

Arsenic Mitigation and Sustainable Behavior Change in Cambodia

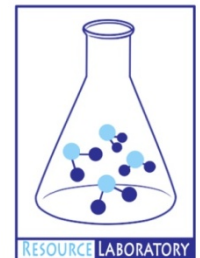
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www.rdic.org

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Summary

- Resource Development International
- Approach to Arsenic Mitigation
 - Arsenic population impact assessment
 - Door-to-door surveying and education
 - Community assessment
 - Arsenic-safe water source interventions
- Arsenic mitigation research
 - Alternative arsenic-safe drinking water options
 - Assessing post-education behavior change
- Sustainable behavior change

Resource Development International (RDI)

- Non-profit NGO established in 2000
- Active in Cambodian water and sanitation sector
- Partner with MRD, UNICEF, WHO, others on arsenic issue
- Departments:
 - Community development
 - Arsenic education and mitigation
 - Educational media studio
 - Laboratory and research
 - Arsenic research and lab testing
 - Household ceramic water filter factory

Approach to Arsenic Mitigation



Step I - Approach to Arsenic Mitigation



Arsenic Pop. Impact Assessment

- How many people exposed to GW arsenic?
- Nation-wide village-level data from 2008 National Census (NIS)
- National Well Database (WellMap), over 40,000 As well tests –
www.cambodiawellmap.com
- Data utilized:
 - % wells in village with Arsenic \geq 50ppb
 - # households in village consuming tube well water
 - Average household size

Example Calculation

- Stueng village, Samroang Thum commune, Kien Svay district, Kandal Province
- 43 As well tests $\rightarrow 95\% \geq 50\text{ppb}$
- 162 of 562 households drinking tube well water in March 2008
- Average 4.7 people per household in village

$$0.95 \times 162 \times 4.7 = 723 \text{ people}$$

Province	Arsenic Tests	Total Population (>50ppb)	Total Population (>250ppb)
Kampong Cham	7,739	19,355	4,221
Kampong Chhnang	1,083	2,531	38
Kampong Thom	1,908	1,410	15
Kandal	17,663	56,177	26,986
Kracheh	804	774	61
Phnom Penh	452	1,030	111
Prey Veng	10,061	33,325	4,880
Total	39,710	114,603	36,312

Sources of Error

- Drinking water source changes since March 2008
 - New water source options available
 - More private wells drilled
- Only a few arsenic tests in some villages
 - Data from a few tests can impact estimations for an entire village

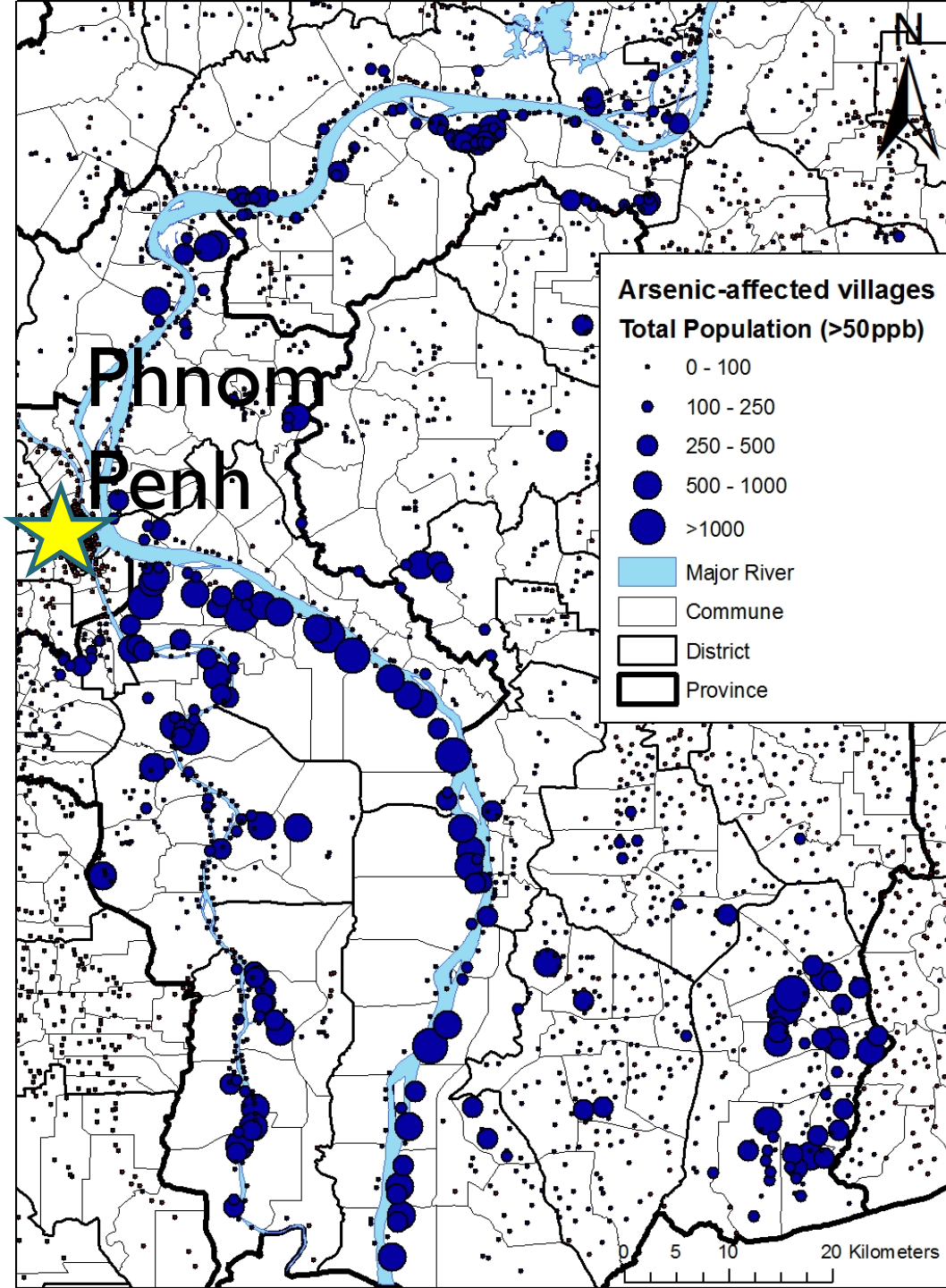
Summary

- Over 2 million living on arsenic contaminated groundwater aquifers
- Approximately 75,000 – 150,000 people consuming arsenic contaminated water in dry season
 - Increase in piped water systems
 - Historical arsenic education and awareness
 - Correlation with high iron and preference for other water sources
- Less exposure in rainy season

Step 2 - Approach to Arsenic Mitigation



Province	District	Commune	Commune pop'n	Population $\geq 50 \mu\text{g/L}$	Population $\geq 250 \mu\text{g/L}$
Kandal	Kien Svay	Samraong Thum	20,195	5,033	3,240
		Banteay Daek	14,593	4,798	2,640
		Dei Edth	16,840	4,339	3,034
		Preaek Aeng	15,791	3,615	2,240
		Kokir	18,058	2,714	2,308
Kandal	S'ang	Svay Prateal	14,531	3,467	1,412
Kandal	Kaoh Thum	Sampov Lun	20,994	2,982	1,472
		Kampong Kong	11,450	2,958	1,636
Prey Veng	Kampong Trabaek	Cham	11,179	2,782	0
		Pratheath	8,841	2,727	0



Step 3 - Approach to Arsenic Mitigation



Door-to-door Arsenic Surveying and Education

- Surveyors ask each household if they drink water from tube wells at any time of year
 - If they do...
 - Well testing
 - Safe or not safe?
 - Give household well testing result card
 - Arsenic education
 - Alternative water source education

Door-to-door Arsenic Surveying and Education

- Household questionnaire
 - Arsenic awareness,
 - Drinking water practices
 - Previous well testing
 - Willingness-to-pay
 - Arsenicosis screening
- Over 6,500 households surveyed since December 2009
 - RDI
 - PDRD-Kandal, PDRD-Prey Veng

Step 4 - Approach to Arsenic Mitigation



Promote Alternative Arsenic-safe Water Sources

- If available...
 - Clean “green” tube wells
 - Piped water supplies
 - Water vendor services
 - Increased rainwater storage
 - Dug wells
 - Surface water + HWTS
- Problems
 - Not always available
 - Financial limitations
 - Low willingness to pay

Step 5 - Approach to Arsenic Mitigation



Community Assessment

- Door-to-door household survey
 - Month-by-month drinking water practices
 - What alternatives are available in community?
 - Arsenic awareness
 - Previous well testing results
 - Willingness-to-pay for alternative water supply
 - Density of arsenic impacted households
- Meetings with local government
 - Willingness to improve situation

Step 6 - Approach to Arsenic Mitigation



Arsenic-safe Drinking Water Interventions

- If no alternatives available...
 - RDI
 - Microfinance rainwater harvesting tank program
 - Microfinance dug well program
 - GRET
 - Piped water supply systems
 - 1001 Fontaines
 - Surface water treatment and vendor systems
 - ITC/Lehigh Universities
 - Community-scale arsenic treatment and water vendor systems
 - Rainwater Cambodia
 - Subsidized rainwater tank program
 - UNICEF
 - Ceramic water filters for surface water
 - Rainwater harvesting systems at schools/households

Arsenic Mitigation Research

- World Bank WSP funded project
- Study on arsenic-safe water options
 - Small-scale piped water systems
 - Rainwater harvesting
 - Dug wells
 - Surface water + HWTS
 - Water vendors

Arsenic Mitigation Research

- Study themes
 - Advantages
 - Disadvantages
 - Cost analysis
 - Willingness-to-pay
 - Risk substitution
- Project timeframe June to November 2011

Arsenic Mitigation Research

- Follow-up assessment of Door-to-Door education program
 - Is behavior change occurring?
 - Why?
 - Why not?
 - Community factors that influence behavior change
 - Willingness to pay
 - Availability of alternative safe water options
 - Is the message remembered?

Sustainable Behavior Change

- Community participation in decision-making process
 - Ownership over the problem
- Community and door-to-door education
 - Increase awareness, increase willingness-to-pay
 - Message not lost over time
- User preferences
 - Rainwater, piped water, clean and treated water
- Subsidies to reach poorest of poor
- Simplicity in water options



Questions?