



Risk assessment of drinking water sources in the Mekong Delta for nutrients, heavy metals and microbial contamination

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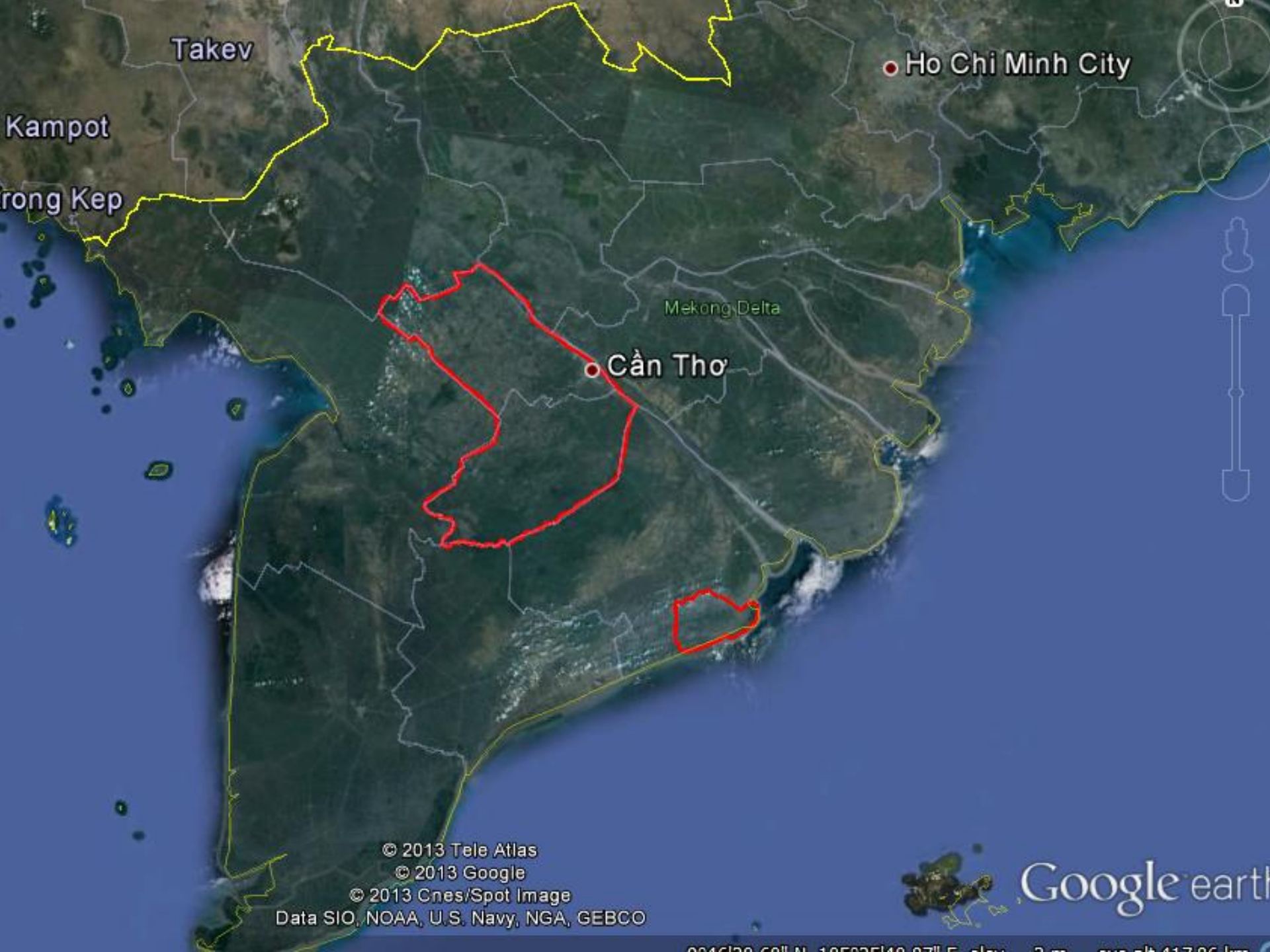


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- Main objectives
- Study sites
- Sources of water used for drinking and domestic functions
- Results of harvested rainwater quality
- Results of surface water quality

- Investigation of water resources used for drinking (and domestic functions) in the selected region
- Investigating the risks associated with drinking water quality – if possible, identify hot-spot areas of pollution
- Assessment of sources of pollution in order to provide recommendation for further improvement of water quality
- Provide recommendations to reduce risks associated with drinking water sources



Takev

Ho Chi Minh City

Kampot

Trong Kiep

Mekong Delta

Cần Thơ

© 2013 Tele Atlas

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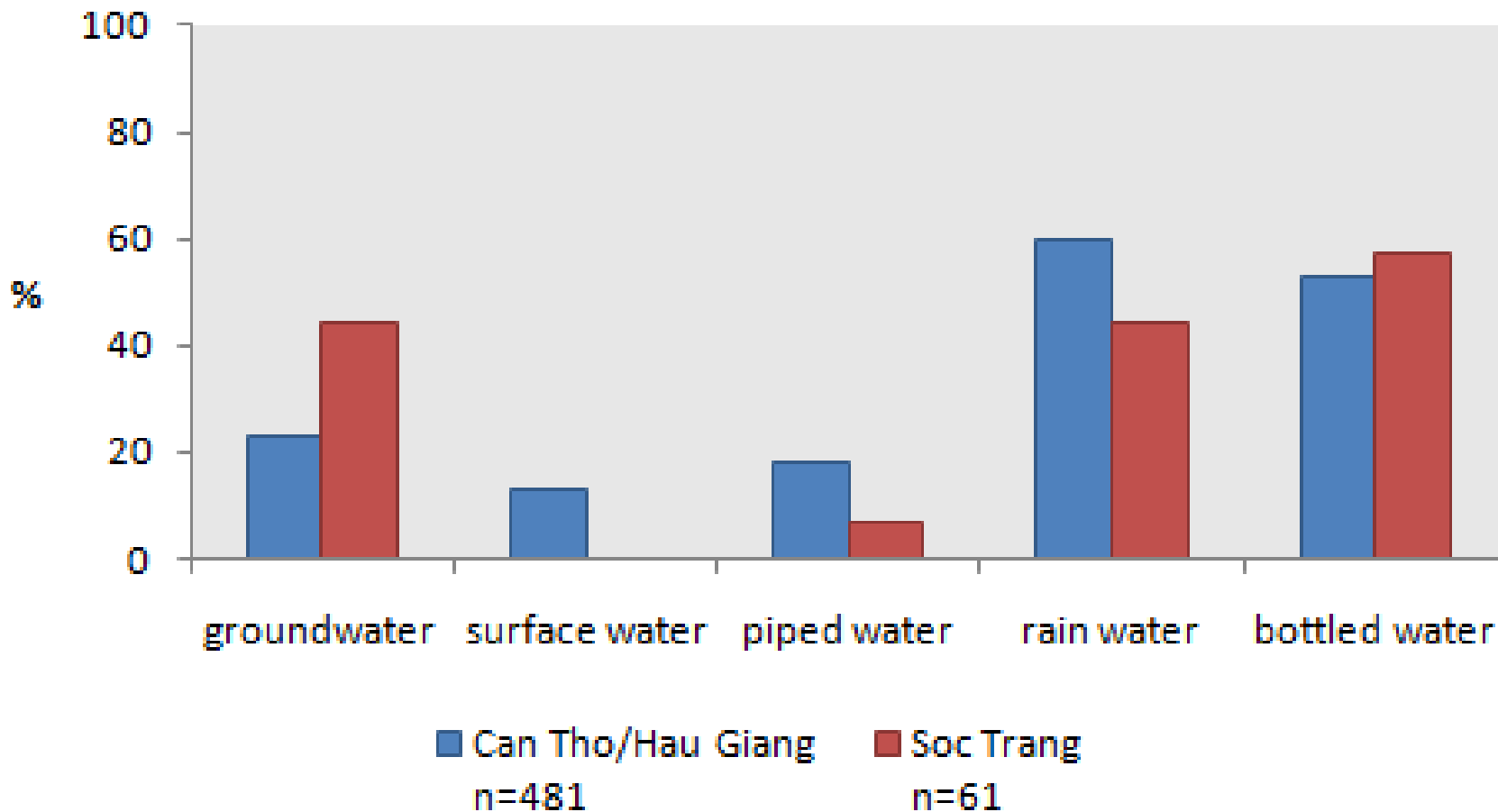
Data SIO, NOAA, U.S. Navy, NGA, GEBCO



Google earth

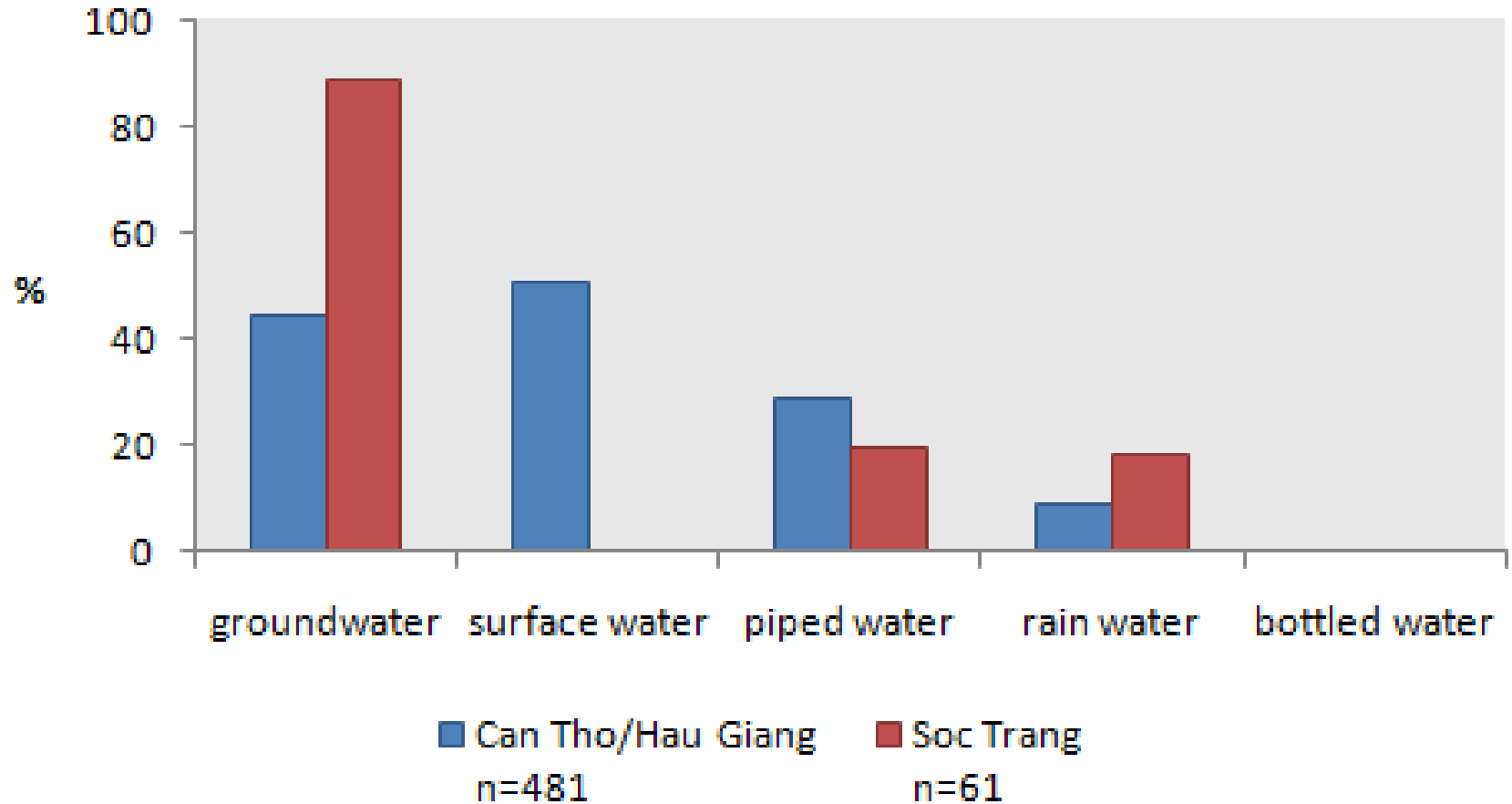
0046120 60° N, 105025140 07° E, elev: 2 m, eye alt: 417.06 km

Drinking water sources



Domestic functions

Domestic water sources



Harvested Rainwater Quality

- 78 harvested rainwater samples were collected
- Investigating effects of local conditions
 - Roof types
 - Storage system
 - Storage duration
- Investigating effects of spatial conditions
 - Industry
 - Main roads
 - Coastline



In general three roof types:

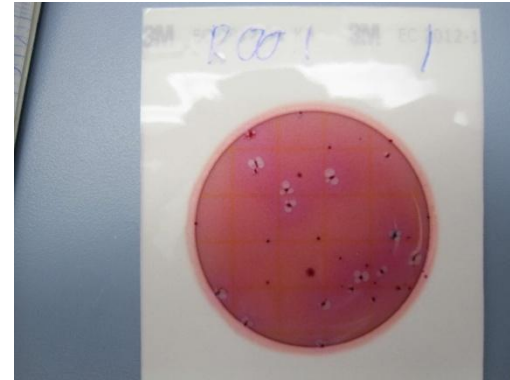
- Thatch: significantly higher concentrations ($p < 0.05$) of COD, phosphorus, manganese and TDS and high turbidity levels
- Metallic sheets: significantly higher concentrations ($p < 0.05$) of zinc
- Asbestos / tile roofs: no significantly differences detected



- Storage system: small but nevertheless significant differences between stored water in tanks versus jars (for ammonium and nitrite)
- Storage duration: no significant difference
- Industrial areas: higher concentrations of barium, zinc and higher pH levels
- Main roads: no significant differences
- Coastline: significantly higher concentrations of sodium and magnesium

- The most severe contamination of harvested rainwater includes:

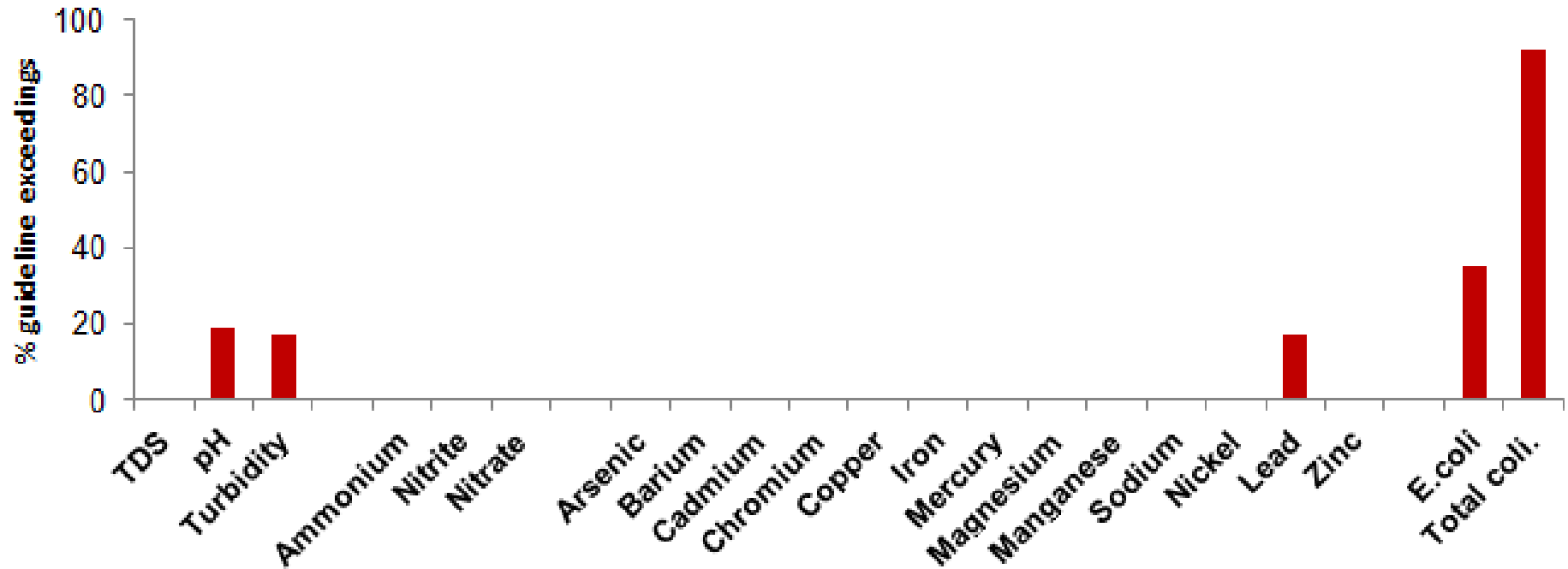
- Fecal contamination
- Lead



- Probably caused by a variety of household specific conditions

- Handling
- Behavioral aspects and hygienic perspectives
- Storage conditions
- Etc...

💧 Guideline exceedings for selected parameters



◆ Conclusions

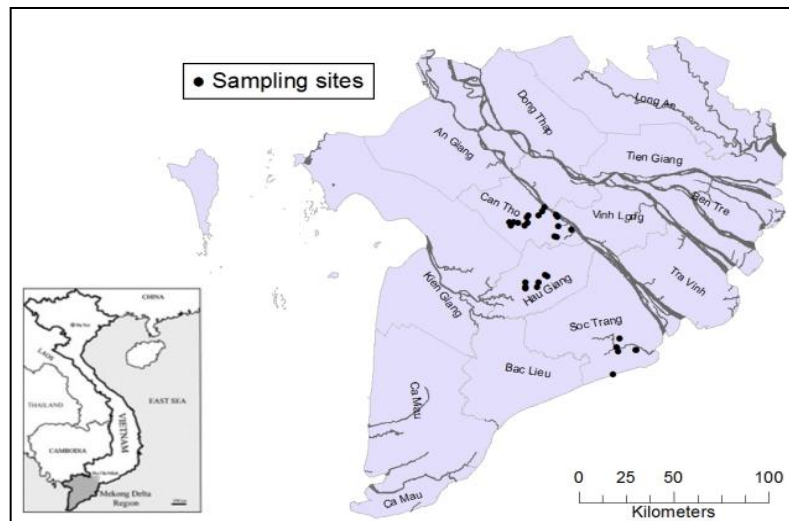
- ◆ Investigated spatial and local conditions influence the quality of household stored rainwater
- ◆ Microbial and lead contamination most severe concern regarding harvested rainwater quality

◆ Recommendations

- ◆ Boiling of harvested rainwater
- ◆ Improve storage conditions
- ◆ Invest on educational measures
- ◆ Despite pollution, harvested rainwater suitable source for drinking

Surface Water Quality

- Surface water quality monitoring: 33 sites, monthly from November 2011 – July 2012



- Purpose of this study
 - Investigating and assessing sources of pollution
 - Identify hot-spot areas of pollution

Urbanization (24.7% variance)



Main source for:
Ammonium
(Total) coliforms
Sodium
Zinc

Soil leaching (24.6% variance)



Main source for:
Aluminum
Chromium
Iron
Nickel
Lead

Tidal influences (20.4% variance)



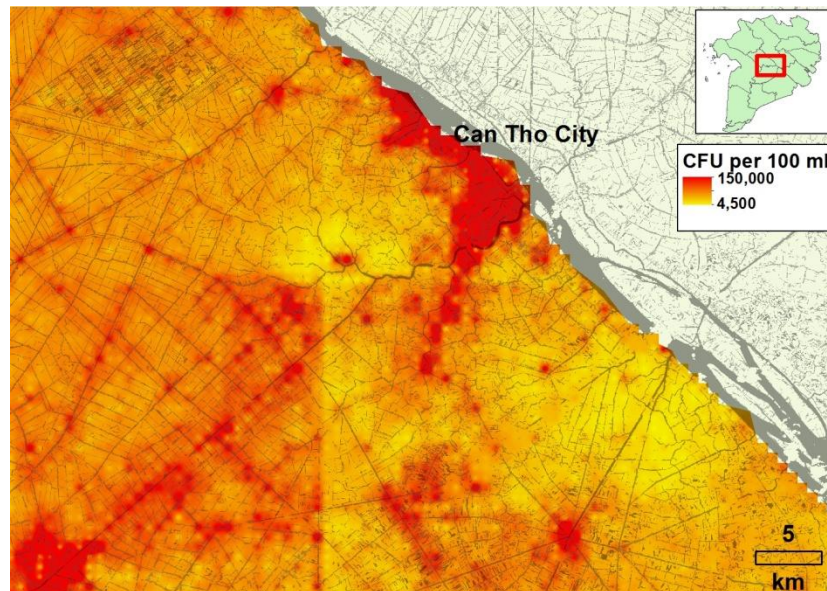
Main source for:
COD
Barium
Manganese

Aquaculture (14.6% variance)



Main source for:
Ammonium
Nitrite
Phosphorus
Mercury

- Regression models were built to develop surface water quality maps
- Please have a look at the poster for results



- Five water sources used for drinking
- Harvested rainwater quality
 - Roof type is relevant
 - Microbial pollution and lead most concerning parameters
- Surface water quality
 - Four main factors that explain presence of contaminants in surface water

Submitted article

Wilbers, G., Sebesvari, Z., Renaud, F.G., Rechenburg, A., (under review). Effects of local and spatial conditions on the quality of harvested rainwater in the Mekong Delta, Vietnam. Environmental Pollution

A blue-tinted photograph of a river or canal. The water is calm, reflecting the sky and the surrounding vegetation. In the background, there is a factory with a tall chimney and a building. The foreground shows some driftwood and branches in the water.

Thank you for your attention

Questions?