STATUS OF GROUNDWATER IN VIETNAM AND RECOMMENDATIONS

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Current Status
Governance
Major Issues
Causes of depletion
Recommendations
Distribution of Groundwater

- North-East: 24%
- Red Delta: 4%
- Central Highlands: 20%
- Central South: 11%
- South-East: 9%
- MK delta: 2%
- Central North: 14%
- North-West: 16%
Groundwater Abstraction in Nation-wide Scope (%)

- North-East: 0.07%
- Central Highlands: 5.3%
- Central North: 5.8%
- North-West: 0.3%
- Hanoi: 21.3%
- Red Delta: 13.2%
- South-East & MK Delta: 47%
- South-East & MK Delta: 15.1%
- Hochiminh: 33.9%
- Others: 30%
- North region: 23%
- Groundwater Exploitation & Use

Others: 30%
Falling of Groundwater Levels

North region: average 0.16m/year

South region: average 0.21m/year
Purposes of Groundwater Use

- Domestic supply
- Agriculture
- Industry

8.89 million m³/year exploited
Groundwater Quality

HN4+, As, TDS

HN4+, Mn, As, TDS

HN4+, As, TDS

HN4+, Fe, As, TDS

HN4+, As, Mn, Se, Fe, TDS, Cl-

HN4+, AS, Cl-

HN4+, As, TDS, Cl-

South-East

Mekong delta

North-West

Red Delta

Central Highlands

Central North

Central

North-East

North-West

Red Delta

Central

South-East

Central Highlands

Red Delta

As

HN4+, As, TDS
Map of Arsenic Pollution

North region

South region
Map of arsenic pollution (cont.)

Supplementary information to research article “Arsenic pollution of groundwater in Vietnam exacerbated by deep aquifer exploitation for more than a century”, published in PNAS. doi:10.1073/pnas.1011915108
Weblink: www.eawag.ch/arsenic-vietnam
Groundwater Pollution (cont.)

Red River Delta
Groundwater Governance

Legal Documents
- Law on Water Resources
- Decree 201/2013/ND-CP
- Circular 27/2014/TT-BTNMT

Key issues
- Licensing
- Planning
- Restriction Zones (prohibited, limited and registered areas)
Falling of Groundwater Level

- Red River Delta
- South – East Region
- Mekong Delta

Groundwater Pollution

- **Arsenic**: highest in Red river delta (18.7%) and lowest in North-west (0.1%)
- **Salinity**: coastal-zone provinces, especially in the Central South Region, Dong Nai province and Mekong delta
Causes of Groundwater Depletion

- Uneven Abstraction
- Inappropriate Abstraction between Aquifers
- Impacts of Climate Change
- Lack of the groundwater recharge source
Recommendations

- Central and Provincial Coordination
- Licensing
- Awareness raising

- Limitation on extraction
- Appropriate exploitation among different aquifers
- Determination of abstraction permit

- Improvement of groundwater monitoring system

- Seek of new sources
- Exploitation limit
- Development of database system