

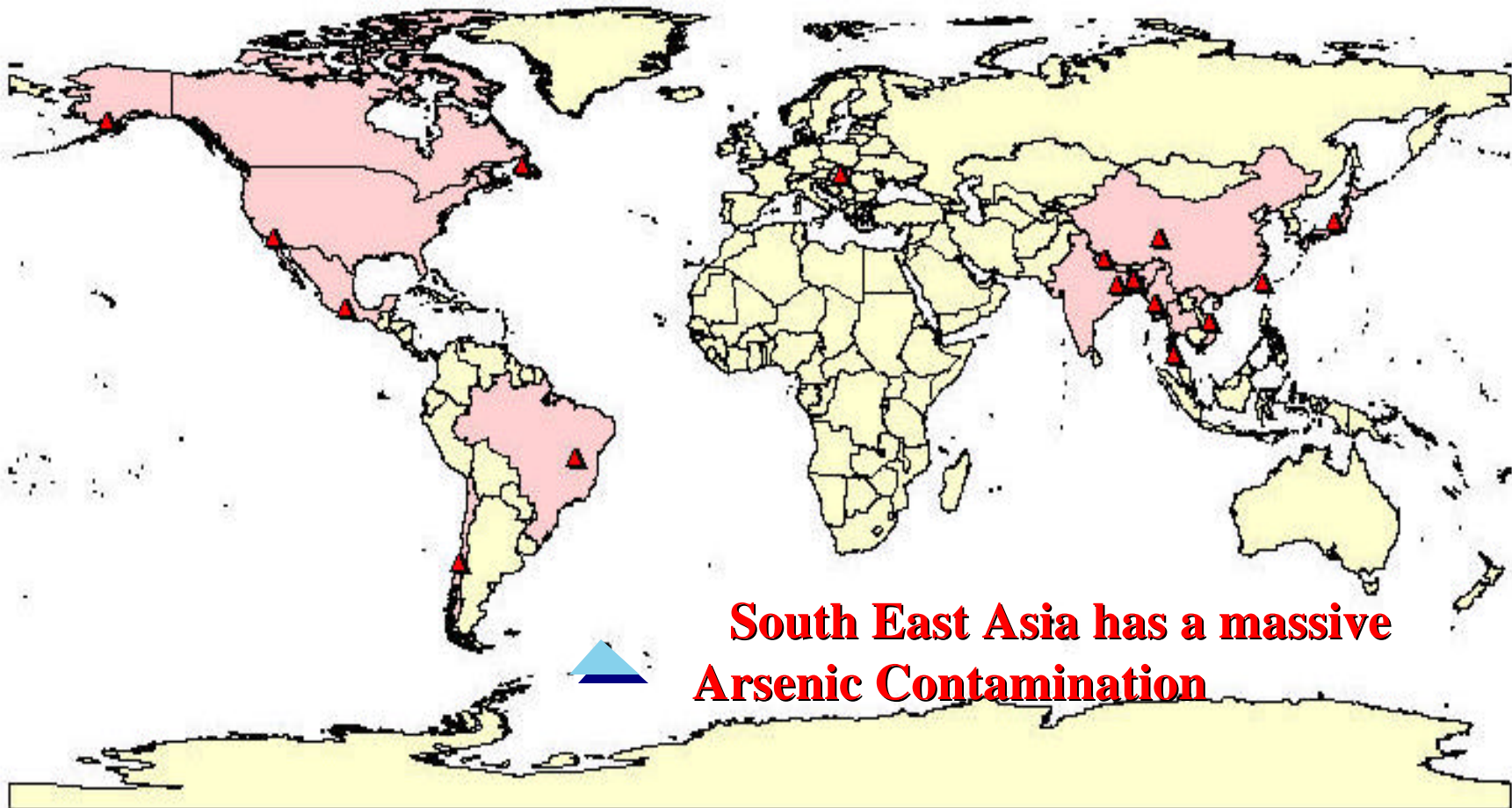
# IUPAC Project: Arsenic Contamination and Remediation in Bangladesh

Dr. John Malin  
Dr. Sut Ahuja

CHEMRAWN COMMITTEE  
Office of International Activities  
American Chemical Society

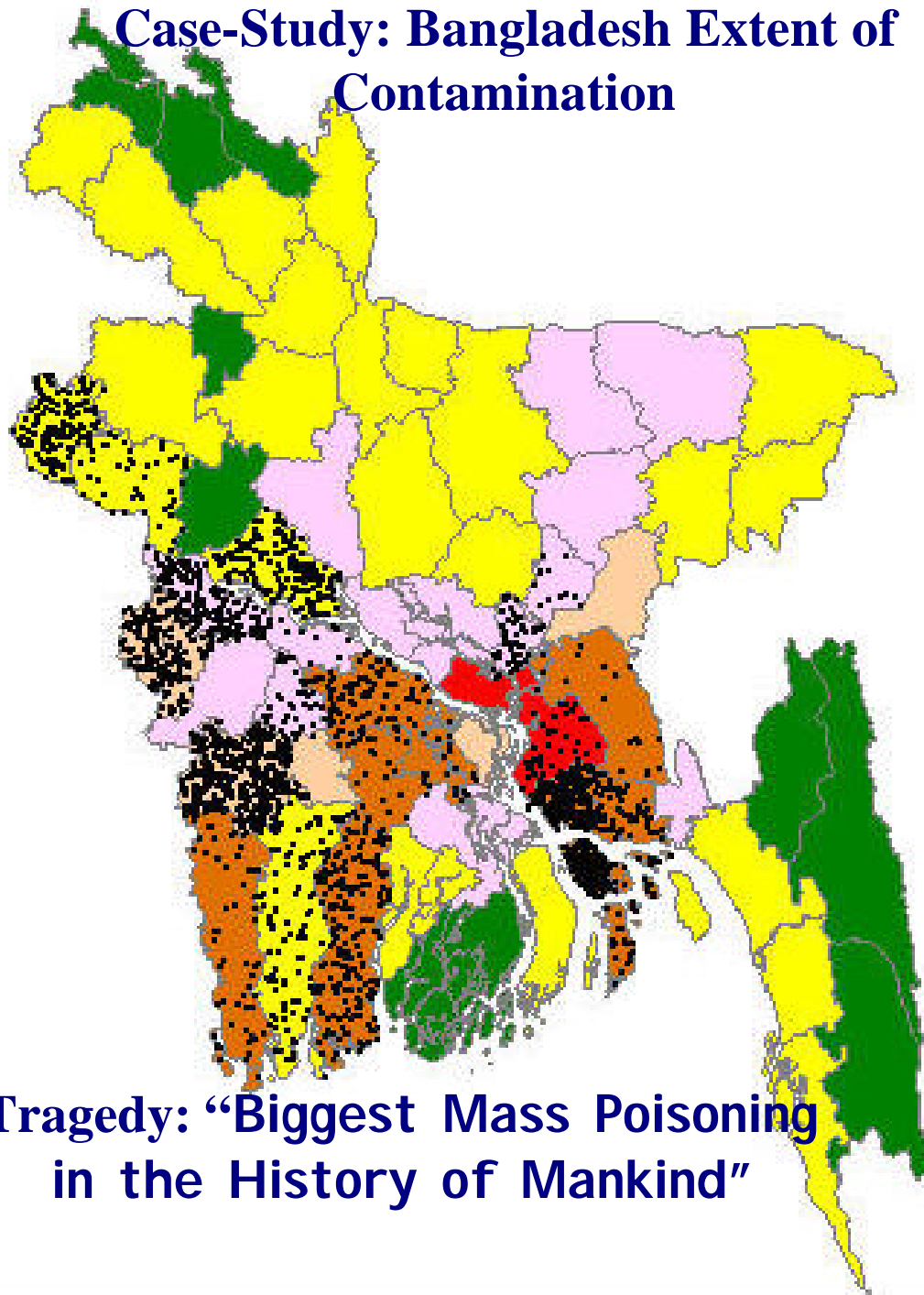
[J\\_malin@acs.org](mailto:J_malin@acs.org)  
[Sutahuja@xaranda.net](mailto:Sutahuja@xaranda.net)

# GROUND WATER IS CONTAMINATED WITH ARSENIC IN MANY PARTS OF THE WORLD



## Case-Study: Bangladesh Extent of Contamination

8-12  
million  
tube wells  
exist



59 out of 64  
Districts are  
affected

Thousands of  
patients seen

Tragedy: “Biggest Mass Poisoning  
in the History of Mankind”

# Introduction to Arsenic Toxicity

**Occurrence: Inorganic Toxic Arsenic occurs in air, water, medicine, food & Soil**

**The commonest is contamination of drinking water**



**~30 % of Exposed subjects develop arsenicosis**



**Late Stage Complications include**

**Various types of cancers (skin, bladder, liver and lungs)**

**Diabetes, adverse reproductive outcomes, etc**

# How Did We Get to the Massive Arsenic Contamination?

- Search for microbiologically pure water in the 1970s
- Bangladesh alone 10-12 million tube wells were dug
- Digging into the aquifer rich in geologic arsenic
- Mechanism: microbially mediated reductive labilization of As



# Challenges in Arsenic Mitigation

- ❖ Lack of reliable field tests for As
- ❖ Need for cheap removal technologies
- ❖ Options for alternative water supply expensive (surface water, deep wells)
- ❖ Variations among neighboring wells
- ❖ No currently known cure for arsenicosis



# Chemical Properties of Interest

- ❖ Analysis in water by colorimetry (classical method), neutron activation, polarography, atomic absorption and emission spectroscopy
- ❖ Formation of organoarsenes
- ❖ As(III) 60x more toxic than As(V)



# Removal of Arsenic from Water by Conventional Technologies

- ❖ Coagulation
- ❖ Sorption to activated alumina
- ❖ Ion Exchange with strong-base anion exchange resins
- ❖ Reverse osmosis





# Removal of Arsenic from Water: Emerging Technologies

- ❖ Fe oxide as absorbent
- ❖ In situ remediation using passive reactive barriers
- ❖ Bioremediation with chemical preparation
- ❖ Aquifer oxygenation



# Questions for Discussion

- ❖ What new scientific knowledge is needed?
- ❖ What is the role of government?
- ❖ What economic incentives exist locally?

