not always being the nearest from the sites assessed.
- Inadequate or no presence of health authorities/agents dedicated for sick people, as well isolation rooms for ill people at the vast number of sites were the study was conducted.
- Despite the presence of waste management systems, often, they are not adequate, and consequently affect the sanitary conditions of already vulnerable locations in terms of population mobility.
- Several means of transport are used to travel from/to/within Suryodaya Municipality. Travel by foot is substantial across the sites, and equal to the use of motorbikes, followed by cars, minivans, and buses, in descending order magnitude.
- Tracking matrix (books/devices) which can be use to monitor people's flow are almost completely absent.
- There is availability of toilet facilities and water (use after toilet, handwashing or drinking) in most of the sites where the study was conducted, mainly based on pumps and the public water system.
- People generally understand and are aware of the procedures to follow if someone is affected by COVID-19. However, the percentage of people wearing masks is not satisfactory, especially market centres, traditional healers, POEs, transport stations, and other places (mostly below 10%).
- There is insufficient presence of health screening stations, including hand washing with soap, hand sanitizer and IPC, at the vast majority of the sites investigated. This poses serious health threats in case of COVID-19 infection, with a higher grade of vulnerability at POEs, transport stations, migrant worksites, traditional healers, entertainment centres, and other places.
- The majority of the assessed sites are open throughout the year and operational throughout the 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 *Jhapa, Ilam, Tehrathum, Taplejung* and *Panchthar;* whereas at the municipality level, people's movement emanates from within *Suryodaya Municipality,* and from *Mangsebung Rural Municipality, Rong Rural Municipality, Ilam Municipality, Sandakpur Rural Municipality, Maijogmai Rural Municipality, Arjundhara Municipality,* and *Mai Municipality.*
- A large number of the sites investigated are situated in *Fikkal* locality and connected to the *Mechi Highway* through several alternative routes, such as *Shree Antu Road.*

4.2 RECOMMENDATIONS

PMM has allowed us to better grasp the dynamics and characteristics of human mobility in Suryodaya 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 places of worship (temples, churches, and mosques). Body temperature checking should be advised at all sites with high population mobility, considering the easy accessibility and low cost of thermometers, and hand sanitizers 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) pieces, 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 disease, 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
Shows Location		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
Fikkal	2138		200	120	340	720	420
Pashupatinagar	787		240	0	0	105	240
Bagbire	400		0	0	400	0	0
Gairi Gaun	320		0	0	320	0	0
Harkate	292		120	0	20	0	10
Aitabare	230		0	20	0	210	0
Kanyam	223		0	140	0	0	10
Mane Vanjyang	194		40	0	0	0	0
Shree Antu	187		0	80	0	0	30
Teen Khutte	180		0	20	100	0	0
Teen Ghare	160		90	50	0	0	20
Karfok	149		0	0	40	0	0
Aarthe taar	140		0	0	140	0	0
Barbote	140		0	0	40	0	0
Malum	90		0	90	0	0	0
Panchakanya	90		0	0	0	0	0
Bhalu Khop	83		0	0	0	0	0
Doctor Khola	60		0	60	0	0	0
Maling	60		0	0	60	0	0
Sundar Pani	54		0	50	0	0	0
Melbote	50		0	0	0	0	0
Fikkal Chowk	45		0	0	0	45	0
Jogmai	40		0	40	0	0	0
Shanti Chowk	38		30	0	0	0	0
Samalbung	35		0	0	0	0	0

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