

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 and developing ground water resources for agriculture are significant *challenges*.

Arsenic in Groundwater is one of the challenging issues.

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 data with positions of wells tested and use GIS to plot data in the map.
- Identify the source of the arsenic upstream from the Terai. Collect, identify, and chemically analyze potential arsenic source rocks and sediments.
- A detailed geochemical and hydrological characterization of the contaminated aquifers is necessary to understand why the aquifers are contaminated in some areas, but not in others.
- Water level monitoring of paired shallow and deep wells in the Terai to characterize where shallow and deeper aquifers are confined or connected.

Create an integrated database with the existing arsenic test data and other collected data. Obtain accurate positions of all wells tested, past and future, with Global Positioning System (GPS) units. Use Geographic Information System (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.

Core Team

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Objectives

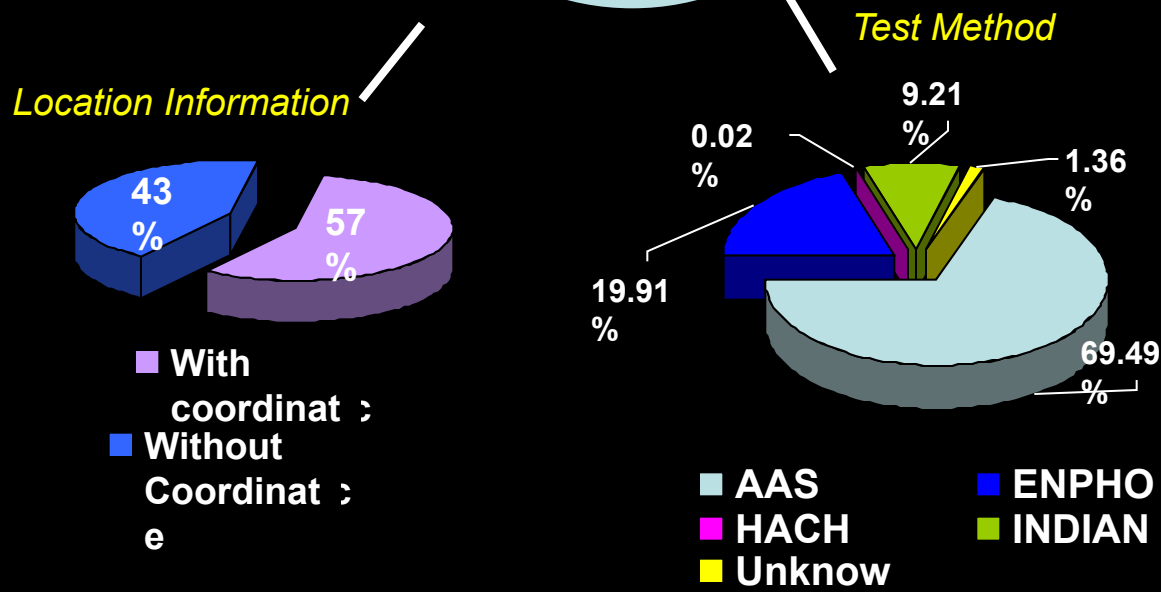
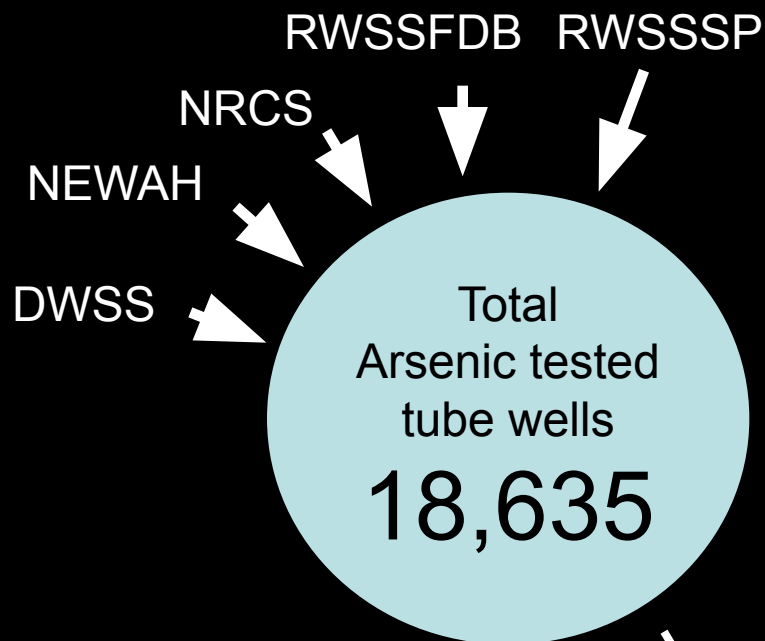
1. Compile all available analyses of water tested for arsenic in the Terai region.
2. Edit the data entries
3. Check location information for each entry
4. Add GPS location information where feasible

4. Add GPS location information where feasible
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.

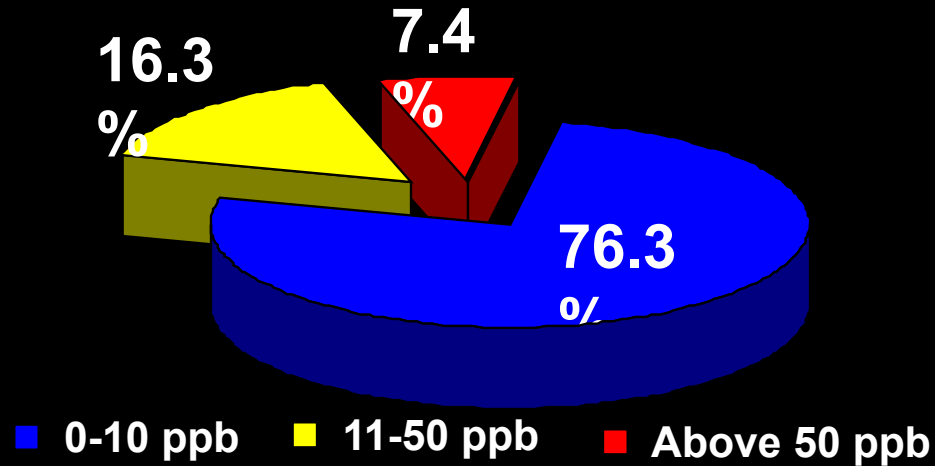
Output of the Project

- 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

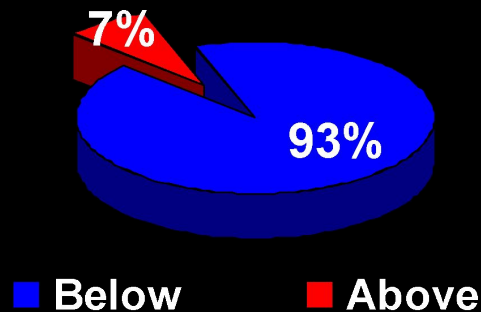
Well ID
Location information
Geographic coordinate
Depth of well
Age of well
Users information
Arsenic concentration
Test method
Microbiological result
Data Source



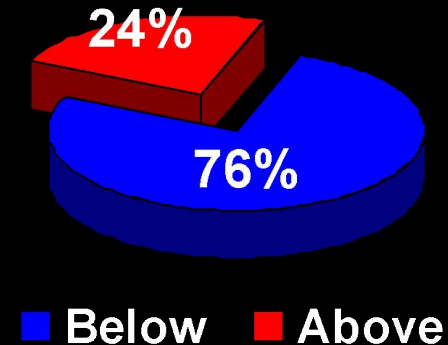
Classification of Arsenic Concentration



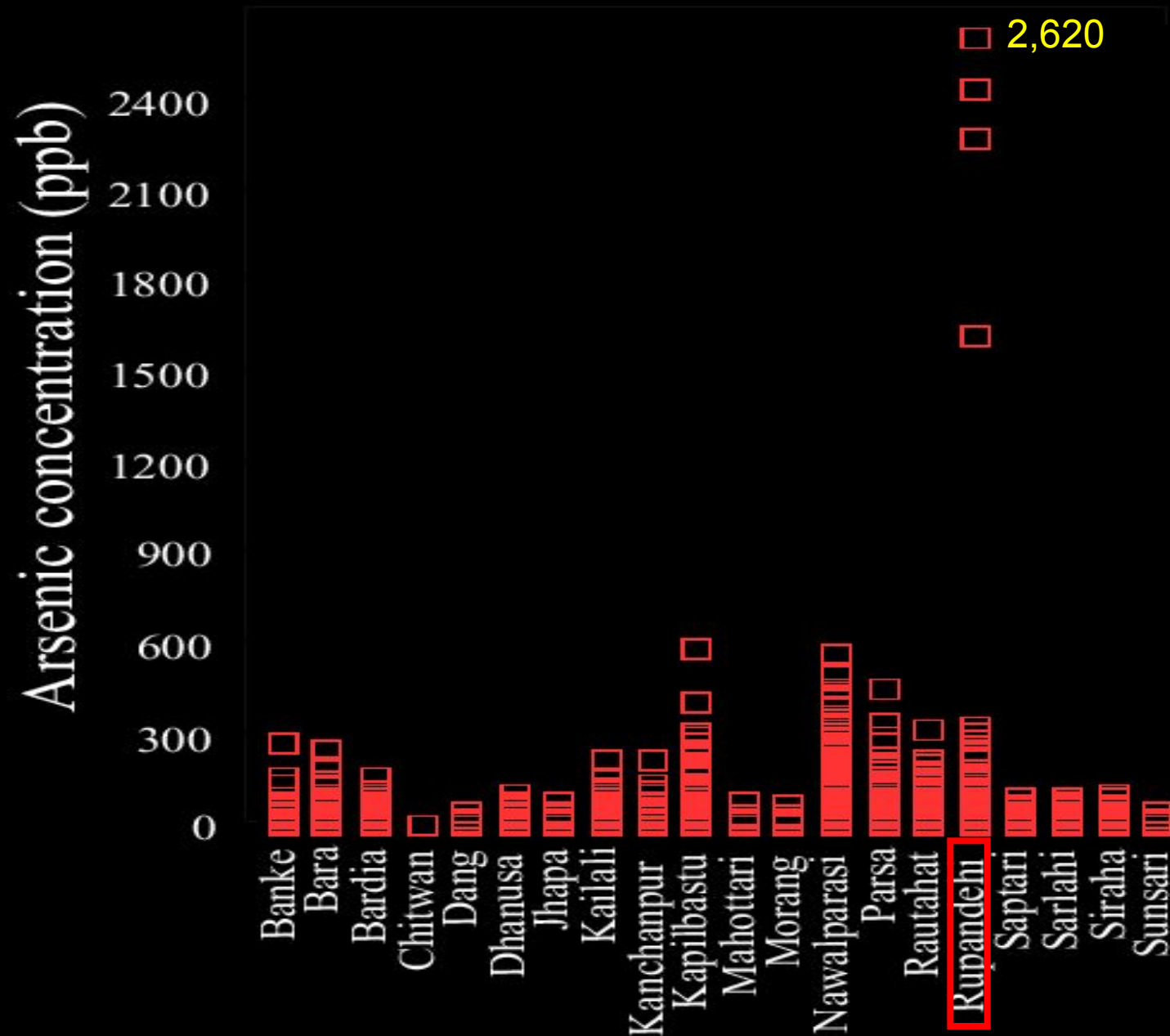
Nepal Interim Standard



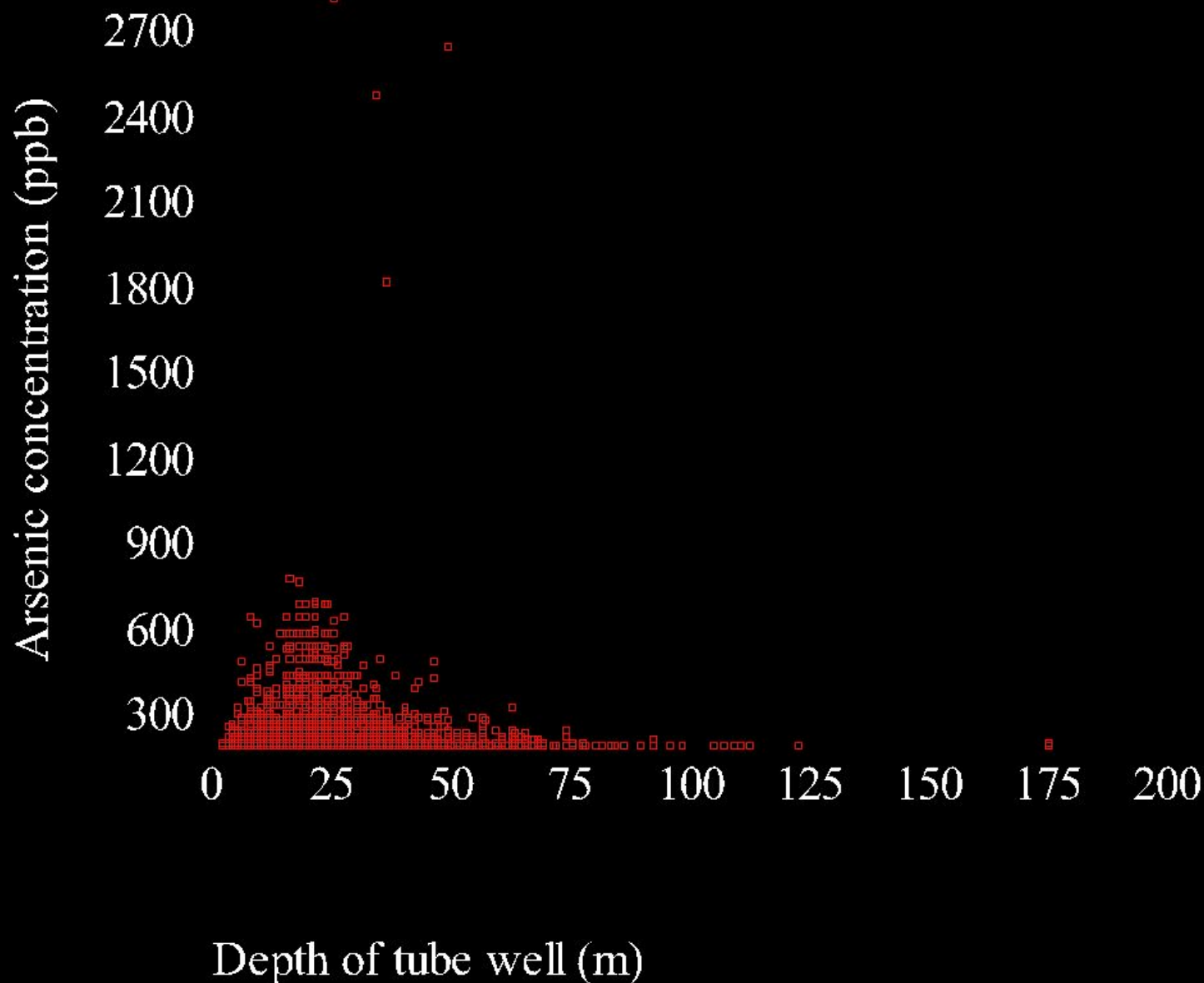
WHO Guideline



Distribution of Arsenic Concentration by District



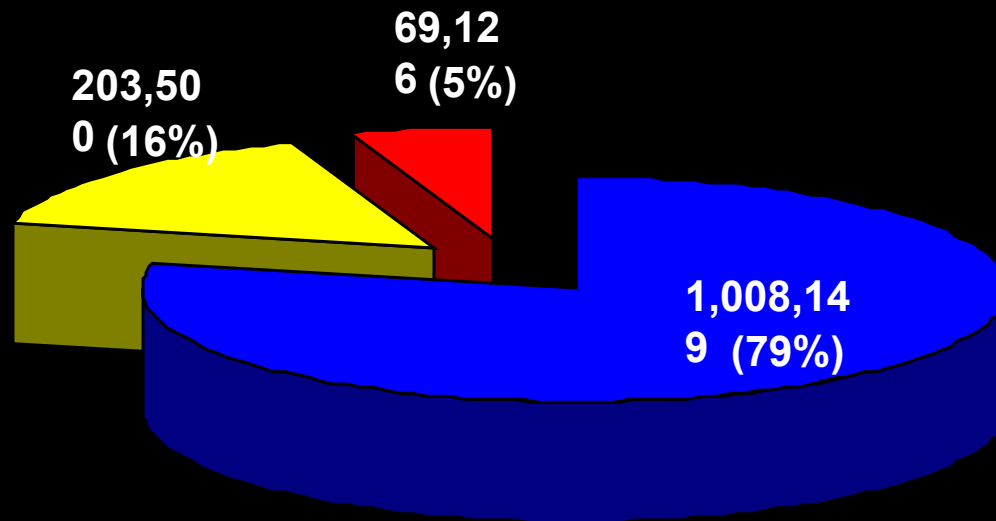
Arsenic Concentration and Depth of Tube Well



Arsenic Exposed Population

Total Population using Arsenic Tested Tube Wells is

1,280,775



■ 0-10 ppb ■ 11-50 ppb ■ Above 50 ppb

Vulnerability to Arsenic

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

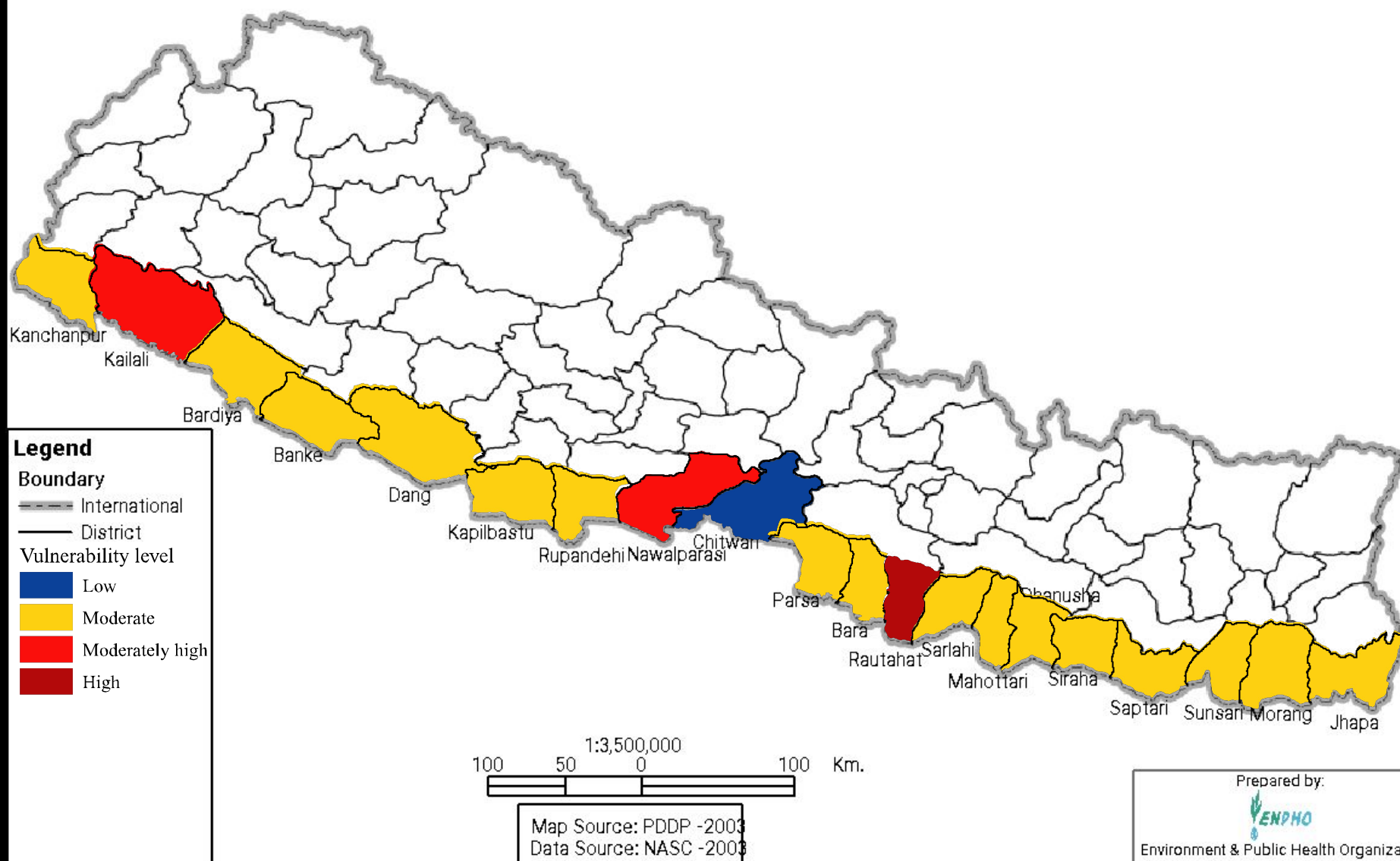
Low (0%)

Moderate (1-25%)

Moderately high (26-50%)

High (>50%)

Drinking Water Vulnerability to Arsenic - Terai

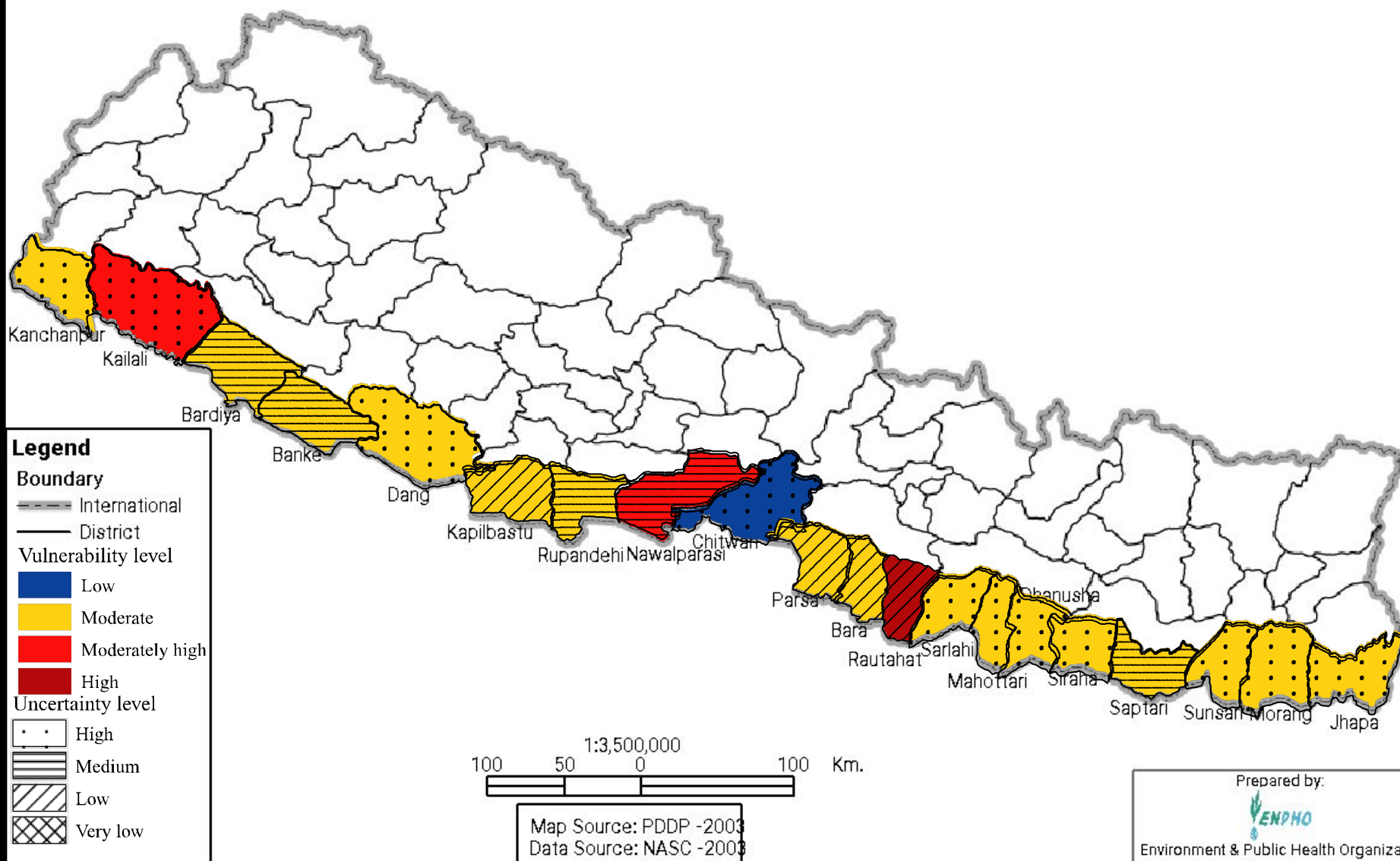


Level of uncertainty

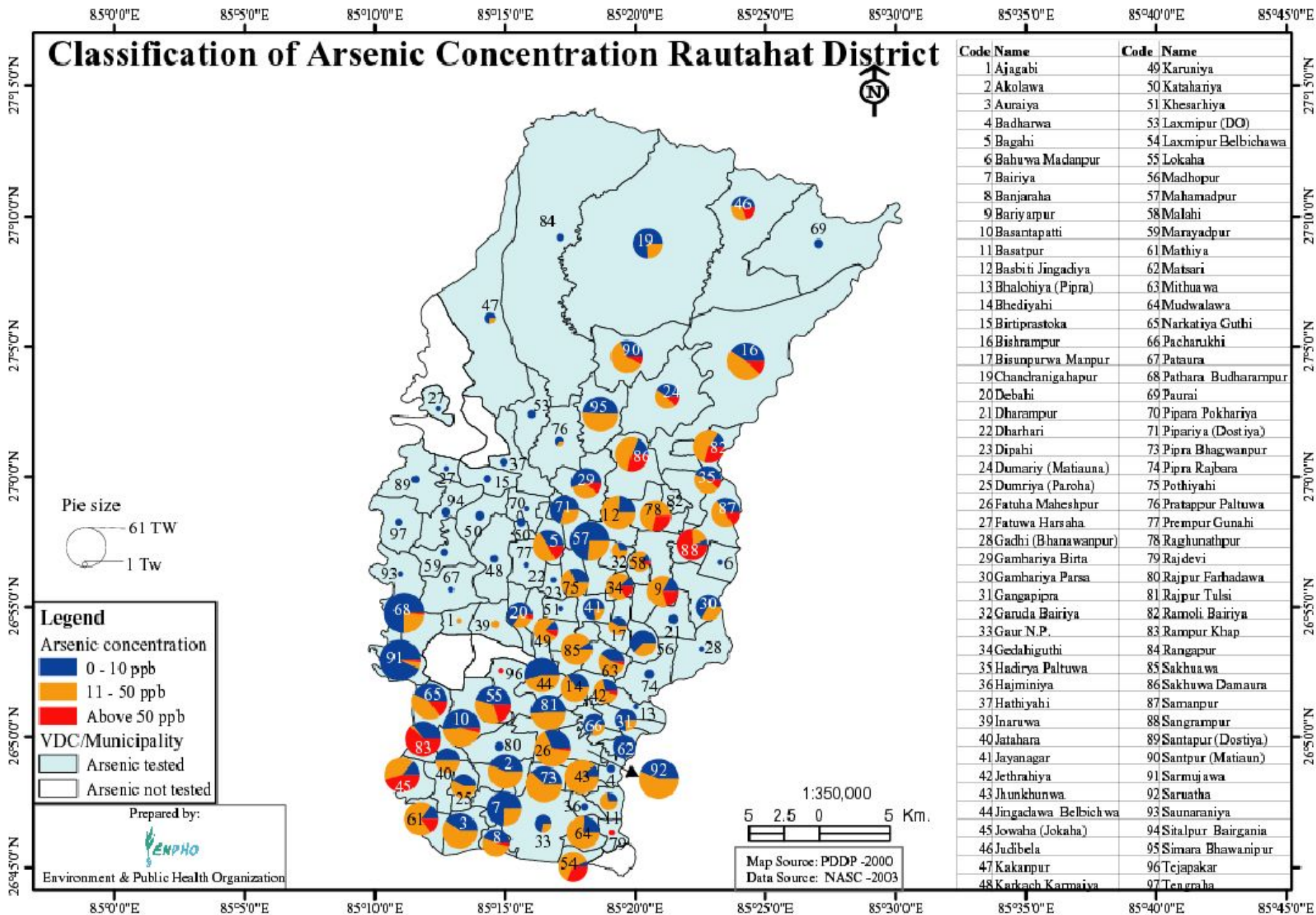
Level of uncertainty was defined based on proportion of household using arsenic tested tube wells to total households.

- High uncertainty $\leq 5\%$
- Medium uncertainty 6-25%
- Low uncertainty 26-50%
- Very low uncertainty $> 50\%$

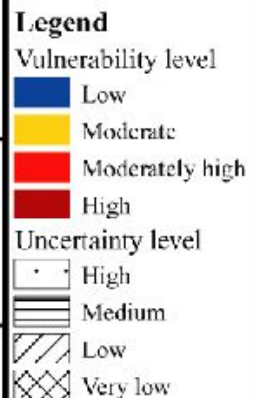
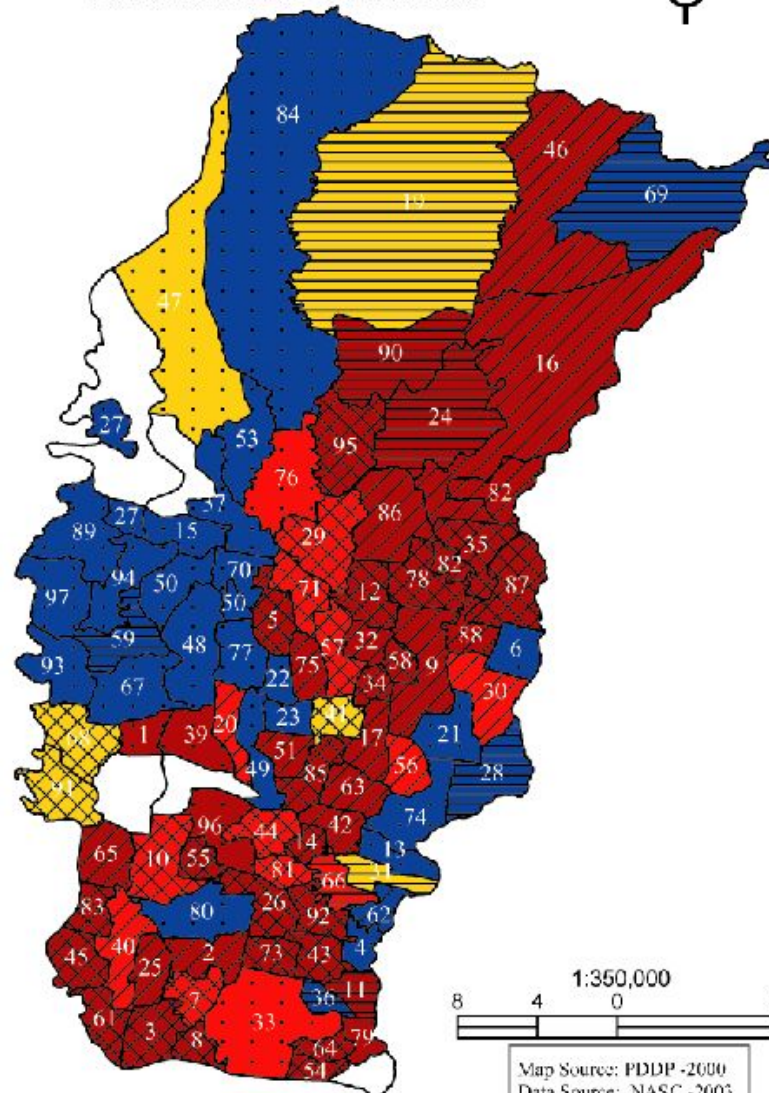
Drinking Water Vulnerability to Arsenic - Terai



Classification of Arsenic Concentration Rautahat District



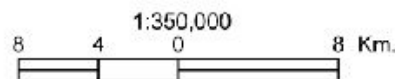
Drinking Water Vulnerability to Arsenic Rautahat District



Prepared by:

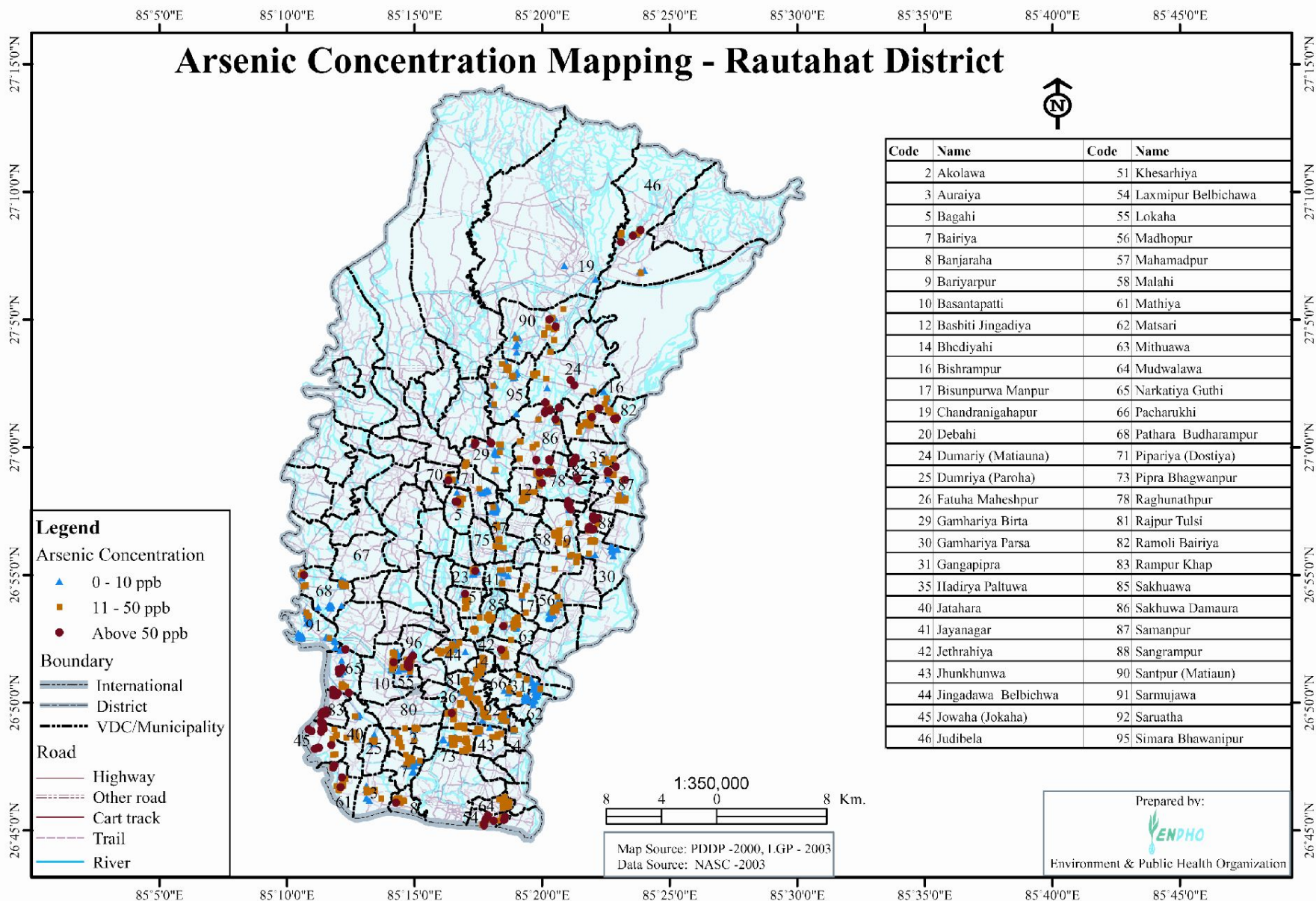


Environment & Public Health Organization



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

Code	Name	Code	Name
1	Ajagabi	49	Karuniya
2	Akolawa	50	Katahuniya
3	Auruniya	51	Khesariya
4	Badharwa	53	Laxmipur (DO)
5	Bagahi	54	Laxmipur Belbichwa
6	Dahuwa Madanpur	55	Lukaha
7	Bairiya	56	Madhopur
8	Banjaraha	57	Mahanadpur
9	Bunyarpur	58	Mulahi
10	Basantapati	59	Marayadpur
11	Basatpur	61	Machiya
12	Bashiti Jigadiya	62	Masari
13	Bhalchiya (Pipa)	63	Mithuwa
14	Bhediya	64	Mudwalawa
15	Biriprastola	65	Nakatiya Guthi
16	Bishrampur	66	Pacharukhi
17	Bisunpurwa Manpur	67	Putara
18	Chandranigahapur	68	Pathara Budharampur
20	Debahi	69	Paurai
21	Dharampur	70	Pipara Pokhariya
22	Dharhari	71	Pipariya (Dostiya)
23	Dipali	73	Pipra Bhagwanpur
24	Dumariya (Matiauna)	74	Pipra Rajbara
25	Dumriya (Paraha)	75	Portayahi
26	Fatua Maheshpur	76	Pratap Paltuwa
27	Fatua Harsaha	77	Prempur Gunahi
28	Gadhi (Bhanawanpur)	78	Raghunathpur
29	Gandhariya Birta	79	Rajdevi
30	Gandhariya Parsa	80	Rajpur Pachadawa
31	Gangupura	81	Rajpur Tulsi
32	Garuda Bairiya	82	Ramoli Bairiya
33	Gaur N.P.	83	Rampur Khap
34	Gedahiguthi	84	Rangapur
35	Hadiya Paltuwa	85	Sakhuwa
36	Hajiriniya	86	Sakhuwa Damaura
37	Hathiyahi	87	Samanpur
38	Inaruwa	88	Sangrampur
40	Jatahara	89	Santapur (Dostiya)
41	Jayanagar	90	Santapur (Matiaun)
42	Jethahiya	91	Sarmajawa
43	Thunkhunwa	92	Saruatha
44	Jingadawa Belbichwa	93	Sauaruniya
45	Jowaha (Jokaha)	94	Sitalpur Baigania
46	Judibela	95	Simara Bhawanipur
47	Kakanpur	96	Tajapakar
48	Karkach Karnaia	97	Tanoraha



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

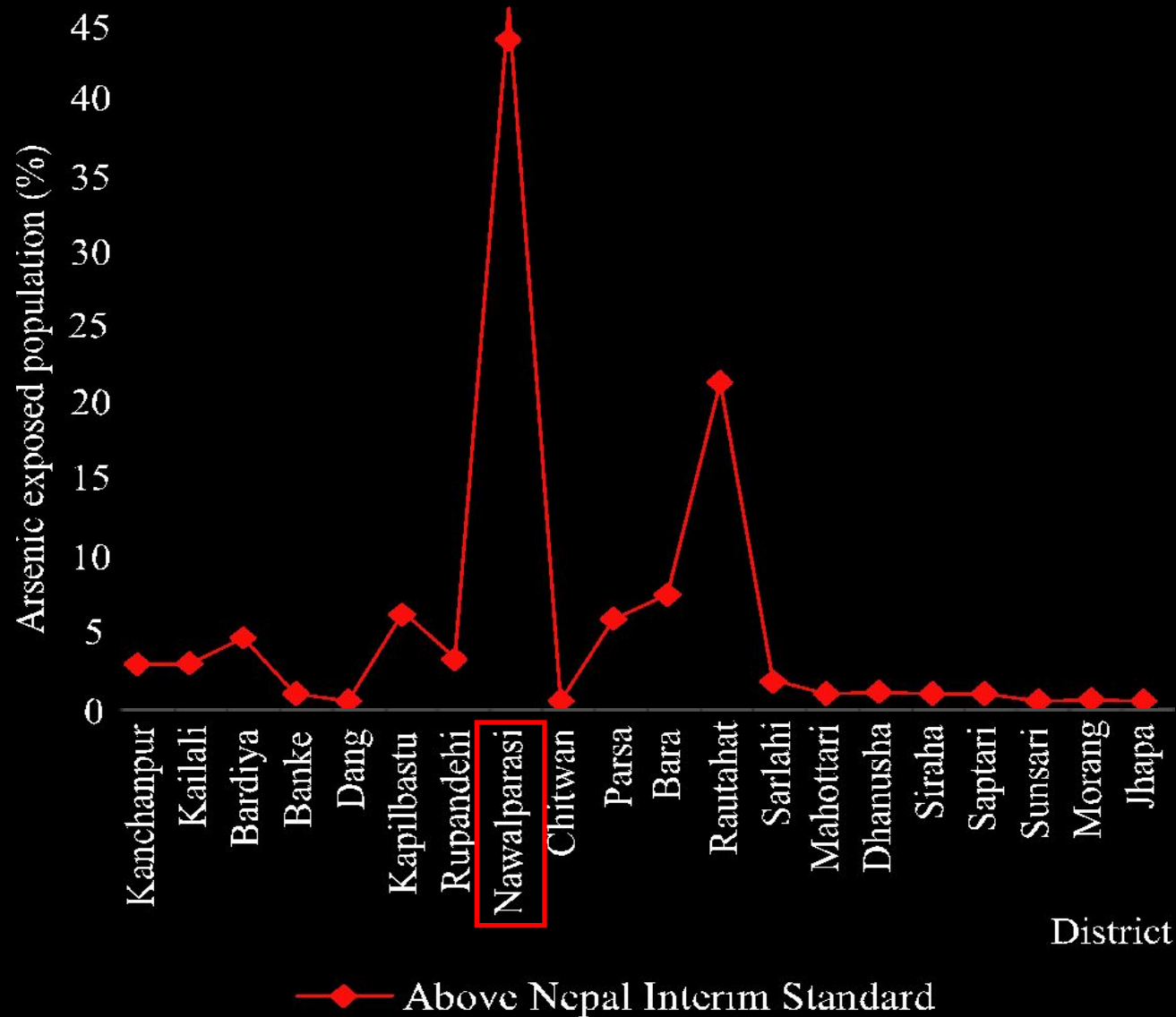
Sangrampur VDC (26) Rautahat

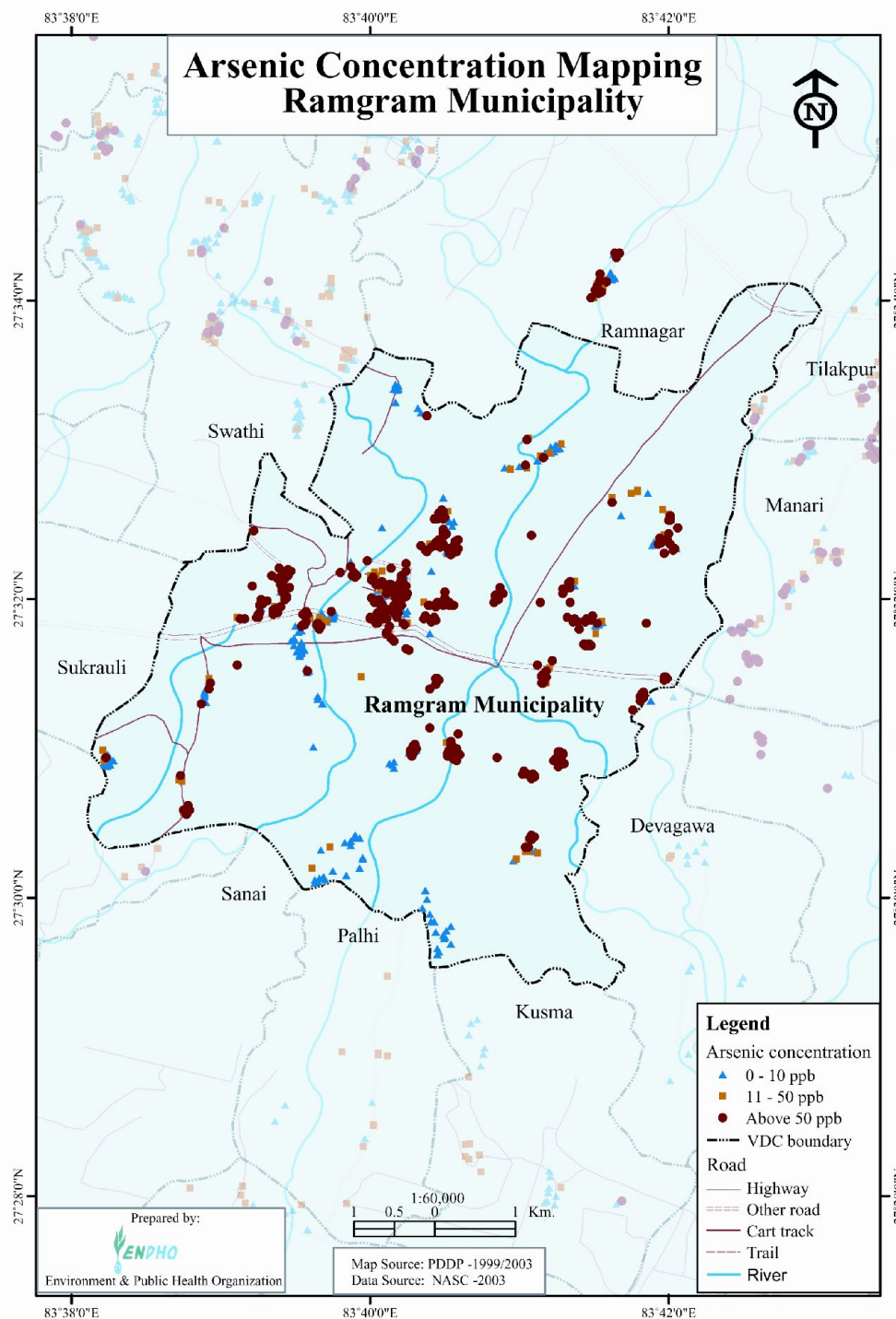
Recommendation

- 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

- 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





Drinking Water Vulnerability to Arsenic - Terai

