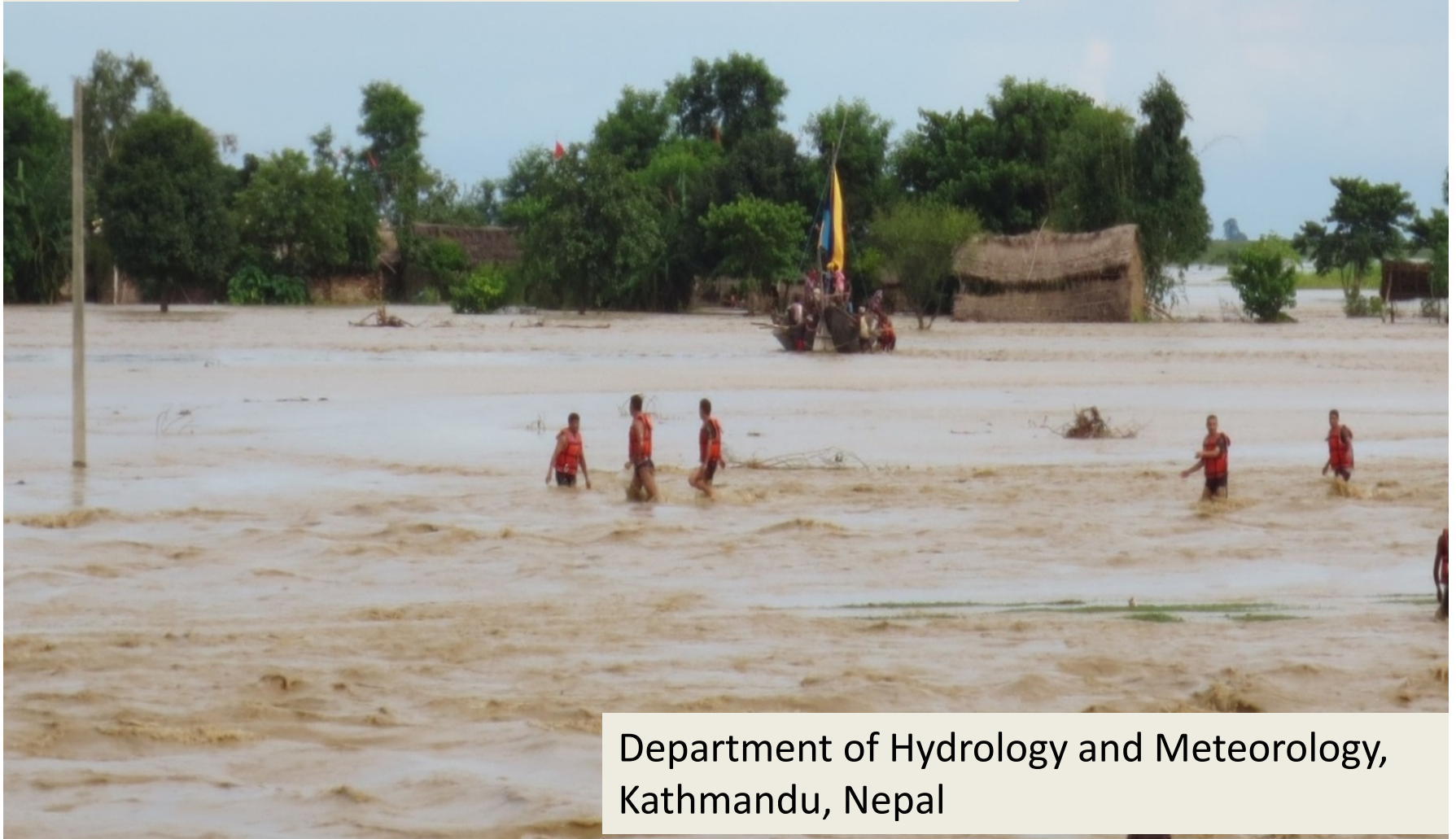


Status of flood and Early Warning System in Nepal

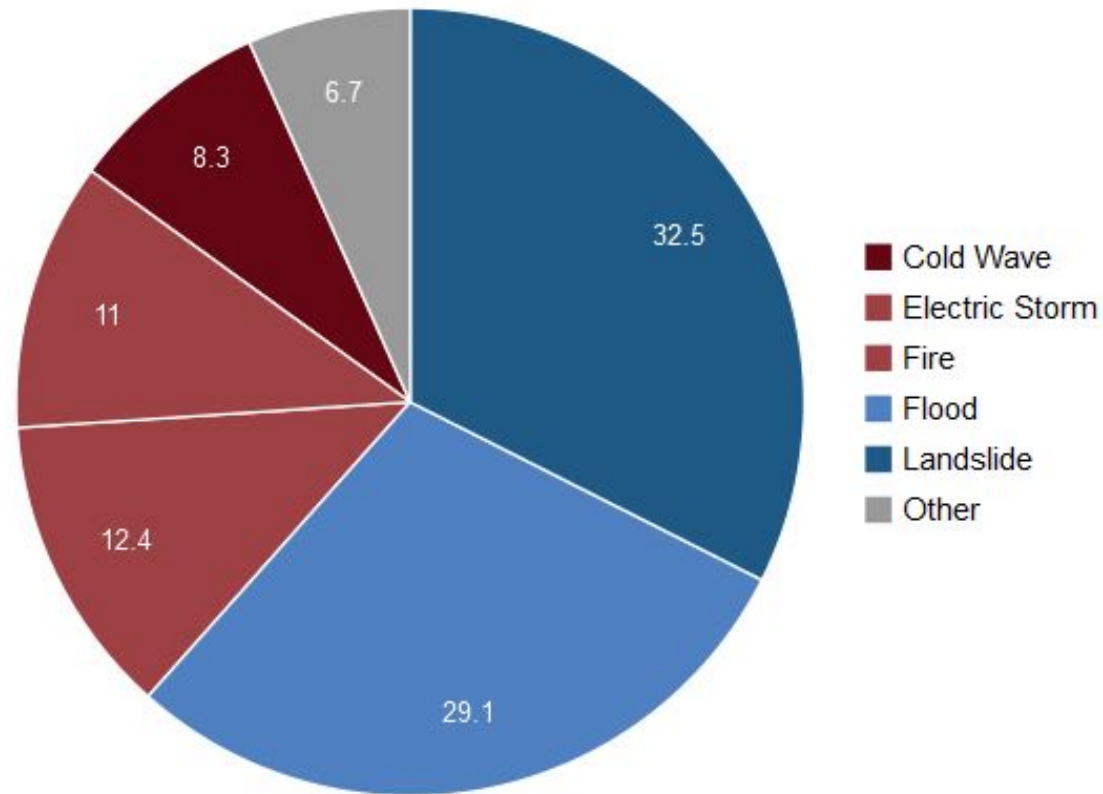


Department of Hydrology and Meteorology,
Kathmandu, Nepal

Disasters in Nepal

Losses 1990-2015

Mortality



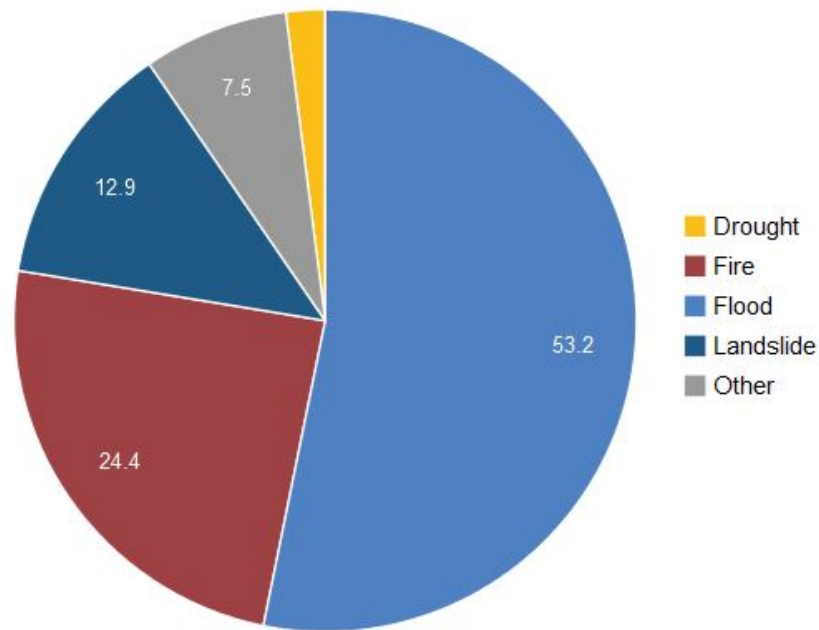
among the top weather-related hazards, Flash Floods have the highest mortality rate globally ...

Source:
www.preventionweb.net

Disasters in Nepal

Nationally Reported Losses 1990-2015

economic losses



Source:
www.preventionweb.net



Principal Activities of Flood Forecasting Section, DHM

- **Establish, operate and manage flood forecasting stations and upgrade them with real time telemetry system.**
- **Assess hazards, vulnerabilities and risks due to floods in major river basins.**
- **Develop river flow forecasting models for major rivers of Nepal.**



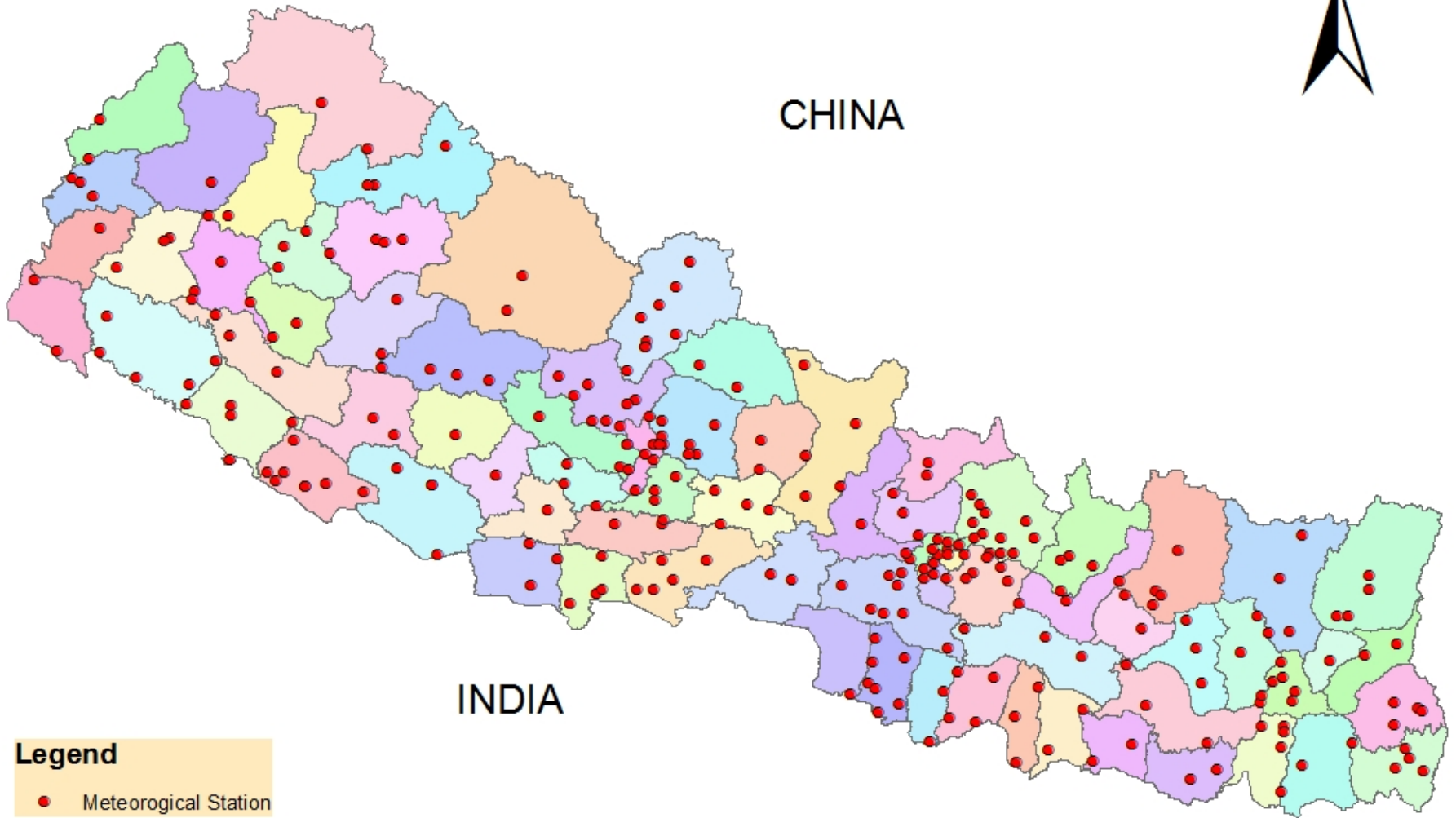
Principal Activities of Flood Forecasting Section, DHM

- **Establish flood early warning systems on major flood prone rivers of Nepal.**
- **Prepare manuals and guidelines for flood early warning systems.**
- **Coordinate with national, regional and international organizations involved in disaster risk management.**

Network of Meteorological Station



CHINA



INDIA

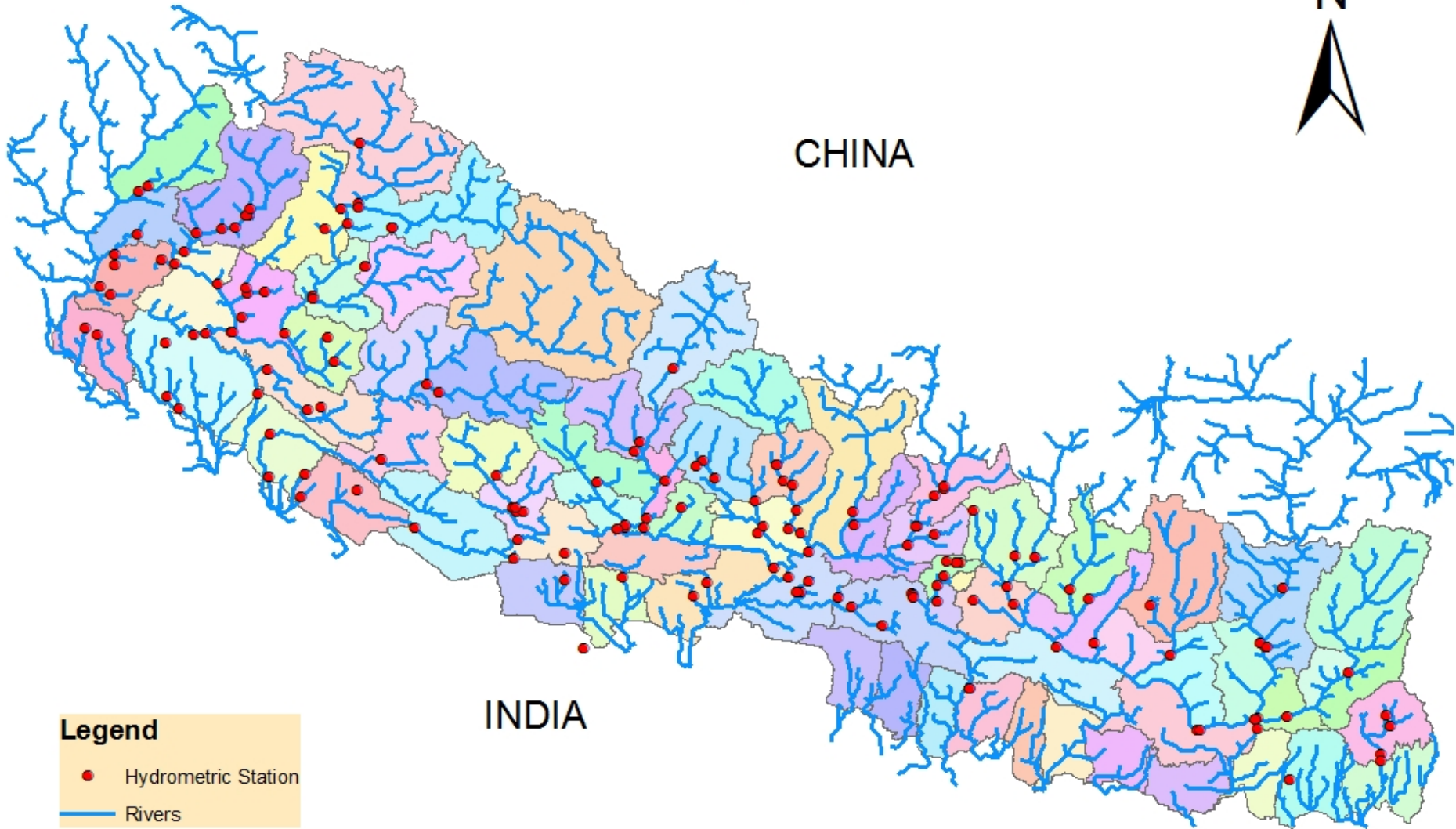
Legend

- Meteorological Station

Network of Hydrometric Station



CHINA

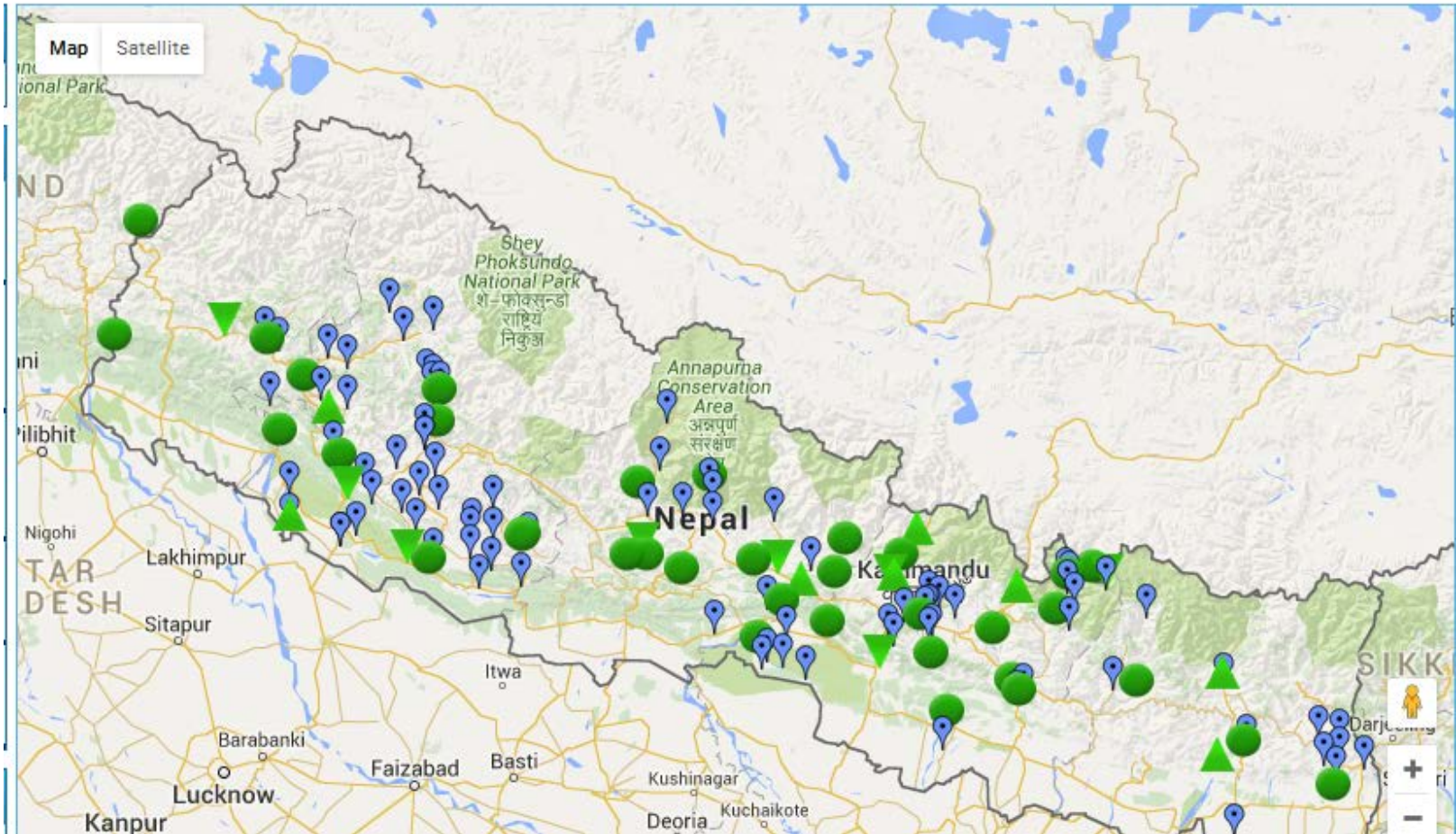


INDIA

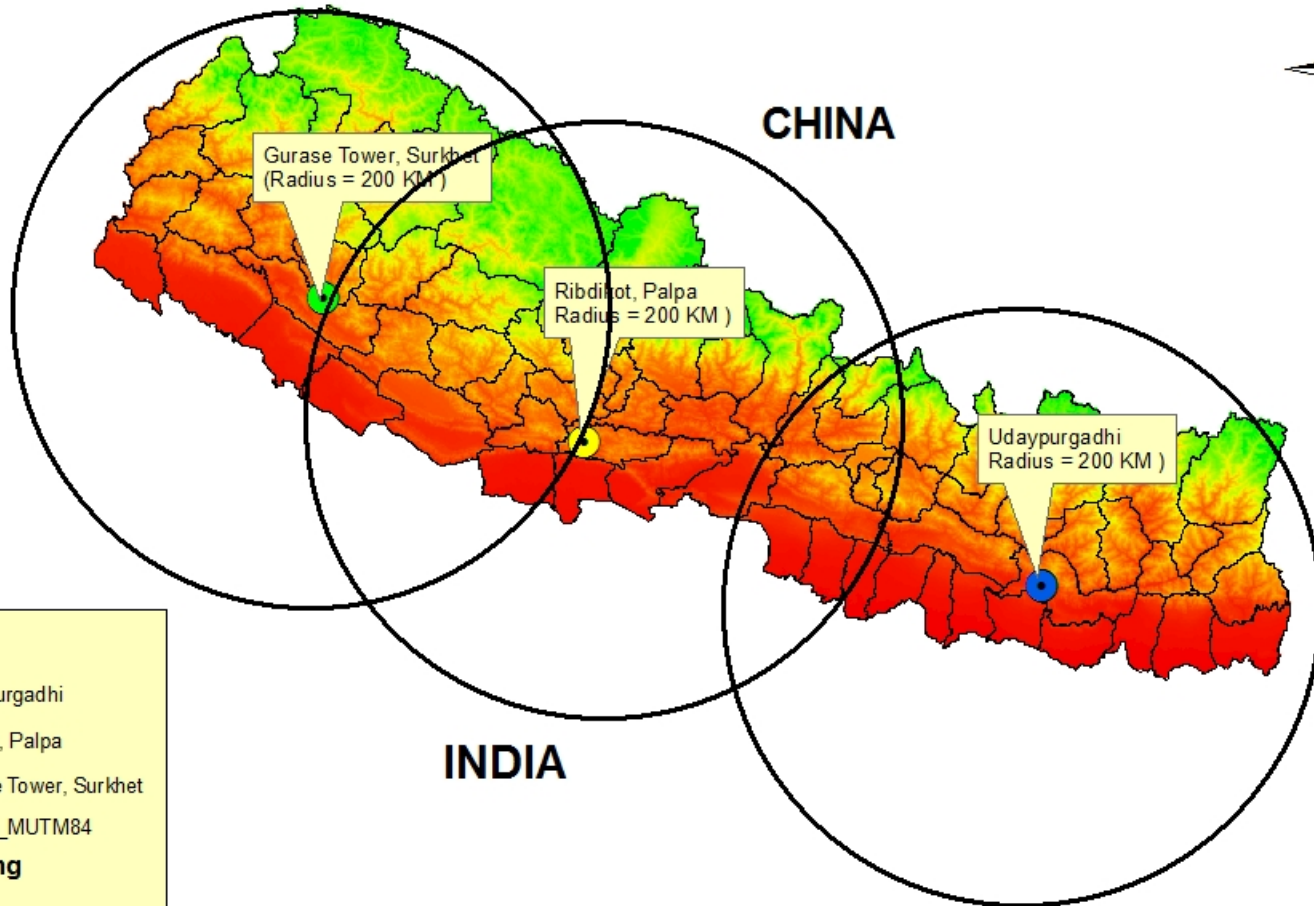
Legend

- Hydrometric Station
- Rivers

Real time Station Network



PROPOSED RADAR SITES (AFTER SURVEYING) THROUGHOUT NEPAL



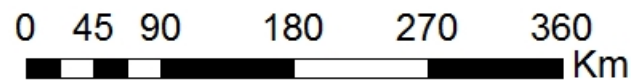
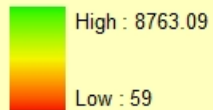
Legend

- Udayapurgadhi
- Ribdikot, Palpa
- Gurase Tower, Surkhet

Districts_MUTM84

dem_org.img

Value



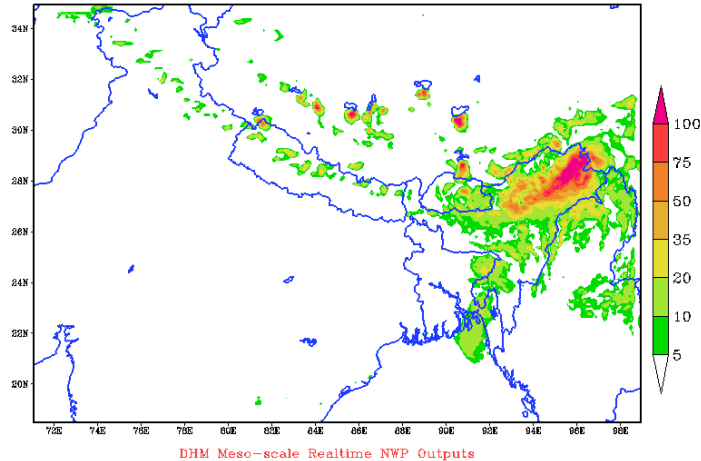
Status of Forecasting

WRF Model 3 Day Forecasts

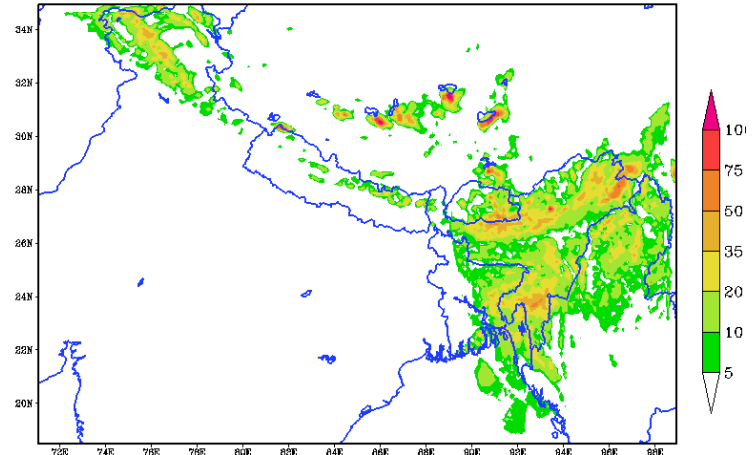
DAY 1

DAY 2

24 Hour Accumulated Rainfall in mm
Valid 15042013 03 UTC to 16042013 03 UTC

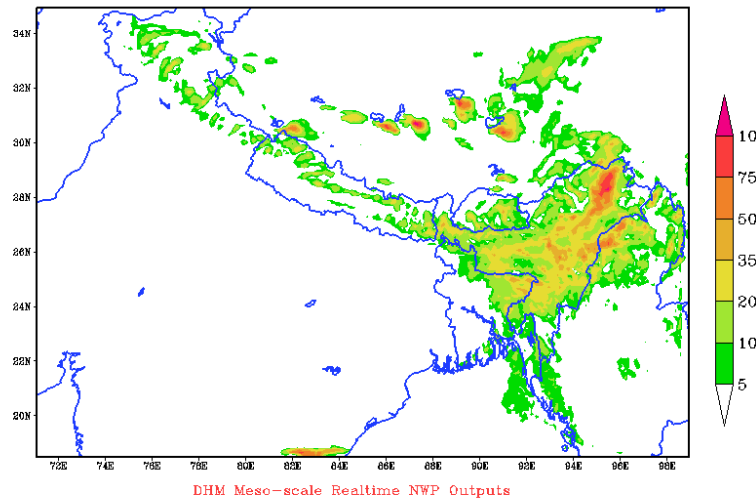


24 Hour Accumulated Rainfall in mm
Valid at 16042013 03 UTC to 17042013 03 UTC



24 Hour Accumulated Rainfall in mm
Valid at 17042013 03 UTC to 18042013 03 UTC

DAY 3



Major works of Flood Forecasting Section, DHM



National Emergency Operation Center

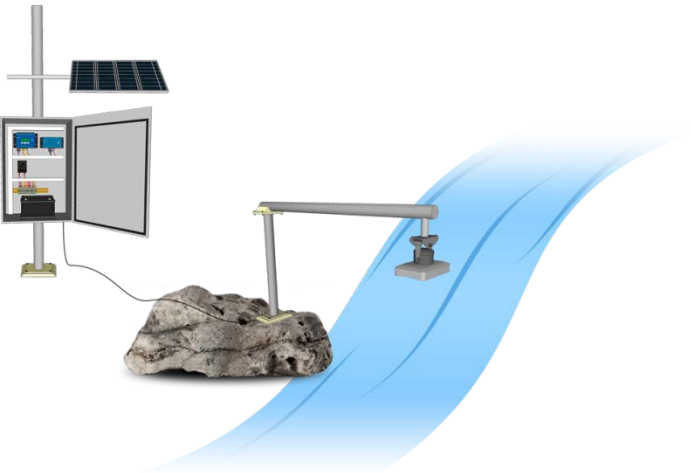
DEOC

LDMC/CDMC



Communication/ Media

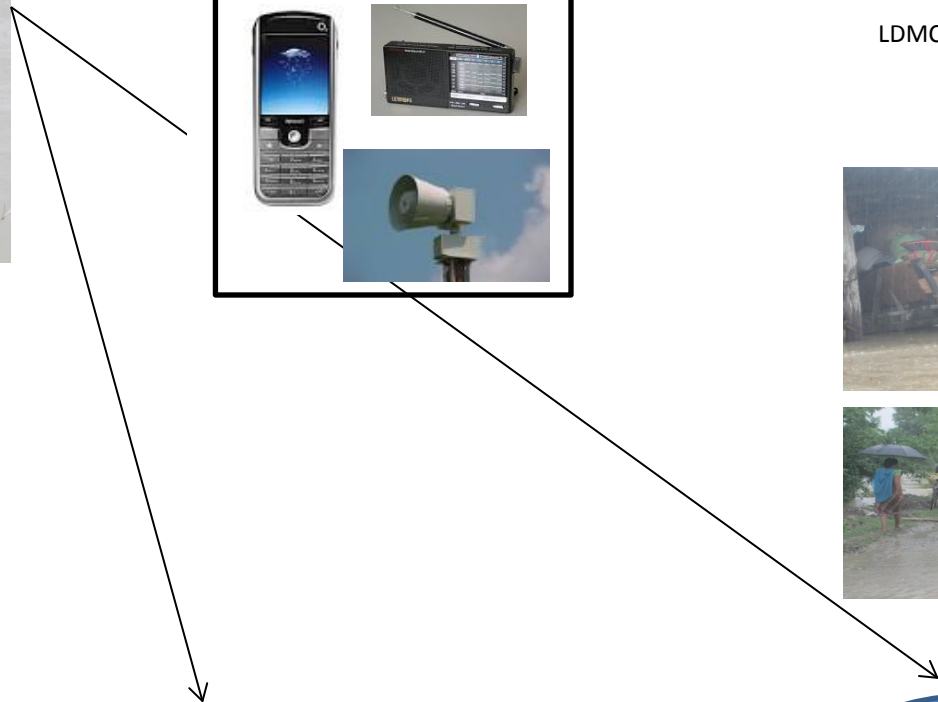
Station Code	Station Name	Water Level (m)	Flow (cms)	Forecast Level (m)	Forecast Flow (cms)	Status	Remarks
1001	Chandraganga	10.5	1000	10.5	1000	Normal	
1002	Chandraganga	10.5	1000	10.5	1000	Normal	
1003	Chandraganga	10.5	1000	10.5	1000	Normal	
1004	Chandraganga	10.5	1000	10.5	1000	Normal	
1005	Chandraganga	10.5	1000	10.5	1000	Normal	
1006	Chandraganga	10.5	1000	10.5	1000	Normal	
1007	Chandraganga	10.5	1000	10.5	1000	Normal	
1008	Chandraganga	10.5	1000	10.5	1000	Normal	
1009	Chandraganga	10.5	1000	10.5	1000	Normal	
1010	Chandraganga	10.5	1000	10.5	1000	Normal	



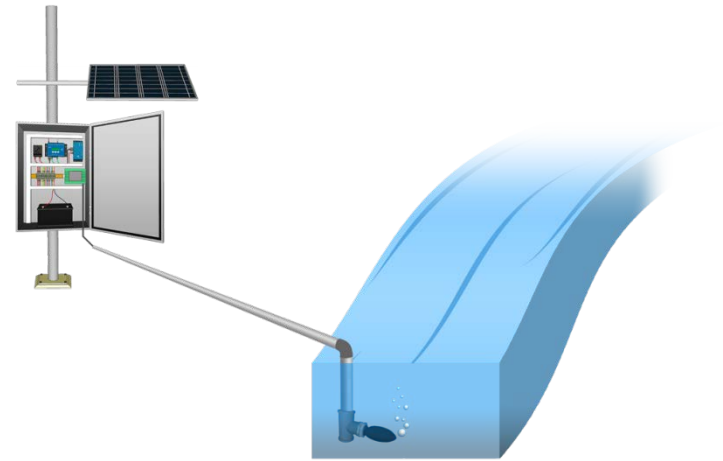
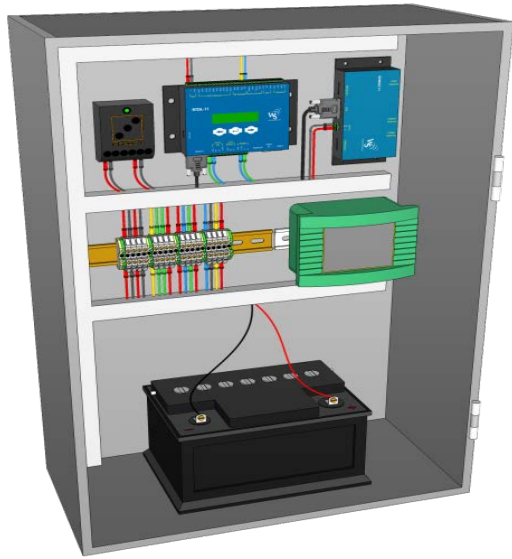
Station

Office

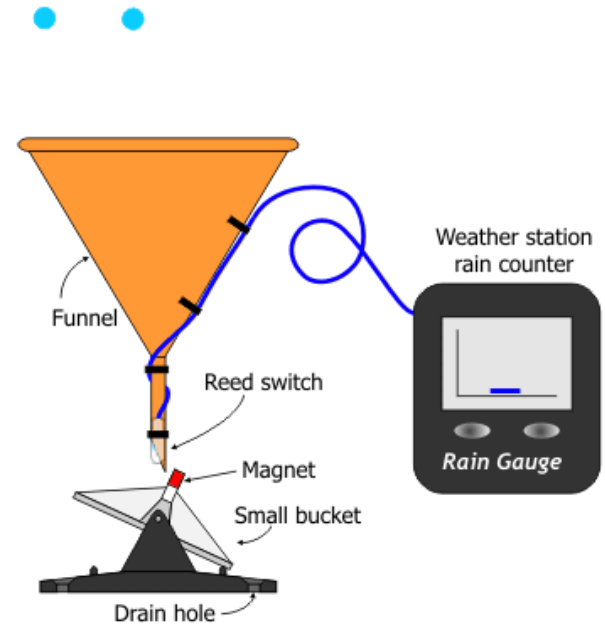
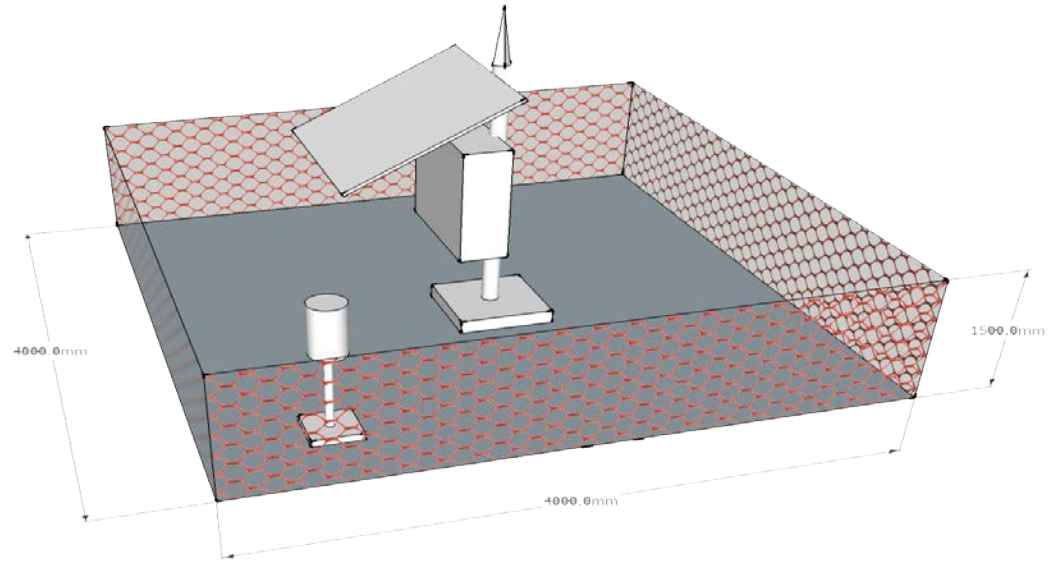
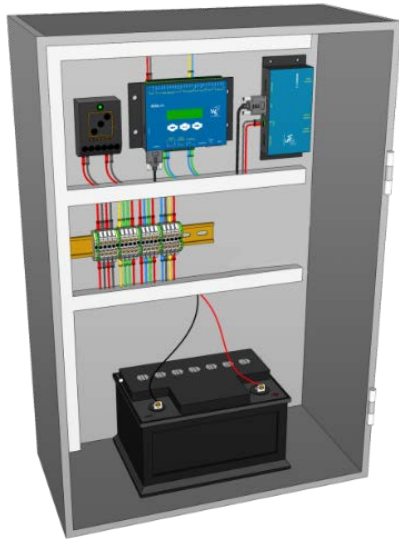
Stake Holders



Flood Station

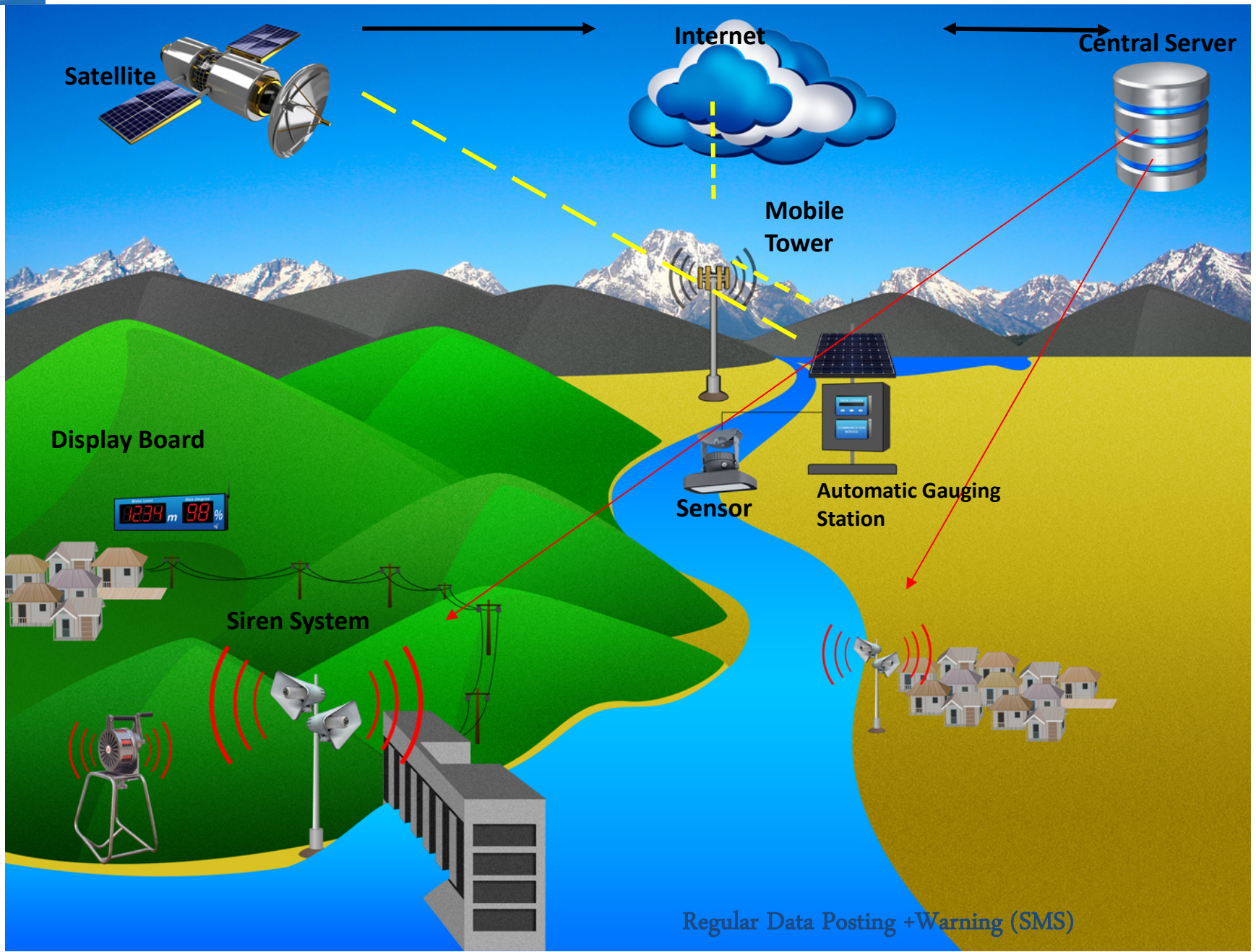


Rainfall Stations/ jiff{dfkkg s]Gb|

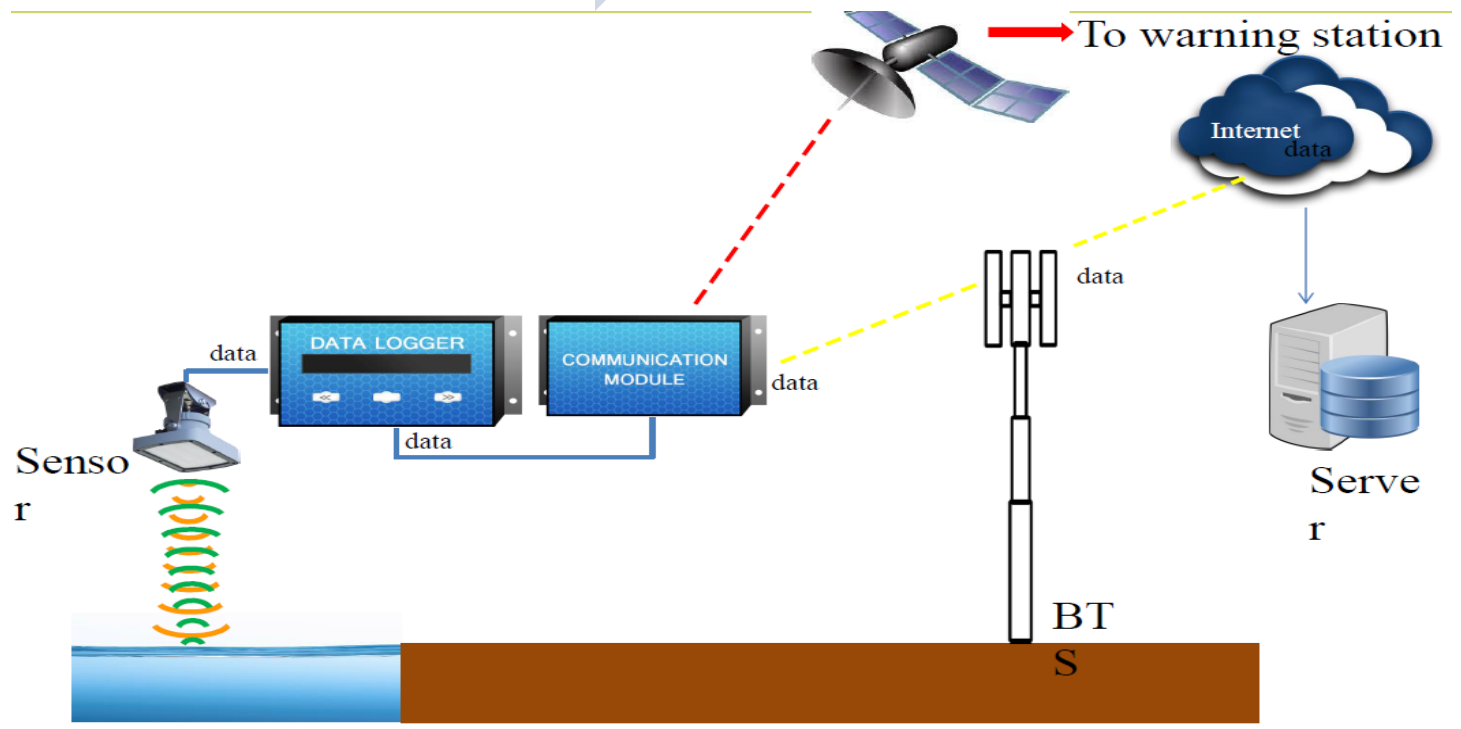




Communication



Communication





hydrology.gov.np/new/bull3/index.php/hydrology/screen_display

Government of Nepal
Ministry of Environment
Department of Hydrology and Meteorology
Flood Forecasting Project

RIVER WATCH

SN	Station Index	Station Name	Water Level (m)	Flow (m ³ /sec)	Warning Level (m)	Danger Level (m)	Trend	Status
1	240	Karnali at Aanaighat 2012.05.17 10:25:00	2.87	-	-	-	Steady	-
2	269.6	Seli at Dipayal 2012.05.17 08:30:00	3.83	-	-	-	Steady	-
3	269.5	Bhesi at Samalighat 2012.05.20 16:16:00	1.68	-	-	-	Steady	-
4	280	Karnali at Chisapani 2012.05.17 08:29:00	3.84	657.20	10.00	10.80	Steady	Below Warning Level
5	289.96	Babai at Chepang 2012.03.24 08:38:12	1.28	27.59	6.50	7.00	Steady	Below Warning Level
6	291	Babai at Bhada Bridge 2012.05.17 10:25:00	2.19	-	-	-	Steady	-
7	330	Mari at Nayagaon 2012.05.17 08:37:00	0.08	-	-	-	Steady	-
8	339.3	Jhimruk at Chisweta 2012.05.17 08:25:30	0.66	-	-	-	Steady	-
9	375	West Rapti at Kusum 2012.05.17 08:30:30	1.50	14.00	5.00	5.40	Steady	Below Warning Level
10	419.1	Kaligandaki at Kumalgaon 2012.01.19 14:23:05	4.77	1729.70	-	-	Steady	-
		Budhikandaki at Arushar	-	-	-	-	-	-

Data Transmission and Dissemination



www.hydrology.gov.np



Telemetric Stations

Government of Nepal
Ministry of Science, Technology and Environment
Department of Hydrology and Meteorology
Flood Forecasting Project



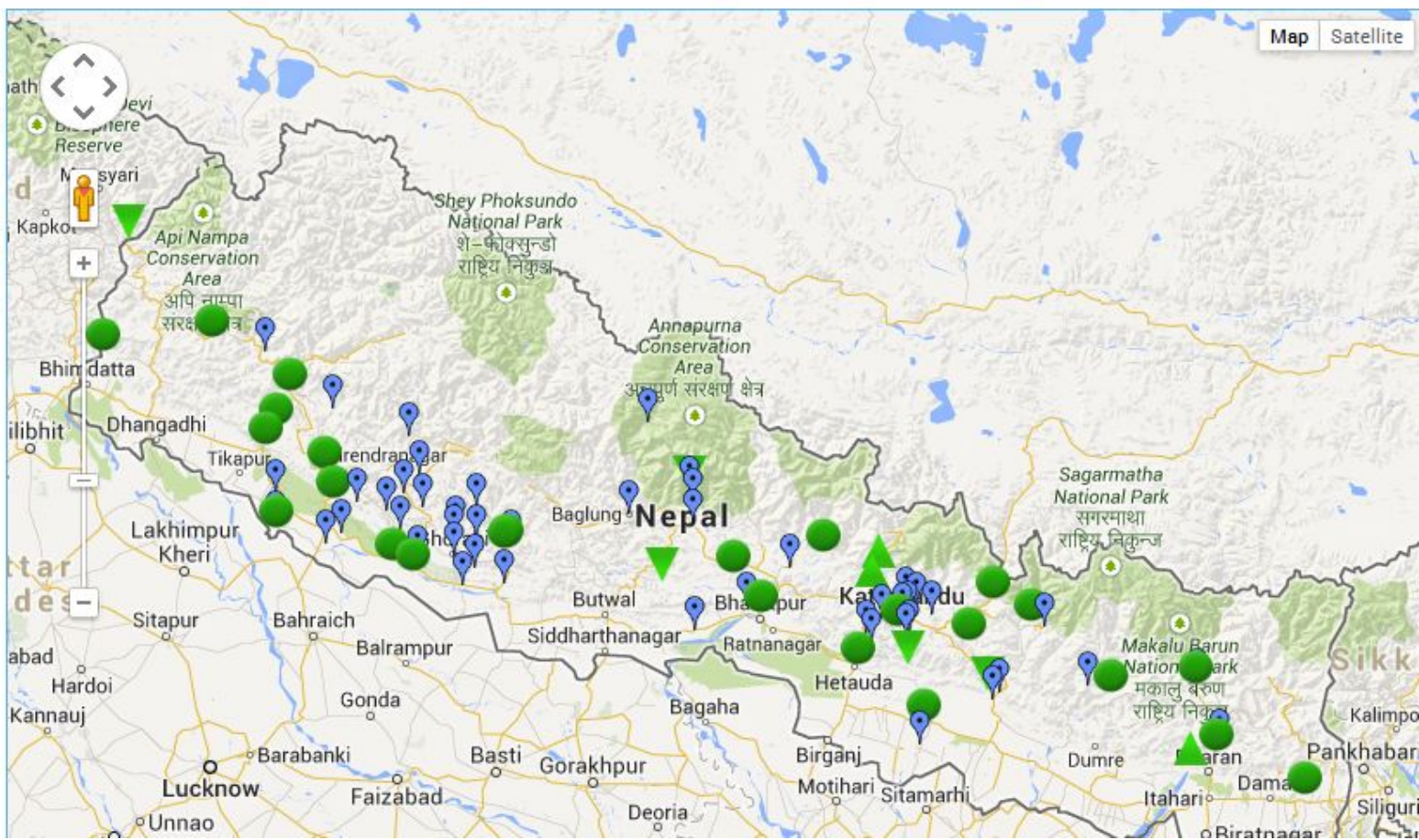
- Home
- Real Time Data
- Manually Observed Data
- Current Forecast
- Community Outreach
- Projects
- Publications
- River Watch
- Rainfall Watch

Notice Board
No New Notice Available

News and Events
No New News Available

Flood Alerts

- Water Level of Karnali at Chisapani at 2014-05-22 11:30:00 is falling [4.03 m] and **Below Warning Level**
- Water Level of Babai River at Chepang at 2014-05-22 12:15:00 is steady [1.00 m] and **Below Warning Level**
- Water Level of Rapti River at Kusum at 2014-05-22 12:15:00 is steady [1.38 m] and **Below Warning Level**
- Water Level of Narayani River at Devghat at 2014-01-28 03:21:10 is falling [0.97 m] and **Below Warning Level**
- Water Level of East Rapti at Rajaiya at 2014-05-02 11:30:00 is steady [0.39 m] and **Below Warning Level**



<http://www.hydrology.gov.np>

Web Based Telemetry :Rainfall Watch



Government of Nepal
Ministry of Science, Technology and Environment
Department of Hydrology and Meteorology
Flood Forecasting Project

RAINFALL WATCH

Last updated on 2014-07-07 10:02:55

S.N	Basin Name	Station Index	Station Name	RAINFALL IN mm					Status ***
				1 hour (09-10)	3 hour (07-10)	6 hour (04-10)	12 hour (22-10)	24 hour (10-10)	
1	Karnali	280	Karnali at Chisapani	13.40	27.40	39.00	39.40	77.20	Below Warning Level
2	Karnali	402	Dailekh	6.00	19.20	20.80	21.00	31.00	Below Warning Level
3	Karnali	404	Jajarkot	2.00	4.60	4.60	4.60	7.00	Below Warning Level
4	Babai	289.95	Babai at Chepang	7.20	56.20	116.60	122.40	151.20	Above Warning Level
5	Babai	417	Ranijaruwa	8.00	26.80	78.60	82.60	109.20	Below Warning Level
6	Babai	508	Tulsipur	5.00	29.00	130.60	130.80	133.20	Above Warning Level
7	Babai	515	Ghorahi	9.60	28.20	145.60	145.80	148.60	Above Warning Level
8	Babai	515	Ghorahi	6.05	16.01	94.83	95.12	96.11	Below Warning Level
9	Babai	519	Tharmare	10.40	22.80	34.60	34.60	44.40	Below Warning Level
10	Babai	525	Rampur-Kalimati	N/A	N/A	N/A	N/A	2.20	Below Warning Level
11	Babai	529	Padampur	0.40	15.20	85.80	86.80	92.40	Below Warning Level

Note: warning level for rainfall :60mm in 1 hr,80 mm in 3 hour, 100 mm in 6 hr, 120mm in 12 hr,140 mm in 24 hr

Web Based Telemetry :River Watch

Most Visited Getting Started

RIVER WATCH

S.N	Station Index	Station Name	Water Level (m)	Flow (m ³ /sec)	Warning Level (m)	Danger Level (m)	Trend	Status
1	259.5	Seti at Dipayal 2013-08-27 13:15:00	6.70	-	-	-	Rising	-
2	289.95	Babai at Chepang 2013-08-27 13:15:00	4.18	777.80	6.50	7.00	Rising	Below Warning Level
3	339.3	Jhimruk at Cherneta 2013-08-27 13:00:00	2.85	-	-	-	Steady	-
4	375	West Rapti at Kusum 2013-08-27 13:15:00	5.75	2414.00	5.00	5.40	Rising	Above Danger Level
5	425	Seti 2013-08-27 13:00:00	2.05	-	-	-	Steady	-
6	550.05	Bagmati at Khokana 2013-08-27 13:15:00	1.28	24.06	3.50	4.00	Falling	Below Warning Level
7	610	Bhote Koshi at Bahrabise 2013-08-27 13:00:00	2.02	-	-	-	Steady	-
8	630	Sunkoshi at Pachuwarghat 2013-08-27 13:00:00	2.04	-	-	-	Falling	-
9	647	Tamakoshi at Busti 2013-08-27 13:00:00	3.29	-	-	-	Falling	-
10	690	Tamor at Mulghat 2013-08-27 13:20:00	4.45	-	-	-	Falling	-

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Government of Nepal
 Ministry of Science, Technology and Environment
 Department of Hydrology and Meteorology
 Flood Forecasting Project

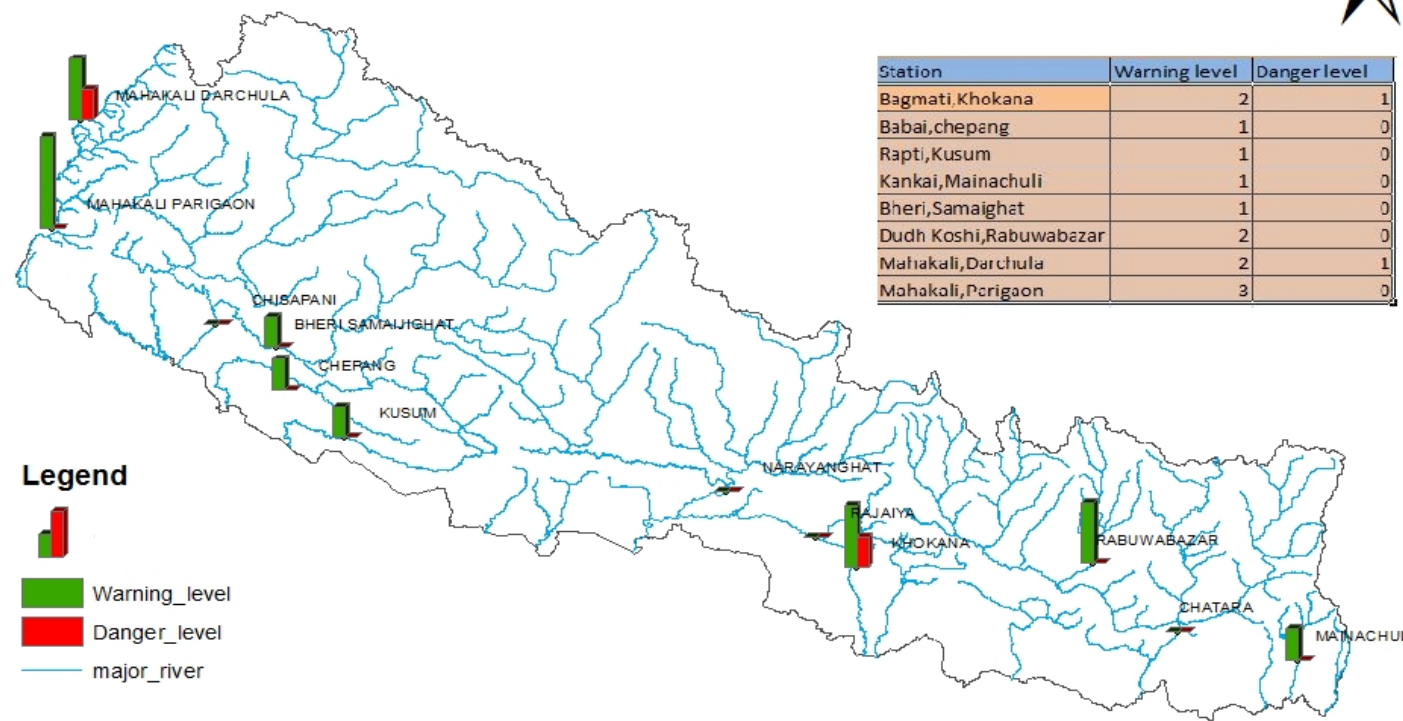
RIVER WATCH

S.N	Station Index	Station Name	Water Level (m)	Flow (m ³ /sec)	Warning Level (m)	Danger Level (m)	Trend	Status
A landslide based dam has been formed at Kaligandaki river approximately 10km upstream of Beni Bazar. Residents of people living downstream in Galeshwor Bazaar and Beni Bazaar need to be in VERY HIGH ALERT. Parts of Syangja, Parbat, Myagdi, Baglung, Gulmi, Palpa and Nawalparasi districts in the downstream of these river also need to stay in HIGH ALERT.								
1	240	Karnali at Asaraghat 2015-05-24 08:25:00	4.57	-	-	-	Steady	-
2	259.5	Seti at Dipayal 2015-05-24 08:15:00	4.09	-	-	-	Steady	-
3	280	Karnali at Chisapani 2015-05-24 08:30:00	4.81	1219.90	10.00	10.80	Falling	Below Warning Level
4	330	Mari at Nayagaon 2015-05-24 08:30:00	1.80	-	-	-	Steady	-
5	375	West Rapti at Kusum 2015-05-24 08:30:00	1.40	11.00	5.00	5.40	Steady	Below Warning Level
6	425	Seti at Jyamirebari 2015-05-22 22:45:00	0.88	-	-	-	Falling	-
7	430.5	Seti at Damauli 2015-05-24 08:15:00	1.04	18.48	-	-	Falling	-
8	448	Tadi at Belkot 2015-05-24 08:15:00	1.61	20.17	-	-	Steady	-



dy	Below Warning Level
dv	-

Number of Days crossing the Water Level Threshold ,2015



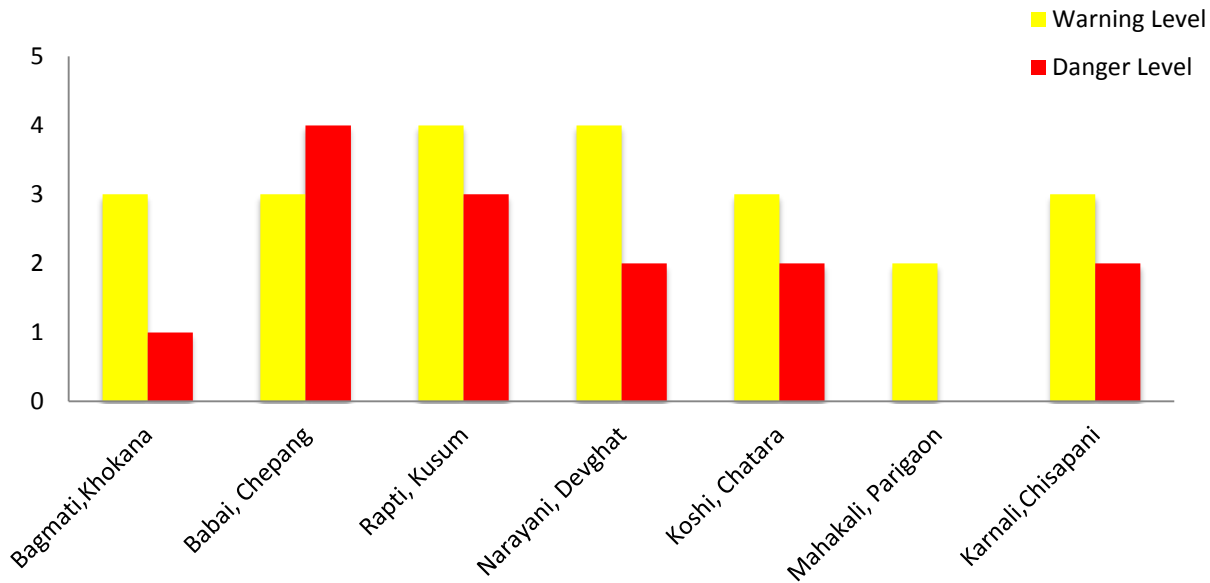
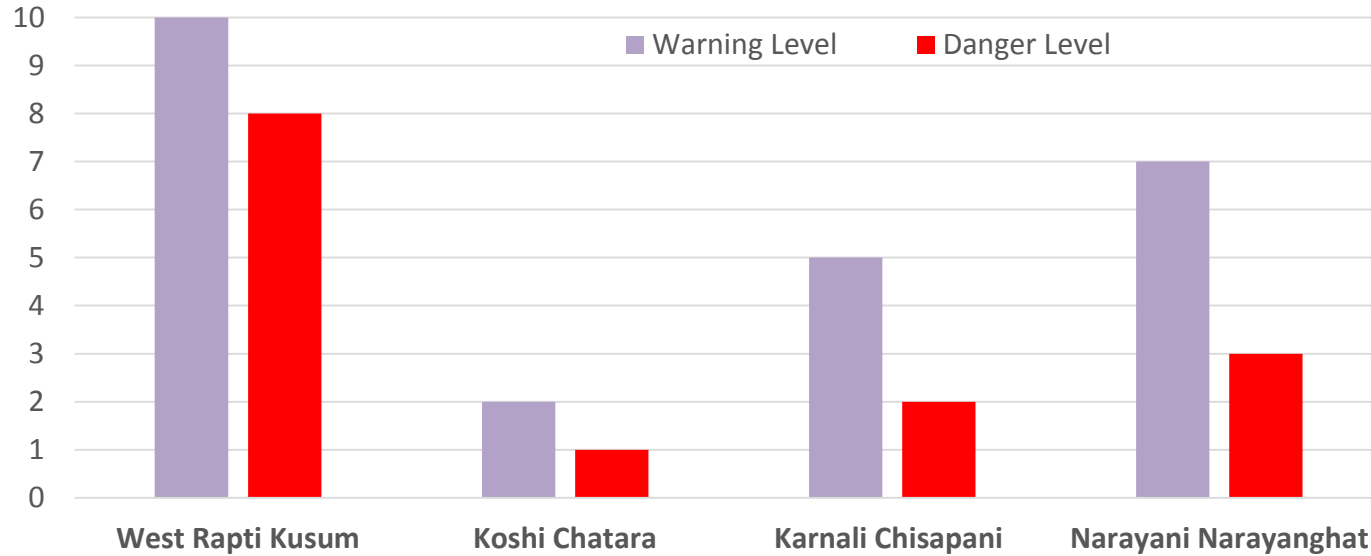
Station	Warning level	Danger level
Bagmati,Khokana	2	1
Babai,chepong	1	0
Rapti,Kusum	1	0
Kankai,Mainachuli	1	0
Bheri,Samaighat	1	0
Dudh Koshi,Rabuwabazar	2	0
Mahakali,Darchula	2	1
Mahakali,Parigaon	3	0

Legend

- Warning_level
- Danger_level
- major_river

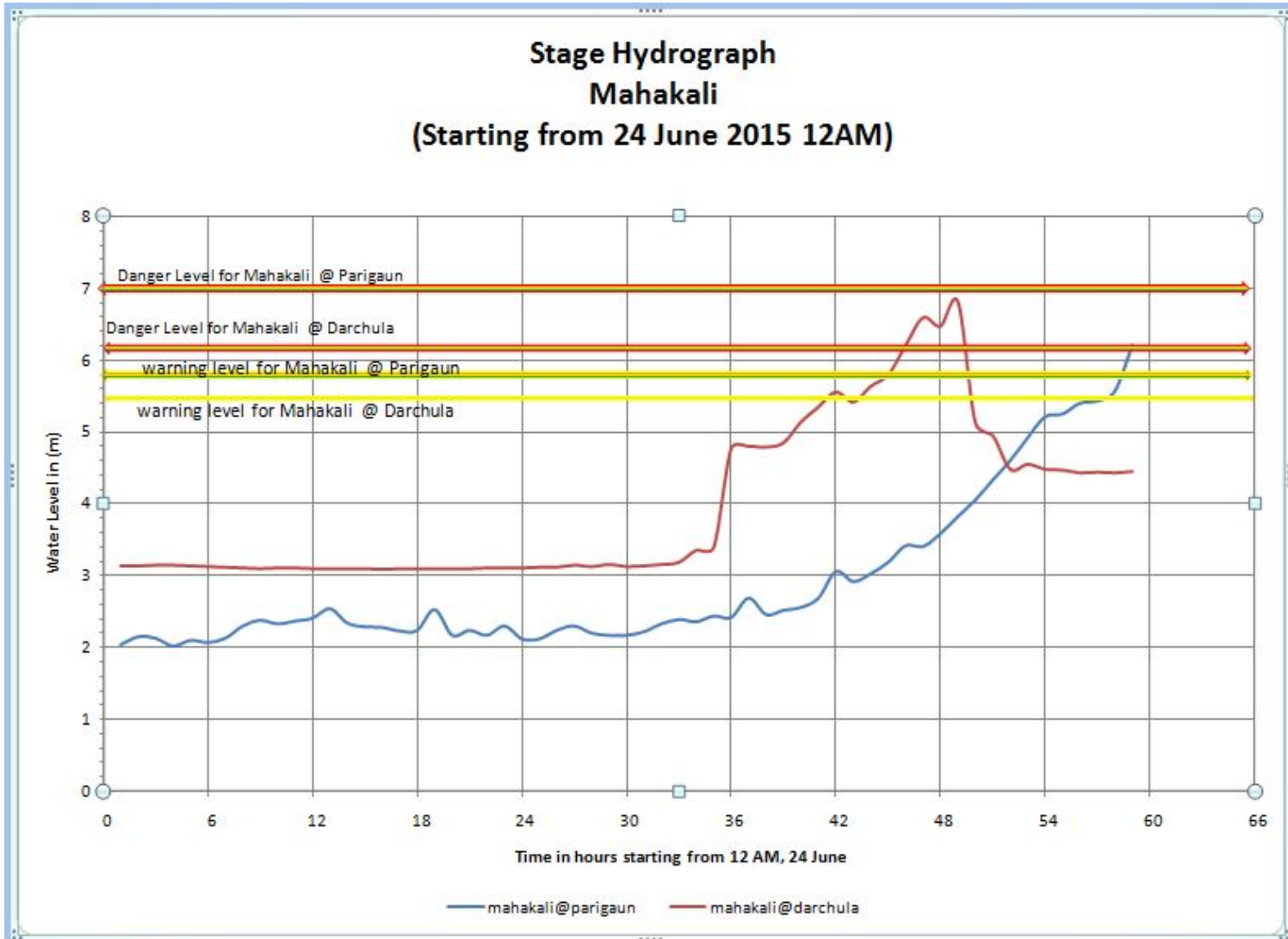


Number of Days crossing the Threshold values



Mahakali Flood

24 June 2015



Bagmati Flood 2015 (17 th and 21th Aug)

Mahakall
 Others

Flood Alerts

Water Level of Karnali at Chisapani at 2015-08-27 07:30:00 is rising (6.42 m) and Below Warning Level

Water Level of Babal River at Chapang at 2015-08-27 06:30:00 is rising (4.39 m) and Below Warning Level

Water Level of Rapti River at Kusum at 2015-08-27 07:45:00 is steady (2.16 m) and Below Warning Level

Water Level of Narayani River at Devghat at 2015-08-27 07:45:00 is falling (4.63 m) and Below Warning Level

Water Level of East Rapti at Rajaya at 2015-08-20 05:30:00 is steady (0.28 m) and Below Warning Level

Water Level of Bagmati River at Karmalya at NIA is NIA (N/A m) and N/A

Water Level of Koashi River at Chatarra at 2015-08-22 10:15:00 is steady (4.52 m) and Below Warning Level

Water Level of Kankal River at Malnachuli at 2015-08-27 07:15:00 is rising (2.52 m) and Below Warning Level

Weather Forecast

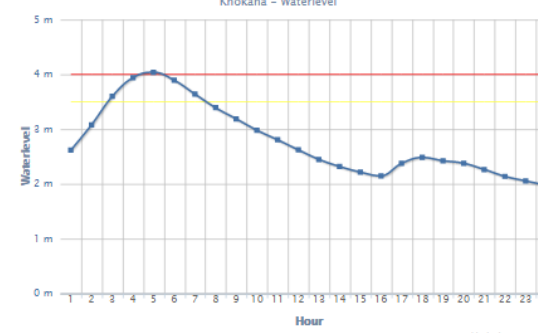


Choose Your Option

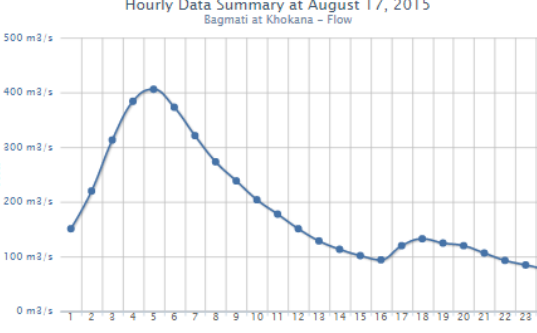
Select Date: 2015-08-17 View Type: Hourly View

Hour	Value (m)	Flow (m3/s)
1	2.62	150.80
2	3.08	219.80
3	3.60	313.00
4	3.94	383.80
5	4.04	405.80
6	3.89	372.90
7	3.64	321.00
8	3.39	273.20
9	3.19	238.30
10	2.98	203.80
11	2.81	177.50
12	2.62	150.80
13	2.45	128.50
14	2.32	113.20
15	2.22	101.64
16	2.15	93.95
17	2.38	119.80
18	2.48	132.40
19	2.42	124.60
20	2.38	119.80
21	2.26	106.32
22	2.14	92.88
23	2.06	84.56
24	1.98	76.62

Hourly Data Summary at August 17, 2015
Khokana - Waterlevel



Hourly Data Summary at August 17, 2015
Bagmati at Khokana - Flow



Hydrology.gov.np

07:45:00 is steady (2.00 m) and Below Warning Level

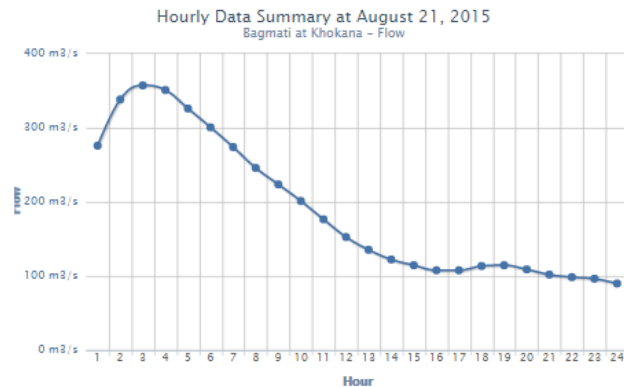
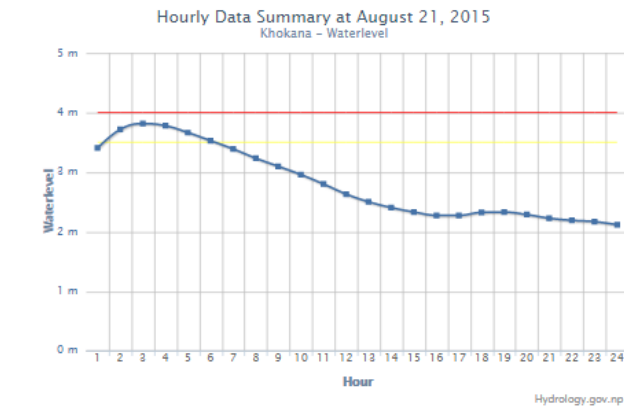
Weather Forecast



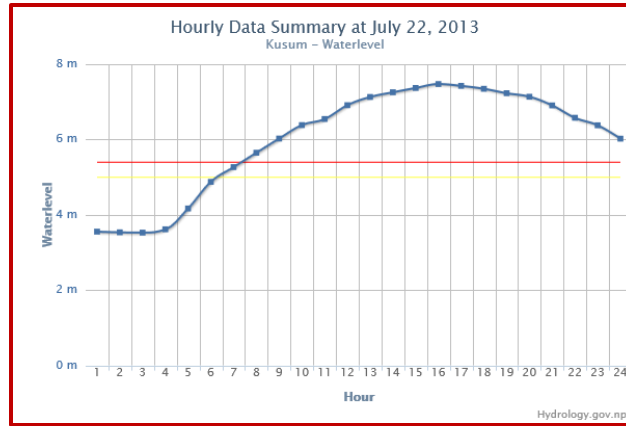
Choose Your Option

Select Date: 2015-08-21 View Type: Hourly View

Hour	Value (m)	Flow (m3/s)
1	3.40	275.00
2	3.72	337.20
3	3.81	356.10
4	3.78	349.80
5	3.66	325.00
6	3.53	299.70
7	3.39	273.20
8	3.23	245.10
9	3.10	223.00
10	2.96	200.60
11	2.80	176.00
12	2.63	152.20
13	2.50	135.00
14	2.40	122.00
15	2.33	114.30
16	2.27	107.49
17	2.27	107.49
18	2.32	113.20
19	2.33	114.30
20	2.28	108.66
21	2.22	101.64
22	2.19	98.23
23	2.17	96.09
24	2.11	89.67



Early warning system: Case study of Banke District



Display board at DAO, Banke showing water level of Rapti River at Kusum (above danger level)

Source:
www.hydrology.gov.np

CDO, Banke taking flood level information



Photo: Community people shifting their belongings to safe place

Stakeholder and Community in action



Security forces were mobilized at Holiya



Armed police force in ready position for rescue



Community people shifting their property by boat

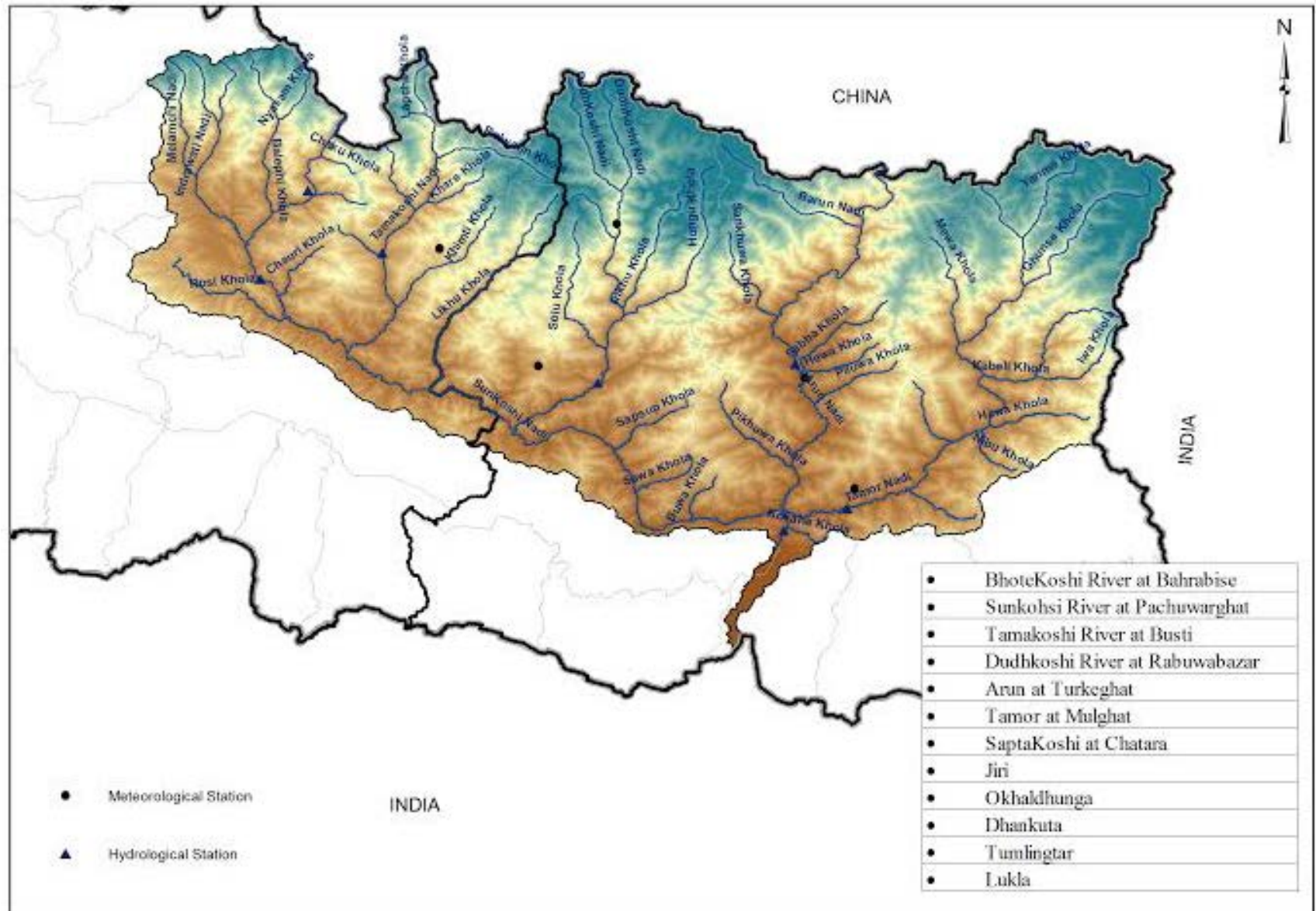


CDO, Banke visited to Holiya to observe the situation

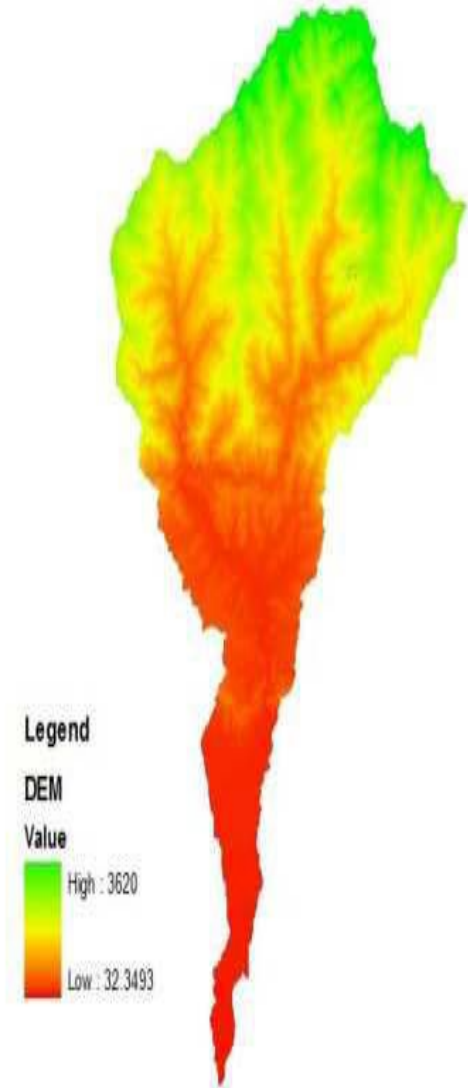
Stakeholder and Community in action



DHM-ICIMOD- HYCOS Project

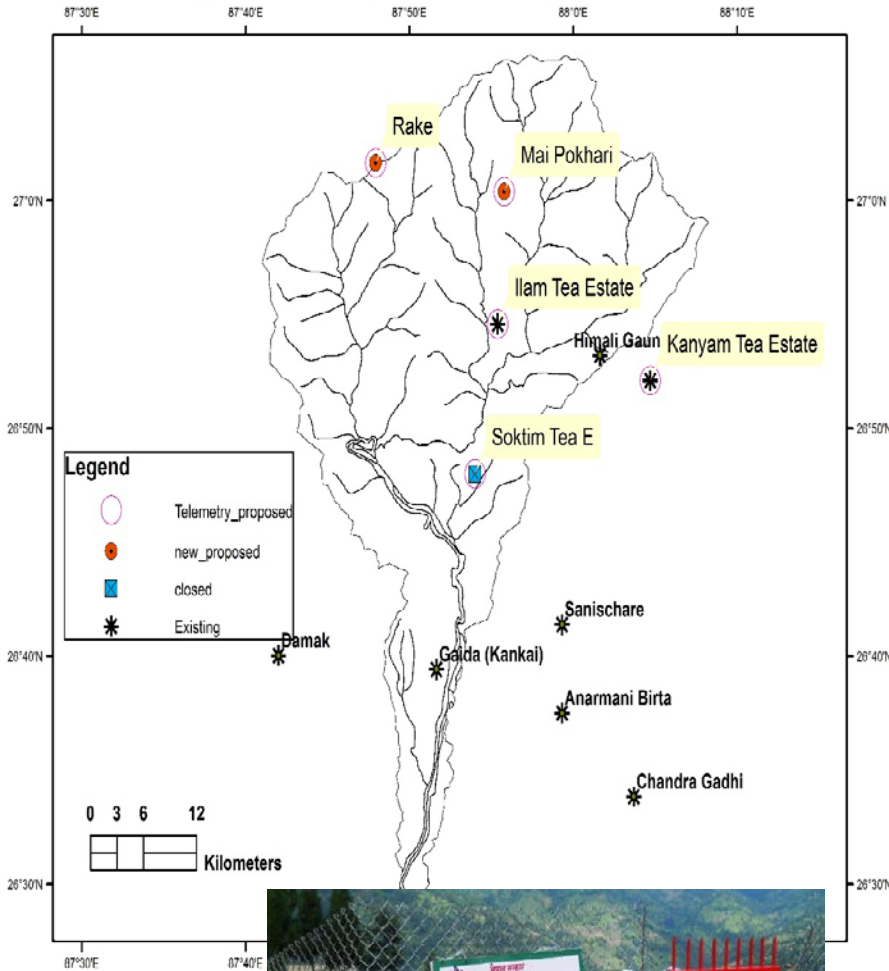


CB-EWS in Kankai River Basin

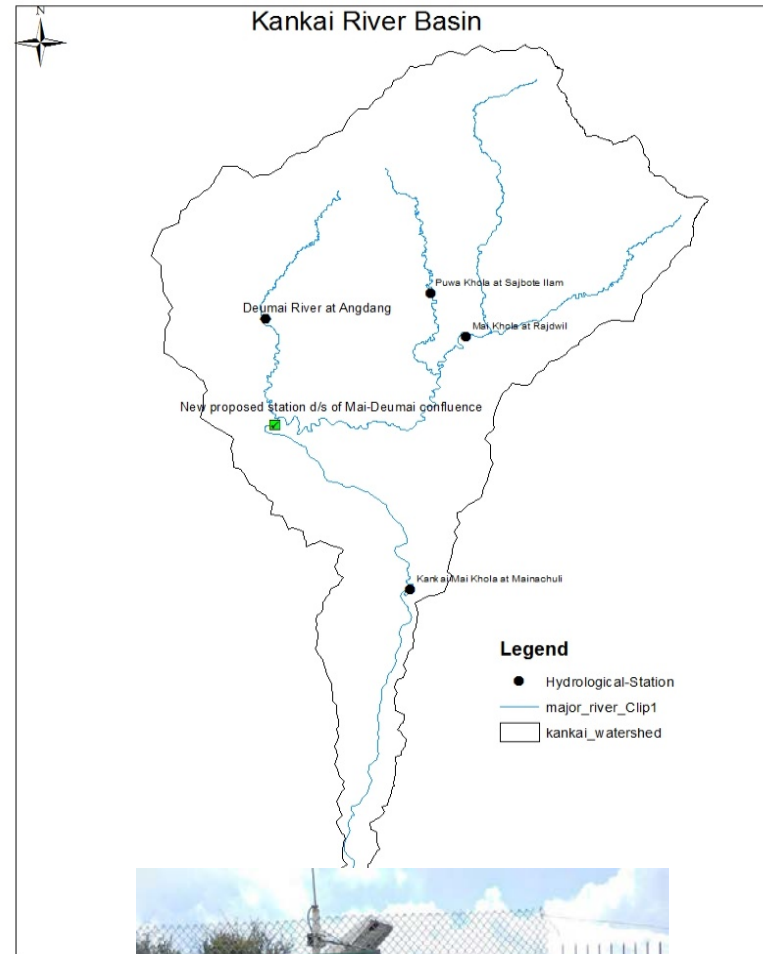


CB-EWS in Kankai River Basin

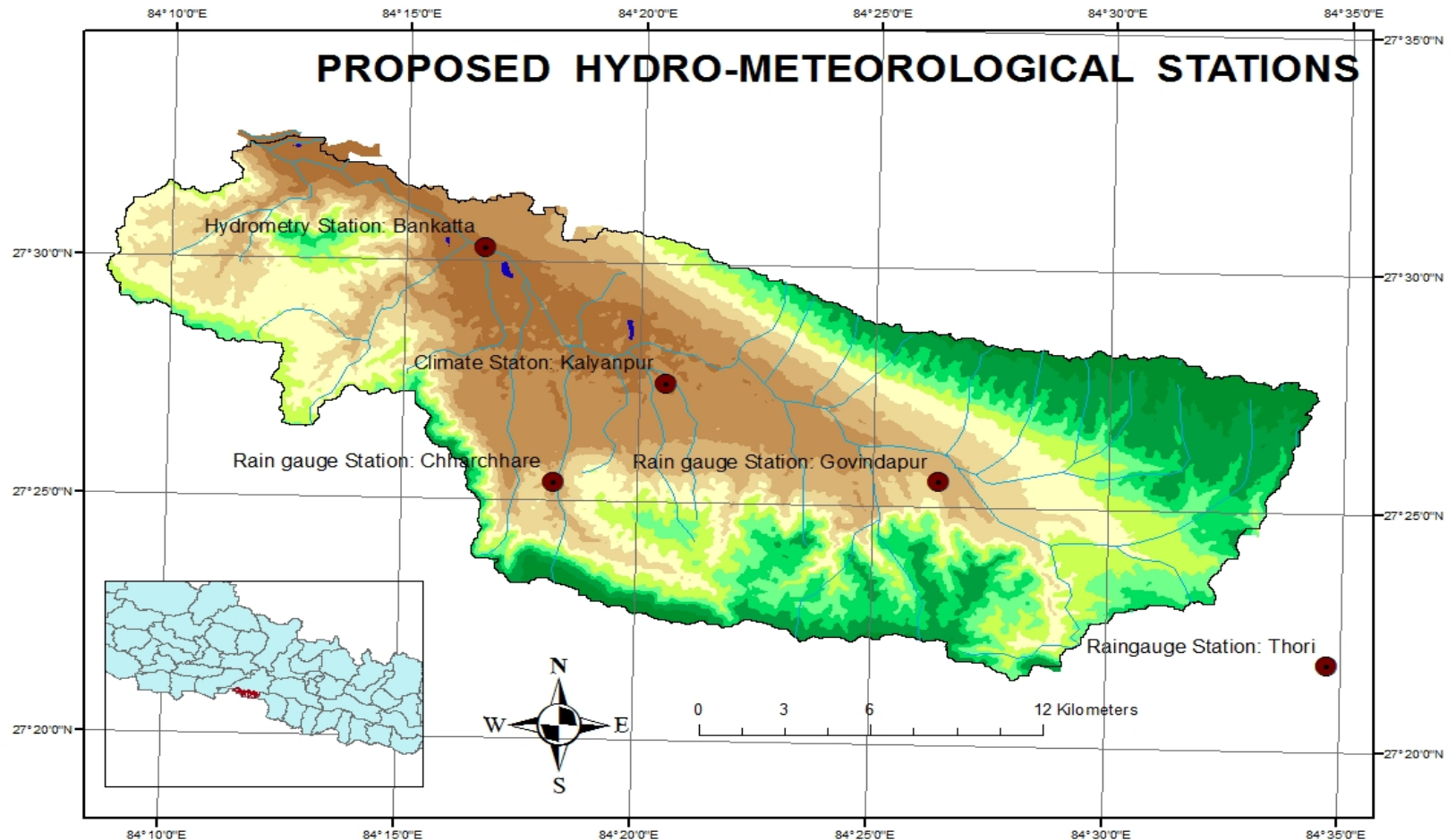
Meteorological Stations Proposed for Telemetry : Kankai Basin Nepal



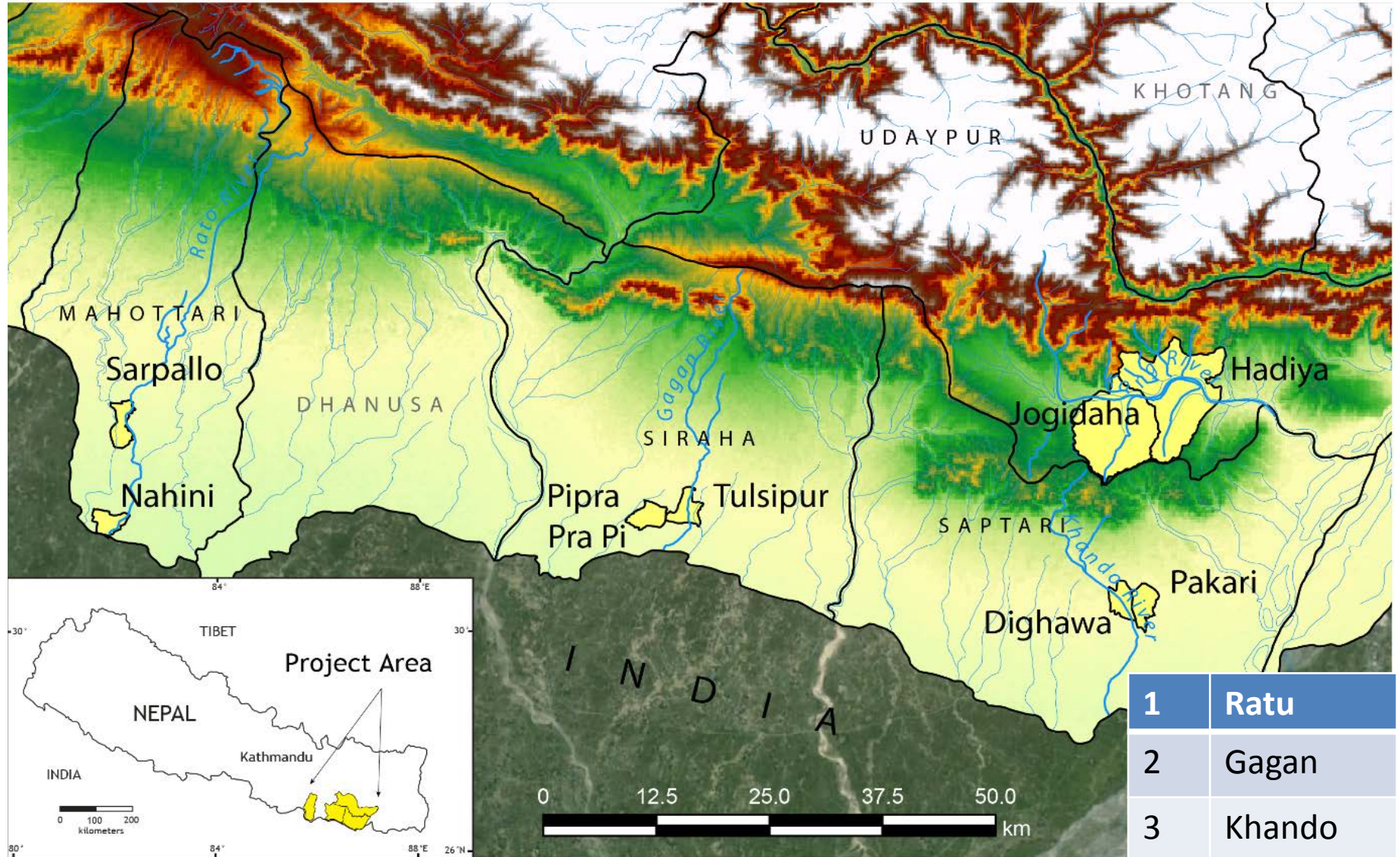
Hydrological Stations proposed for Telemetry



Hydro-Met Stations for Maadi CBEWS

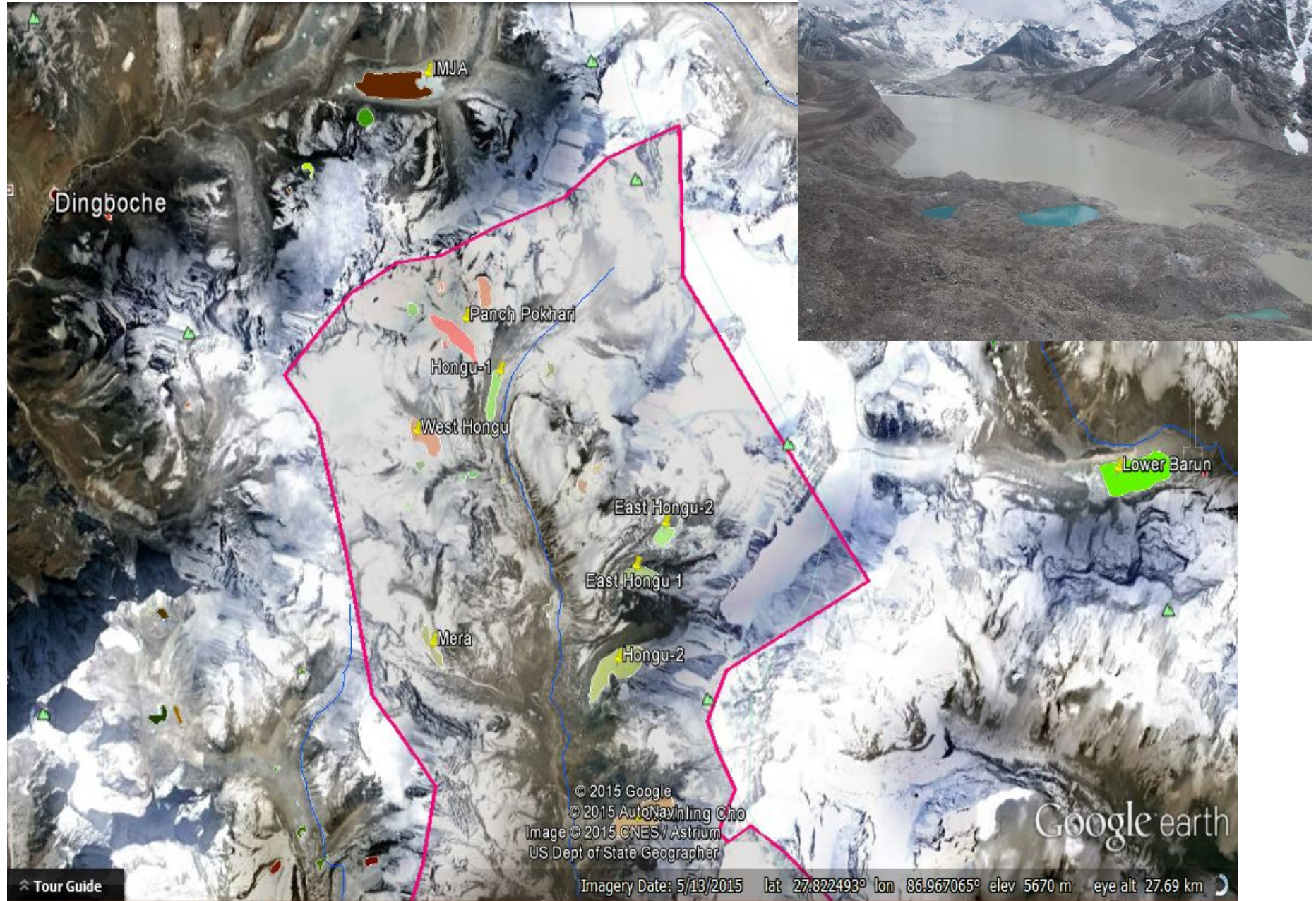


CFGORRP- Component II (ongoing)



1	Ratu
2	Gagan
3	Khando
4	Kong
5	Hadiya

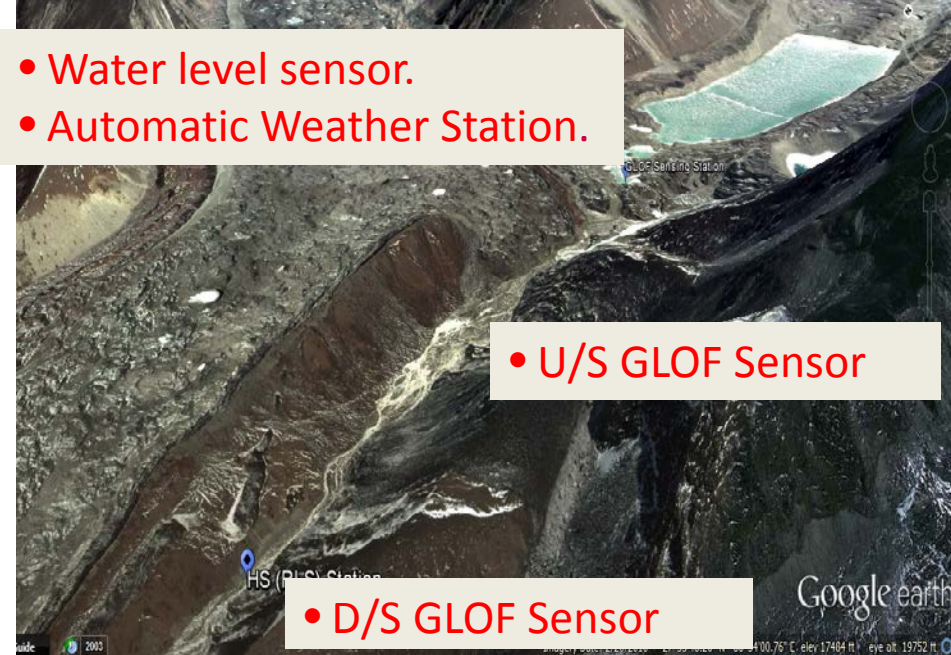
Glacier lakes Monitoring



Glacier lake monitoring...



CFGORRP CB-EWS in Imja Glacial Lake Component 1 (ongoing)



GLOF Sensing - Upstream:

- The pressure level sensor
- moraine dam movement sensor
- water content reflectometers

GLOF Sensing - Downstream:

- radar level sensor
- water content reflectometers
- Camera
- decibel meter

**Moraine Dam
Movement Sensor**



**Water Content
Reflectometer**



THANK YOU

