The State of Arsenic in Nepal - 2003

April 22, 2004

Kathmandu

About 500,000 tube wells provide water to about 11 million people in Terai, which is about half of the national population.

90 % of the people in the Terai use groundwater as their primary source for drinking water.

Providing clean drinking water is the significant *challenge*.

Arsenic in Groundwater is one of the challenging issues.

Needs for Better Strategy to overcome this challenge

Formulation of the Project

A report “Options for Hydrogeological Investigations on Arsenic Occurrence in Groundwater in Nepal” submitted to UNICEF-Nepal, NASC and U.S. Embassy by David Clark and John W. Whitney (USGS) made following recommendations.

Recommendations

- Create an integrated database with the existing arsenic test.
- Identify the source of the arsenic
- Identify the reason for contamination of aquifers
- Monitoring of Water level to know the connection between shallow and deep aquifer

- Create an Integrated Database with the Existing arsenic test data and other collected data.
- Obtain accurate positions of all wells tested
- Use GIS software to plot data in order to identify information gaps and map areas with higher arsenic concentrations.
- Use the database to plan future well testing and health surveys.

Task Force Members

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Objectives

1. Compile all available analyses of water tested for arsenic in the Terai region.
2. Edit the data entries
3. Check location information for each entry
4. Add GPS location information where feasible

Objective contd…….

5. Display arsenic data on maps

6. Interpret and display some statistical parameters of the arsenic data

7. Produce a report on the state of arsenic in Nepal – 2003 that includes a CD-ROM of an integrated national database of arsenic tested tube wells.

Output of the Project

- A Report “The State of Arsenic in Nepal – 2003”
- An integrated database of arsenic tested tube wells
- Georeferenced digital maps of twenty districts of Terai

RWSSFDB RWSSSP

NRCS

NEWAH

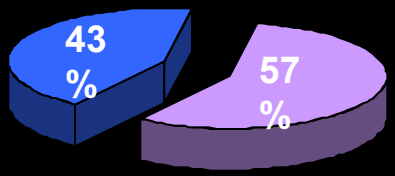
DWSS

Total Arsenic tested tube wells

18,635

- Well ID
- Location information
- Geographic coordinate
- Depth of well
- Age of well
- Users information
- Arsenic concentration
- Test method
- Microbiological result
- Data Source

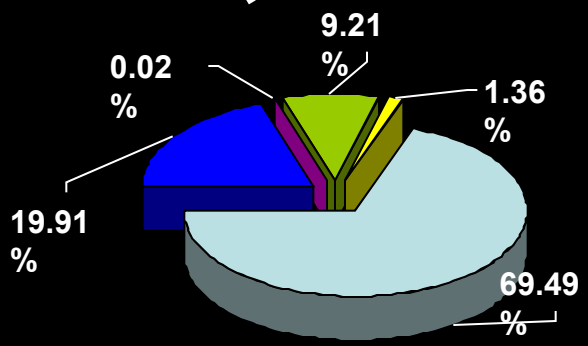
Location Information



With coordinate

Without Coordinate

Test Method



AAS

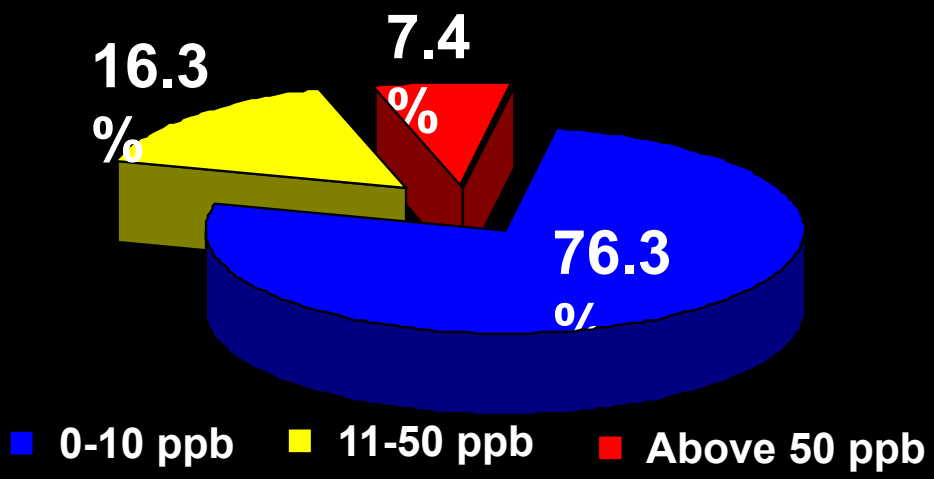
ENPHO

HACH

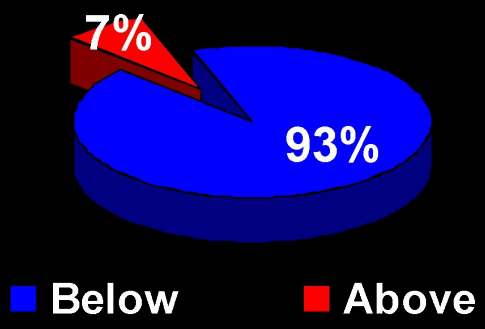
INDIAN

Unknown

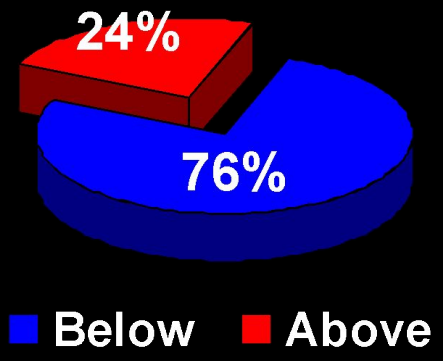
Classification of Arsenic Concentration



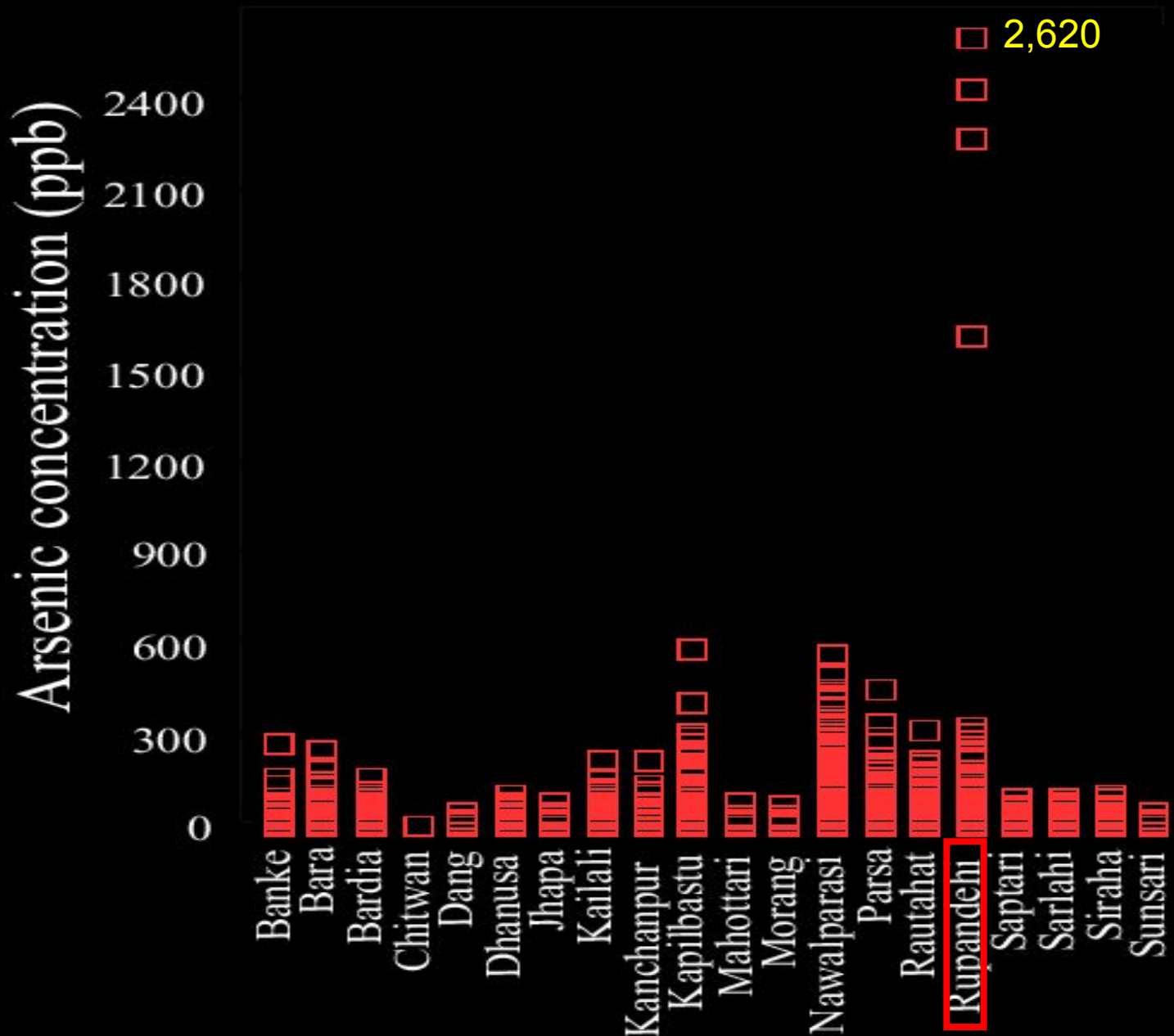
Nepal Interim Standard



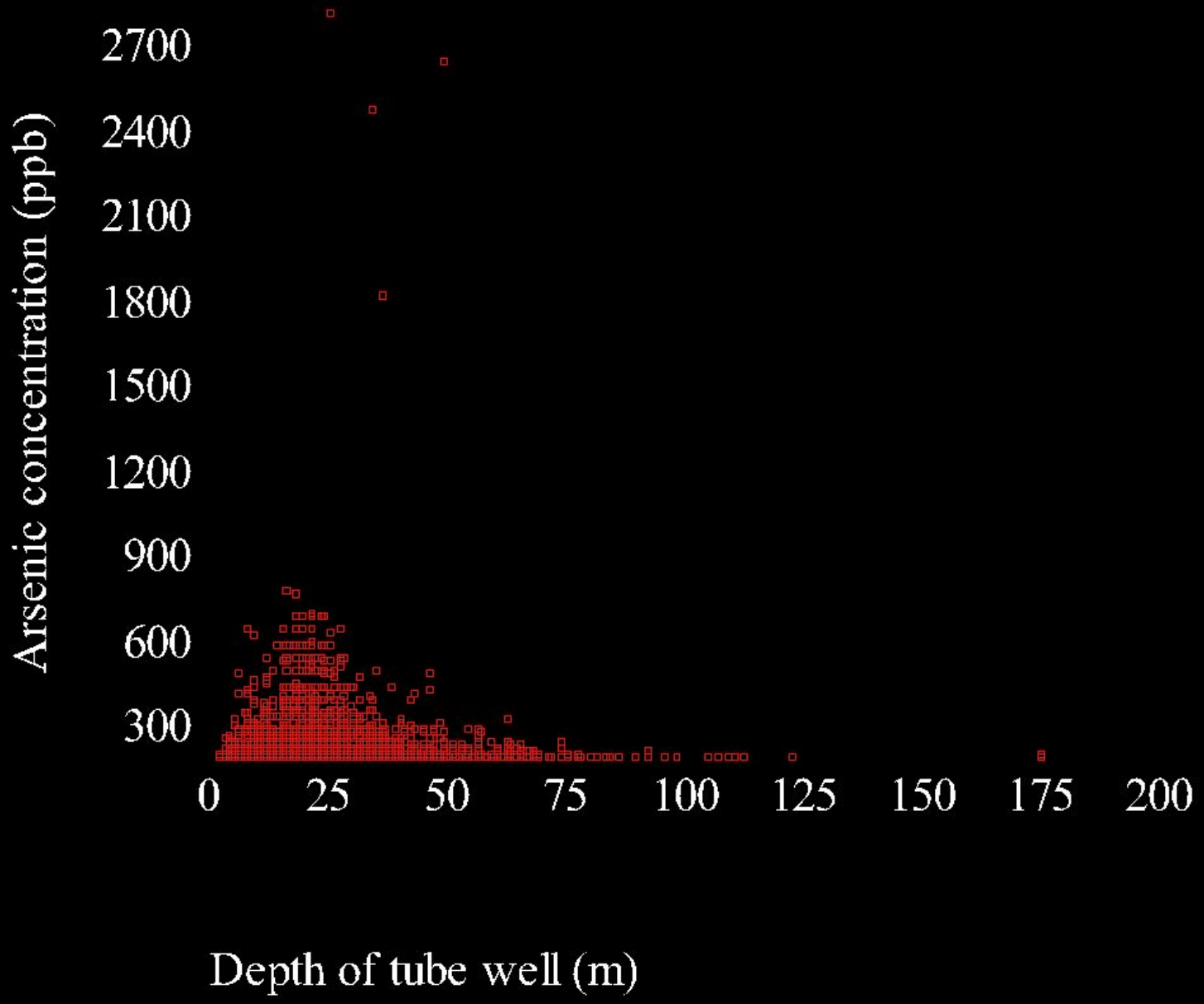
WHO Guideline



Distribution of Arsenic Concentration by District



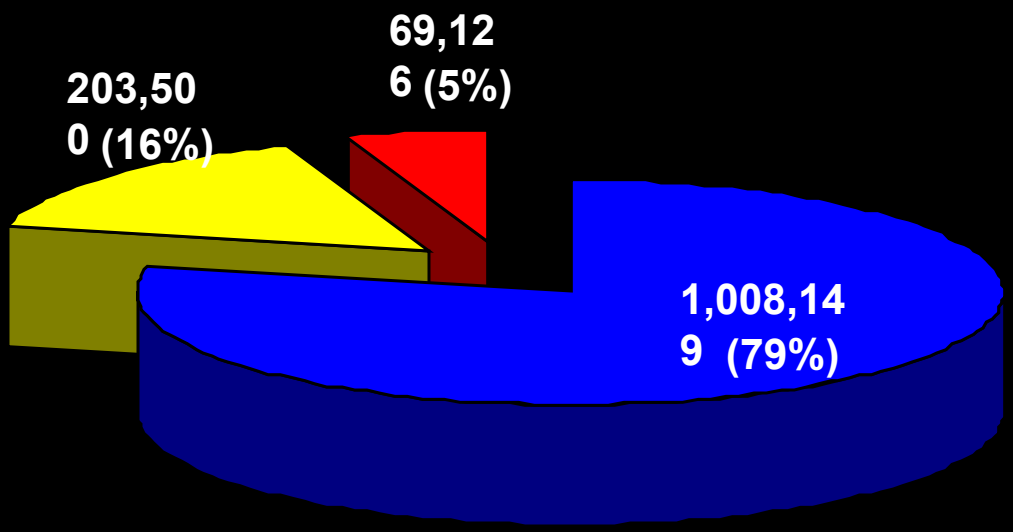
Arsenic Concentration and Depth of Tube Well



Arsenic Exposed Population

Total Population using Arsenic Tested Tube Wells is

1,280,775



Vulnerability to Arsenic

Arsenic vulnerability was defined based on the percentage of arsenic tested tube wells exceeding the WHO Guideline.

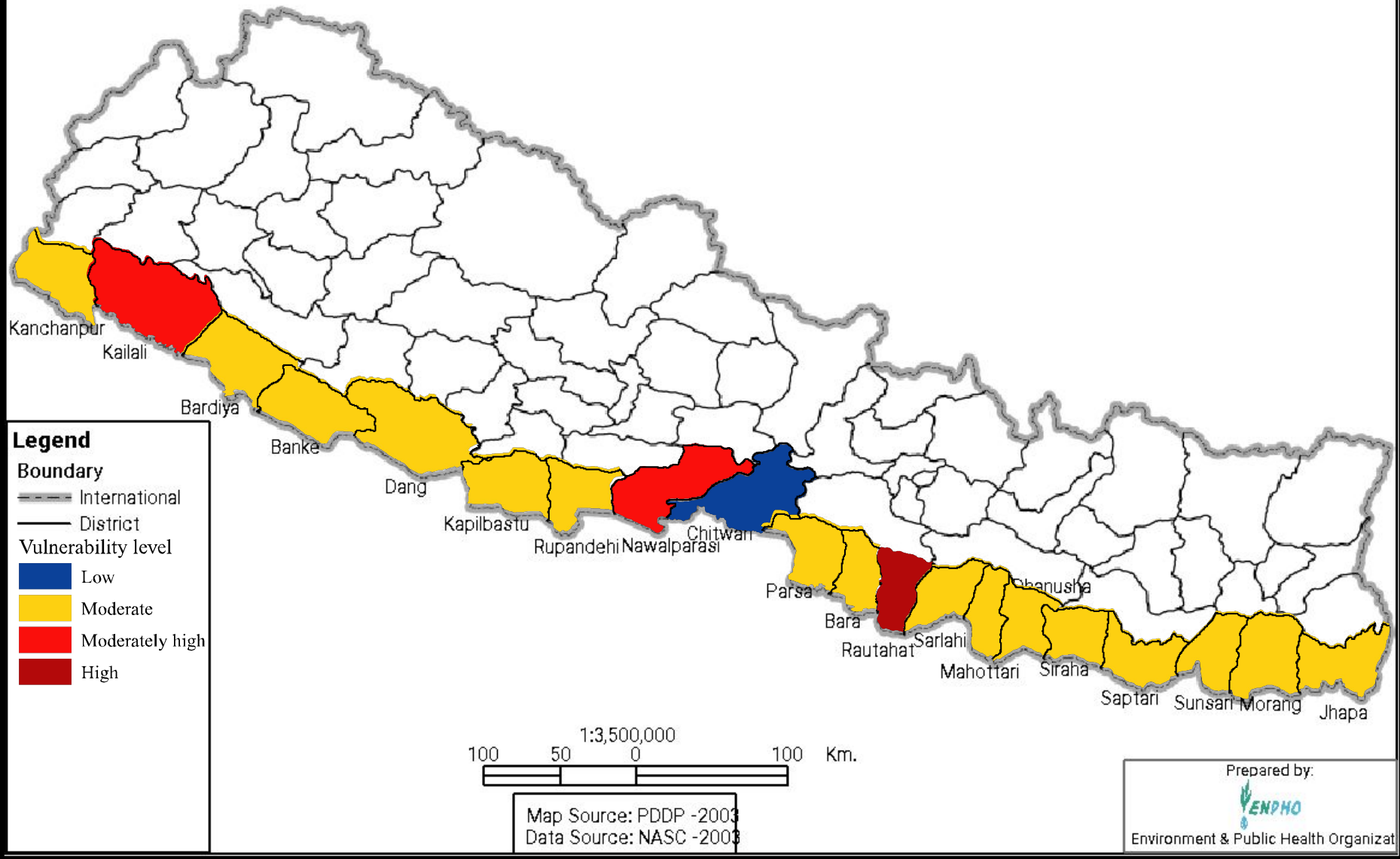
Low (0%)

Moderate (1-25%)

Moderately high (26-50%)

High (>50%)

Drinking Water Vulnerability to Arsenic - Terai

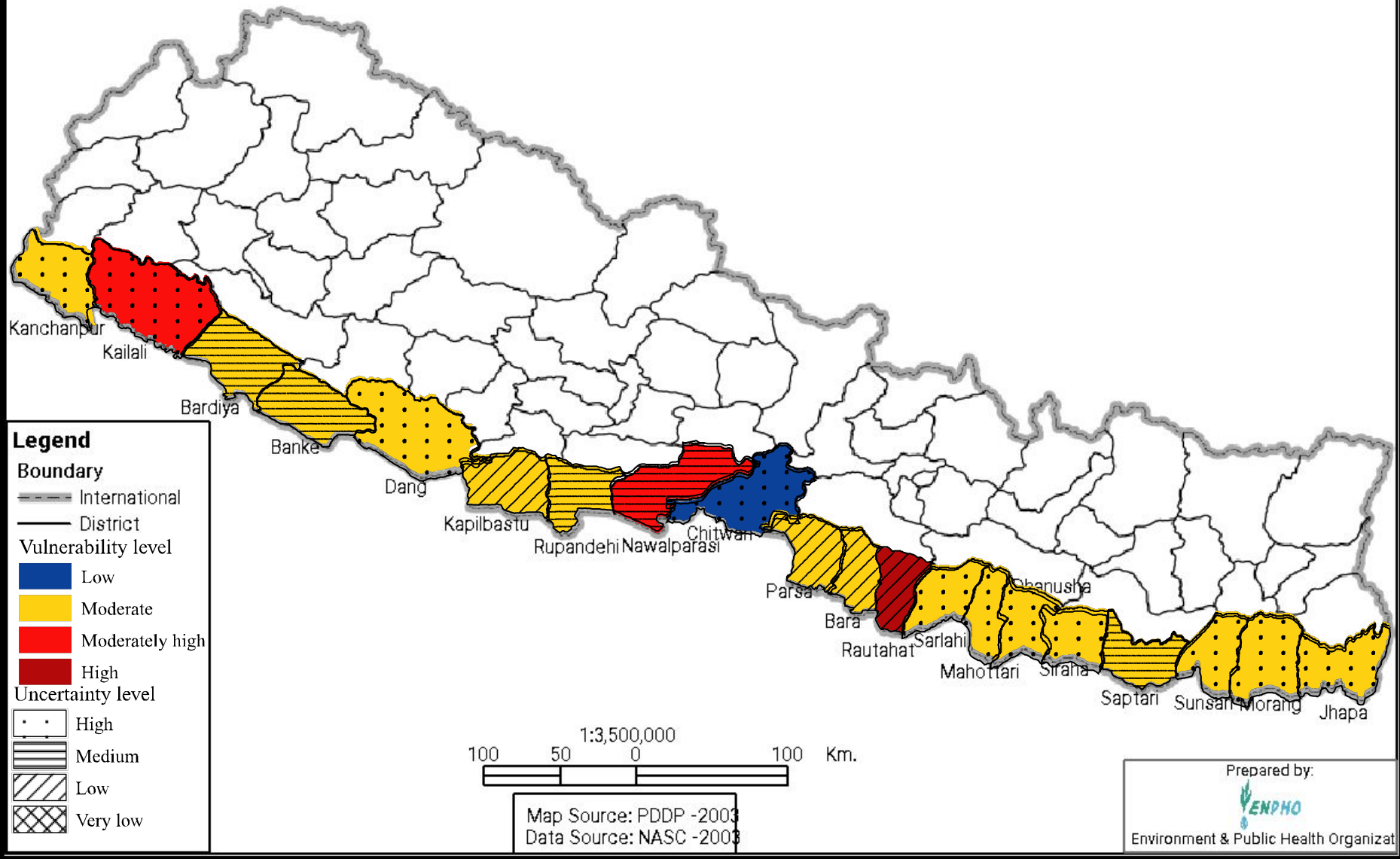


Level of uncertainty

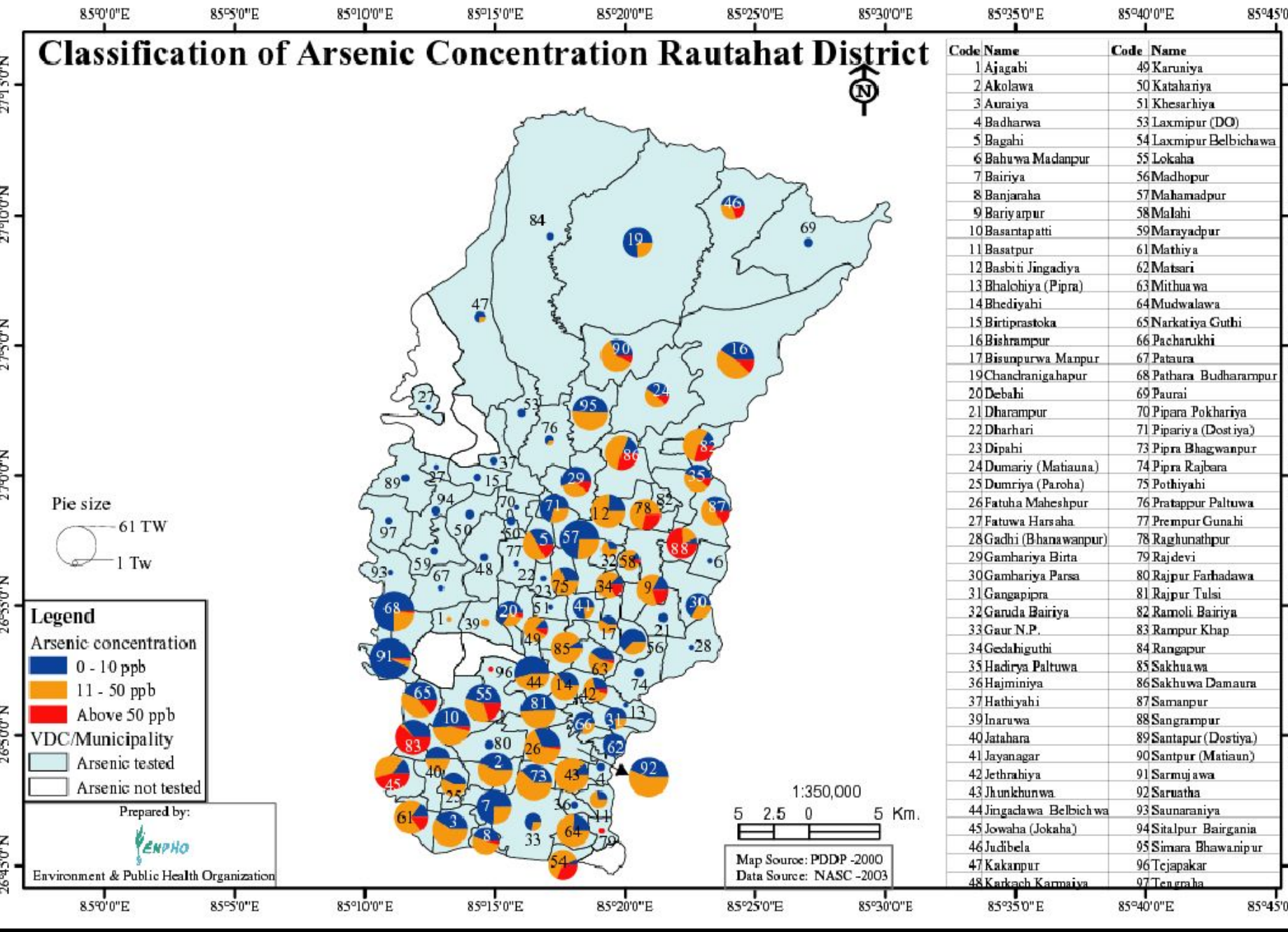
Level of uncertainty was defined based on proportion of household using arsenic tested tube wells to total households.

- High uncertainty <=5%
- Medium uncertainty 6-25%
- Low uncertainty 26-50%
- Very low uncertainty >50%

Drinking Water Vulnerability to Arsenic - Terai

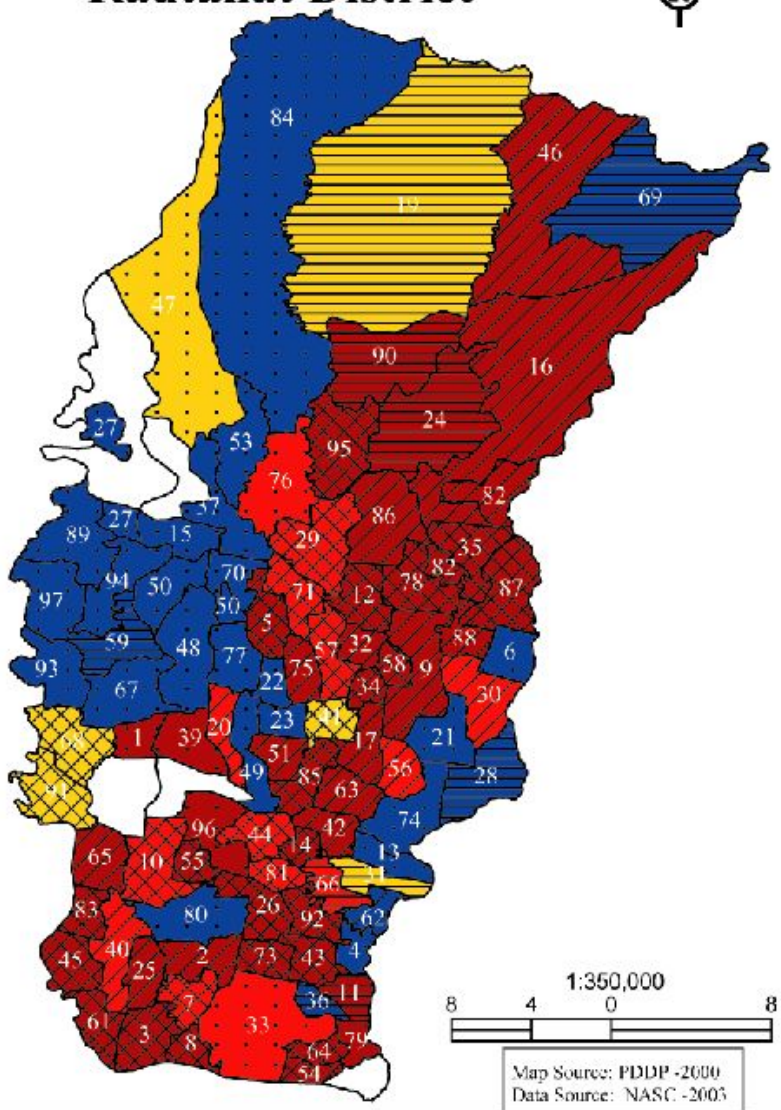


Classification of Arsenic Concentration Rautahat District



Code	Name	Code	Name
1	Ajagabi	49	Karuniya
2	Akolawa	50	Katahariya
3	Auraiya	51	Khesarhiya
4	Badharwa	53	Laxmipur (DO)
5	Bagahi	54	Laxmipur Belbichawa
6	Bahuwa Madanpur	55	Lokaha
7	Bairiya	56	Madhopur
8	Banjaraha	57	Mahamadpur
9	Bariyarpur	58	Malahi
10	Basantapatti	59	Marayadpur
11	Basatpur	61	Mathiya
12	Basbiti Jingadiya	62	Matsari
13	Bhalohiya (Pipra)	63	Mithuawa
14	Bhediyahi	64	Mudwalawa
15	Birtiprastoka	65	Narkatiya Guthi
16	Bishrampur	66	Pacharukhi
17	Bisunpurwa Manpur	67	Pataura
19	Chandranigahapur	68	Pathara Budharampur
20	Debahi	69	Paurai
21	Dharampur	70	Pipara Pokhariya
22	Dharhari	71	Pipariya (Dostiya)
23	Dipahi	73	Pipra Bhagwanpur
24	Dumariy (Matiauna)	74	Pipra Rajbara
25	Dumriya (Paroha)	75	Pothiyahi
26	Fatuha Maheshpur	76	Pratappur Paltuwa
27	Fatuwa Harsaha	77	Prempur Gunahi
28	Gadhi (Bhanawanpur)	78	Raghunathpur
29	Gambhariya Birta	79	Rajdevi
30	Gambhariya Parsa	80	Rajpur Farhadawa
31	Gangapipra	81	Rajpur Tulsi
32	Garuda Bairiya	82	Ramoli Bairiya
33	Gaur N.P.	83	Rampur Khap
34	Gedahiguthi	84	Rangapur
35	Hadirya Paltuwa	85	Sakhuawa
36	Hajminiya	86	Sakhuwa Damaura
37	Hathiyahi	87	Samanpur
39	Inaruwa	88	Sangrampur
40	Jatahara	89	Santapur (Dostiya)
41	Jayanagar	90	Santpur (Matiaun)
42	Jethrahiya	91	Sarmujawa
43	Jhunkhunwa	92	Saruatha
44	Jingadawa Belbichwa	93	Saunaraniya
45	Jowaha (Jokaha)	94	Sitalpur Bairgania
46	Judibela	95	Simara Bhawanipur
47	Kakanpur	96	Tejapakar
48	Karkach Karmaiya	97	Tengraha

Drinking Water Vulnerability to Arsenic
Rautahat District



Legend

Vulnerability level
- Low
- Moderate
- Moderately high
- High

Uncertainty level
- High
- Medium
- Low
- Very low

Prepared by:
ENPHO
Environment & Public Health Organization

1:350,000
8 4 0 8 Km.

Map Source: PDDP -2000
Data Source: NASC -2003

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9	Baniyarpur	58	Mulahi
10	Basantapatti	59	Narayadpur
11	Basatpur	61	Nathiya
12	Bashiti Jingadiya	62	Natsari
13	Bhalohiya (Pipra)	63	Nithuawa
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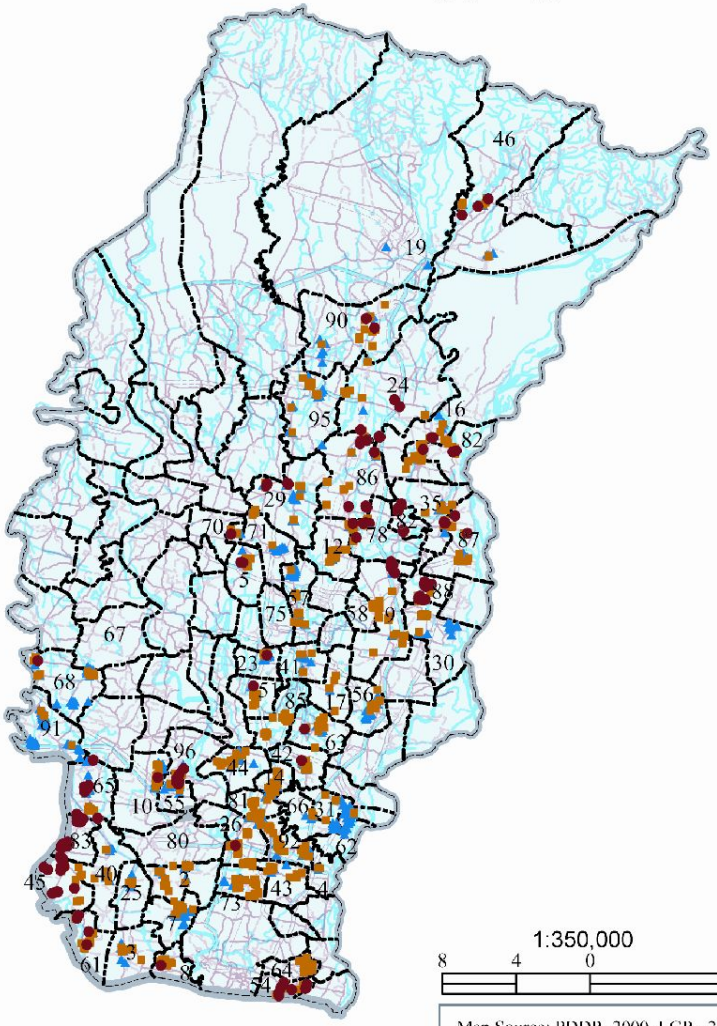
Arsenic Concentration Mapping - Rautahat District



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10 Hotspots VDC / Municipalities

Ramgram Municipality		(445)	Nawalparasi
Manari	VDC	(69)	Nawalparasi
Swathi	VDC	(68)	Nawalparasi
Tilakpur	VDC	(62)	Nawalparasi
Sunwal	VDC	(46)	Nawalparasi
Mahendrakot	VDC	(38)	Kapilbastu
Jahada	VDC	(31)	Nawalparasi
Rampur Khap	VDC	(28)	Rautahat
Devadaha	VDC	(28)	Rupandehi
Sangrampur	VDC	(26)	Rautahat

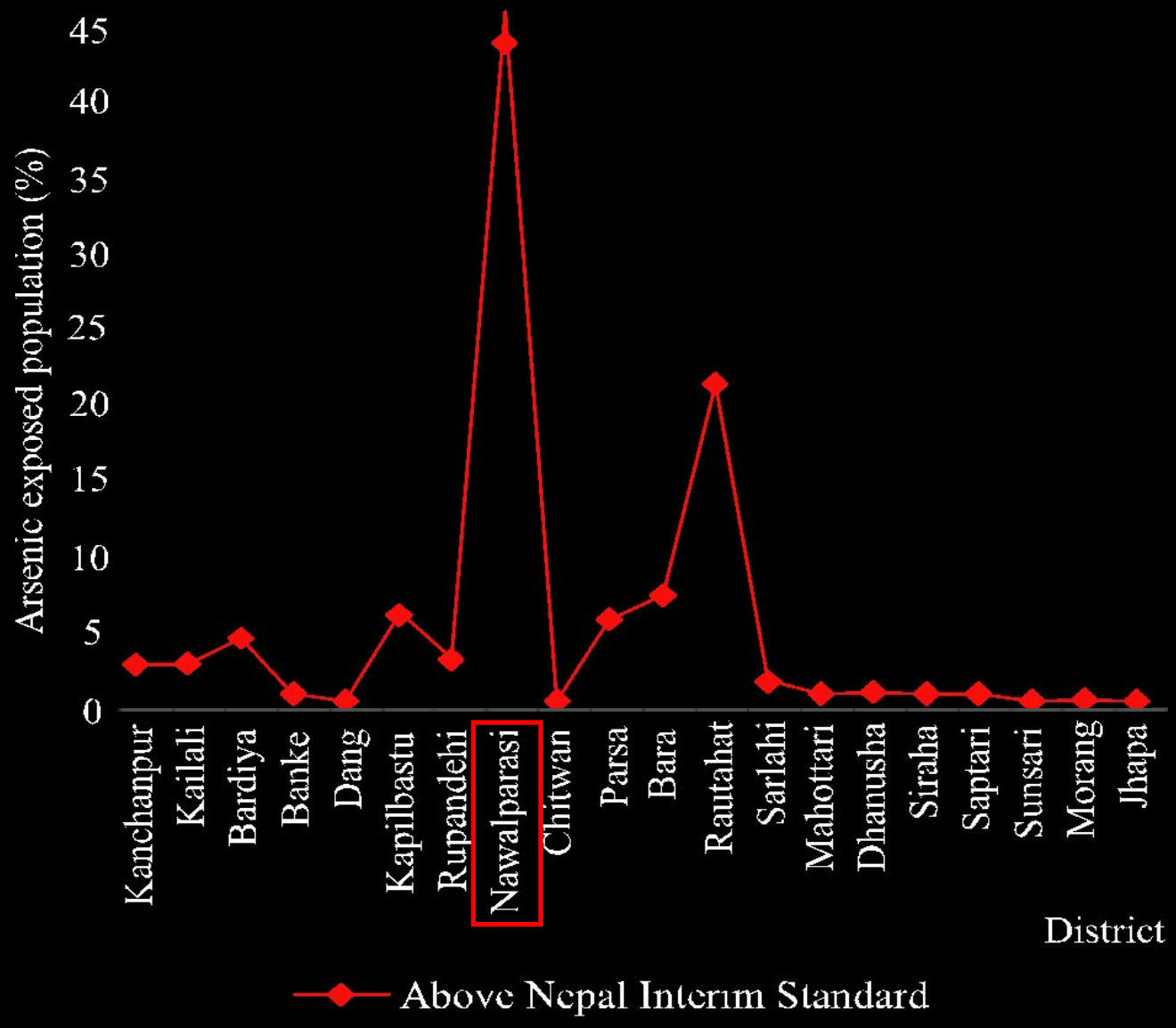
Recommendation

- Standardization of data format
- Data management in organization level
- Collection and error correction of location data
- Determining confidence level of arsenic field kits
- Regular monitoring of wells with arsenic concentration between 11 – 50 ppb
- Establishment of a center for integrated database of arsenic tested wells

Recommendation Contd……..

- Strengthening district level arsenic steering committees
- Use of the database in developing arsenic mitigation strategy
- Testing of arsenic in additional tube wells
- Evaluation of arsenic hotspots and anomalous data
- Data analysis of arsenic concentration at local level
- Incorporation of basic health related data in the national arsenic database

Thank You


Arsenic exposed population (%)
45
40
35
30
25
20
15
10
5
0
Kanchanpur
Kailali
Bardiya
Banke
Dang
Kapilbastu
Rupandehi
Nawalparasi
Chitwan
Parsa
Bara
Rautahat
Sarlahi
Mahottari
Dhanusha
Siraha
Saptari
Sunsari
Morang
Jhapa
District
Above Nepal Interim Standard

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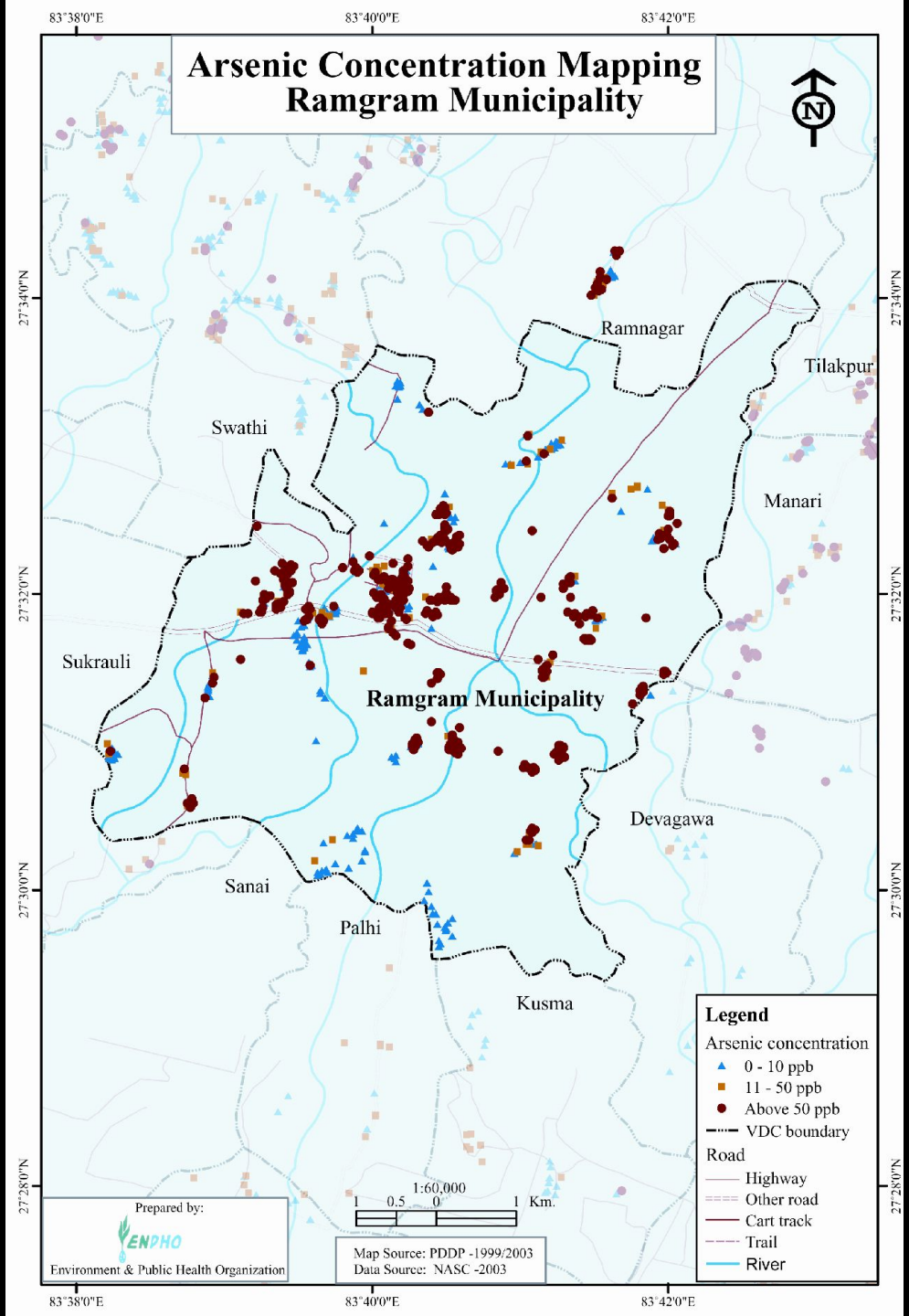
Arsenic Concentration Mapping
Ramgram Municipality
N
83°38'0"E
83°40'0"E
83°42'0"E
27°34'0"N
27°32'0"N
27°30'0"N
27°28'0"N
Ramnagar
Tilakpur
Swathi
Manari
Sukrauli
Ramgram Municipality
Devagawa
Sanai
Palhi
Kusma
Legend
Arsenic concentration
0 - 10 ppb
11 - 50 ppb
Above 50 ppb
VDC boundary
Road
Highway
Other road
Cart track
Trail
River
1:60,000
1 0.5 0 1 Km.
Prepared by:
ENPHO
Environment & Public Health Organization
Map Source: PDDP -1999/2003
Data Source: NASC -2003

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