Development of a water quality monitoring for the distribution system Bribin (District Gunung Kidul) and conception of a field laboratory for the water hygienisation at the Wonosari hospital

Kerstin Matthies
1) Introduction

2) Hygienic analysis of the water distribution system Bribin
   • Material and methods
   • Results und discussion

3) Conception of a field laboratory
   • Material und methods
   • Results and discussion

4) Conclusion

5) Outlook
Gunung Kidul, Java

Reference: http://www.iwrm-indonesien.de/
Situation in Gunung Kidul

- tropic climate
- Karstformation
- bad filtration capacity
- water shortages in dry season

- bad water quality
- no quality monitoring
- dilapidated water distribution network and reservoirs

Population forced to boil water
- barely sustainable
- problem for high amount of water (e.g. hospital)
Introduction

Monitoring

Field laboratory

Conclusion

Outlook

➢ Usage of underground water:
  ➢ accumulation of water in a cave
  ➢ use of electricity of waterpower plant to pump water to the surface
  ➢ feeding into water distribution system
  ➢ renovation and extension of distribution network
  ➢ monitoring of water quality and water hygienisation
Development of appropriate monitoring

- monthly: caves (Gua Bribin & Gua Seropan) & hospital Wonosari
- twice a year: caves, hospital & distribution network Bribin

**physiochemical analysis**
- temperature
- pH
- oxygen
- conductivity
- turbidity

**micro- und molecularbiol. analysis**
- cultivation
  - ColiLert
- species-specific PCR
- population analysis

Localization of methods

1: PCR = polymerase-chain-reaction
Development of appropriate monitoring

- monthly: caves (Gua Bribin & Gua Seropan) & hospital Wonosari
- twice a year: caves, hospital

physiochemical analysis
- temperature
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Localization of methods

1: PCR = polymerase-chain-reaction
ColiLert-Results

Introduction Monitoring Field laboratory Conclusion Outlook

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ColiLert-Results

TC: >2005
R1
TC: 504
R5
R BP3
R BP1
R BP2
R BP4
R7
R8
TC: >2005

TC: 254
R2
TC: 324
R3

TC: 659
R4

TC: 560
TC: 1652
R9

TC: 271
Gua Bribin

TC: 275
Gua Seropan

TC: 69,7
Hosp.Won.

Legend

TC<500
500<TC<1000
1000<TC<10.000
TC>10.000

TC=Total Coliforms

Unit: CFU/ 100ml

CFU = colony forming unit

Karte: http://iwrn.gik.uni-karlsruhe.de/mapguide/iwrn

Gua Bribin
TC: 271
Gua Seropan
TC: 275
Hosp.Won.
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Räumliche Zuteilung der ColiLert-Ergebnisse

Introduction  Monitoring  Field laboratory  Conclusion  Outlook

Detection limit
Development of appropriate and sustainable methods for water treatment
Plan for water treatment

Introduction  Monitoring  Field laboratory  Conclusion  Outlook

Cave
- Sand-filtration
  - Central removal of turbidity before distribution system
- Hygienisation
  - Central but near to customer (in village)
- Ceramic filtration
  - household (point of use) disinfection

1: PDAM = Indonesian drinking water agency
Plan for water treatment

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Introduction  Monitoring  Field laboratory  Conclusion  Outlook

1: PDAM = Indonesian drinking water agency

Pilot plant with 4 hygienisation methods will be installed in Wonosari hospital and will be fed with PDAM1- water

Sand-filtration

Hygienisation

Ceramic filtration

cave
Plan for water treatment

Introduction  Monitoring  Field laboratory  Conclusion  Outlook

sand-filtration

hygienisation

chloride  Slow-sand-filtration  UV-disinfection  ceramic filtration

Only a field laboratory – no final water treatment plant

ceramic filtration
Introduction

Monitoring

Field laboratory

Conclusion

Outlook

Result of monitoring:
high bacterial count and high contamination with fecal bacteria

> water treatment after distribution network is essential

chosen techniques:
chloride, UV-disinfection, slow sand- & ceramic filtration

Pilot plant / field laboratory
Outlook

- Project runs until 2013
- continuation of monitoring
  - monthly: Gua Bribin, Gua Seropan, Hospital Wonosari
  - twice a year: whole distribution network
- Optimization of DNA-extraction from filters
- construction of container for field laboratory
- shipping of container in October 2010
- first experiments at Wonosari hospital from January 2011
- development of appropriate and sustainable water treatment for project region
Thank you for your attention!

Questions?

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