

Causes of Groundwater Contamination in Rural and urban areas of Afghanistan

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Eng. M. Hassan Saffi

Outline

- Causes of groundwater contamination
- Contaminated drinking water and health effects
- Finding policy relevant option
- Major challenges
- Recommendation

Salinity contamination

Nitrate contamination

Boron contamination

Fluoride contamination

Arsenic contamination

Chromium contamination

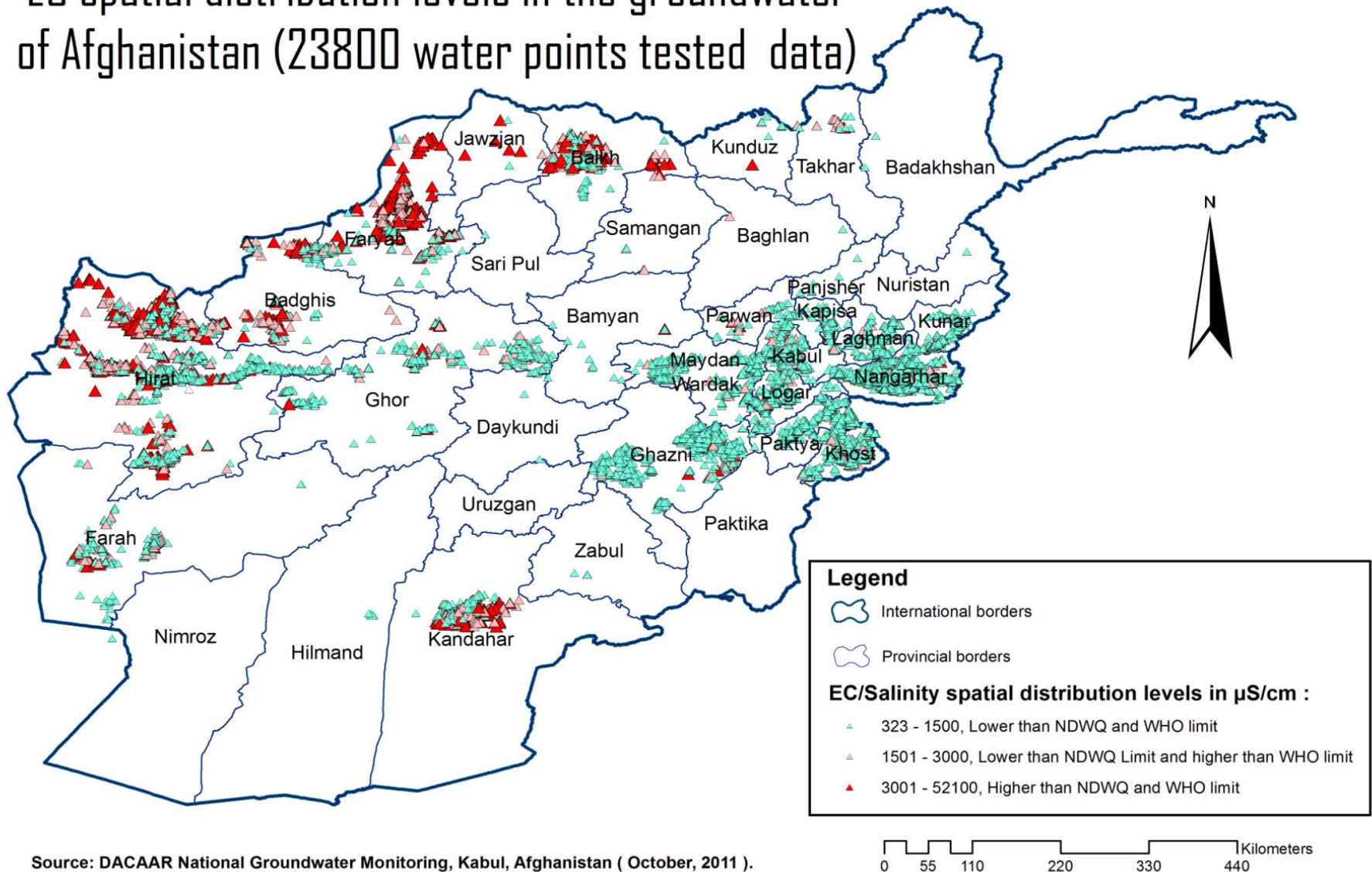
Hardness

Faecal Coli form bacteria

**Groundwater
Quantitative concerns**

Salinity problem in Afghanistan

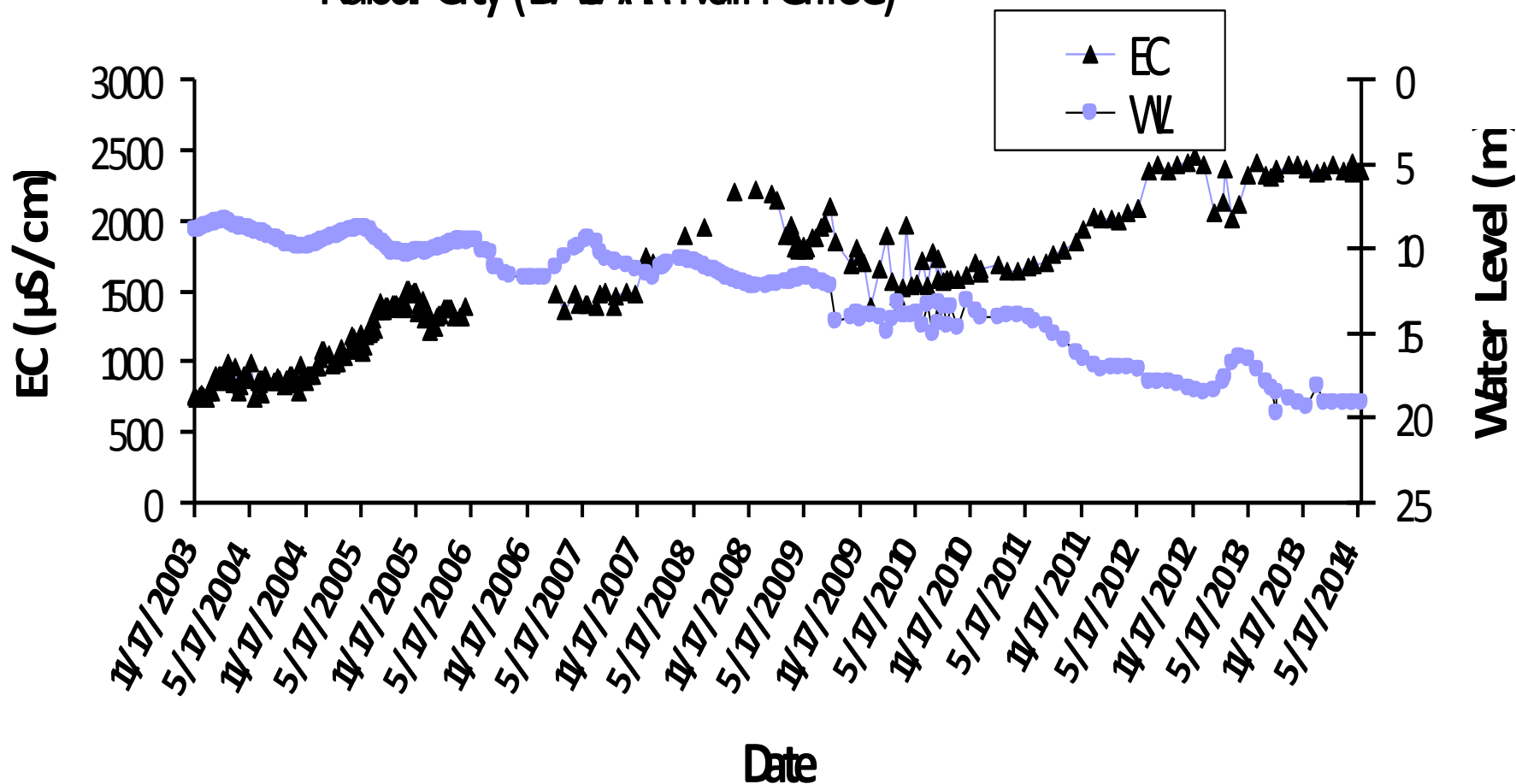
EC spatial distribution levels in the groundwater of Afghanistan (23800 water points tested data)



Deteriorating WQ due to lowering Water Table

GW_MID2 (Water Level and EC Variation with Time)

Kabul City (DACAAR Main Office)





Faryab province



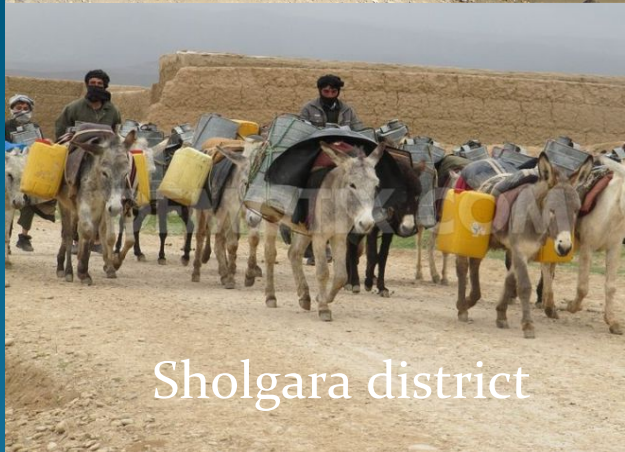
Nimroz province



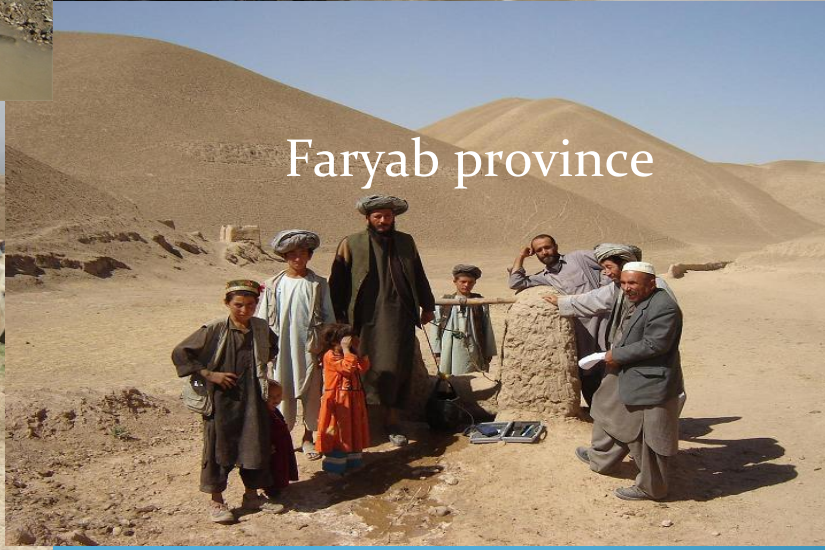
Ghor province



Kunduz province



Sholgara district

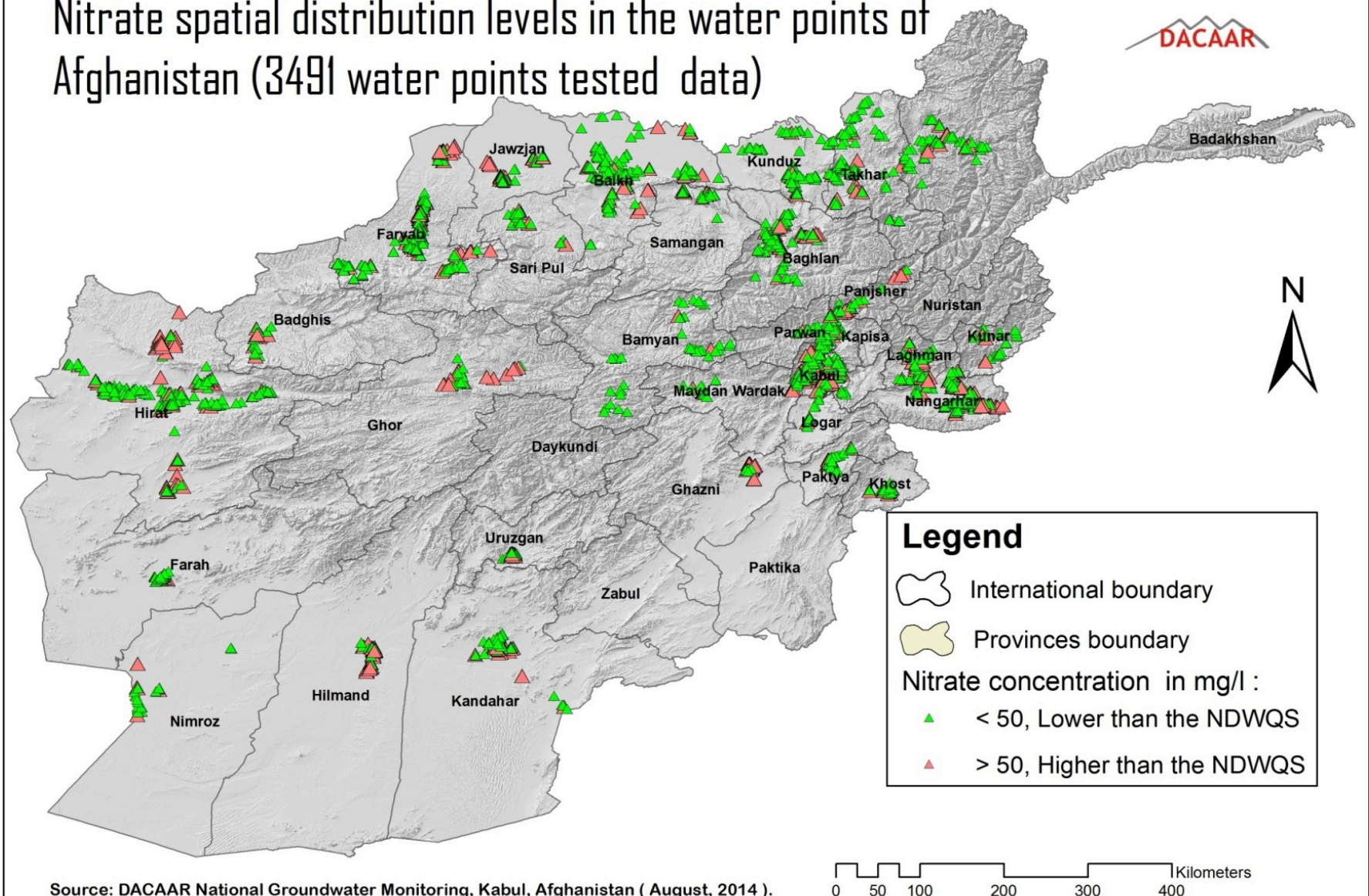


Faryab province

People collect there drinking water from contaminated river channel

Nitrate contamination in Afghanistan

Nitrate spatial distribution levels in the water points of Afghanistan (3491 water points tested data)



Sources of Nitrate:

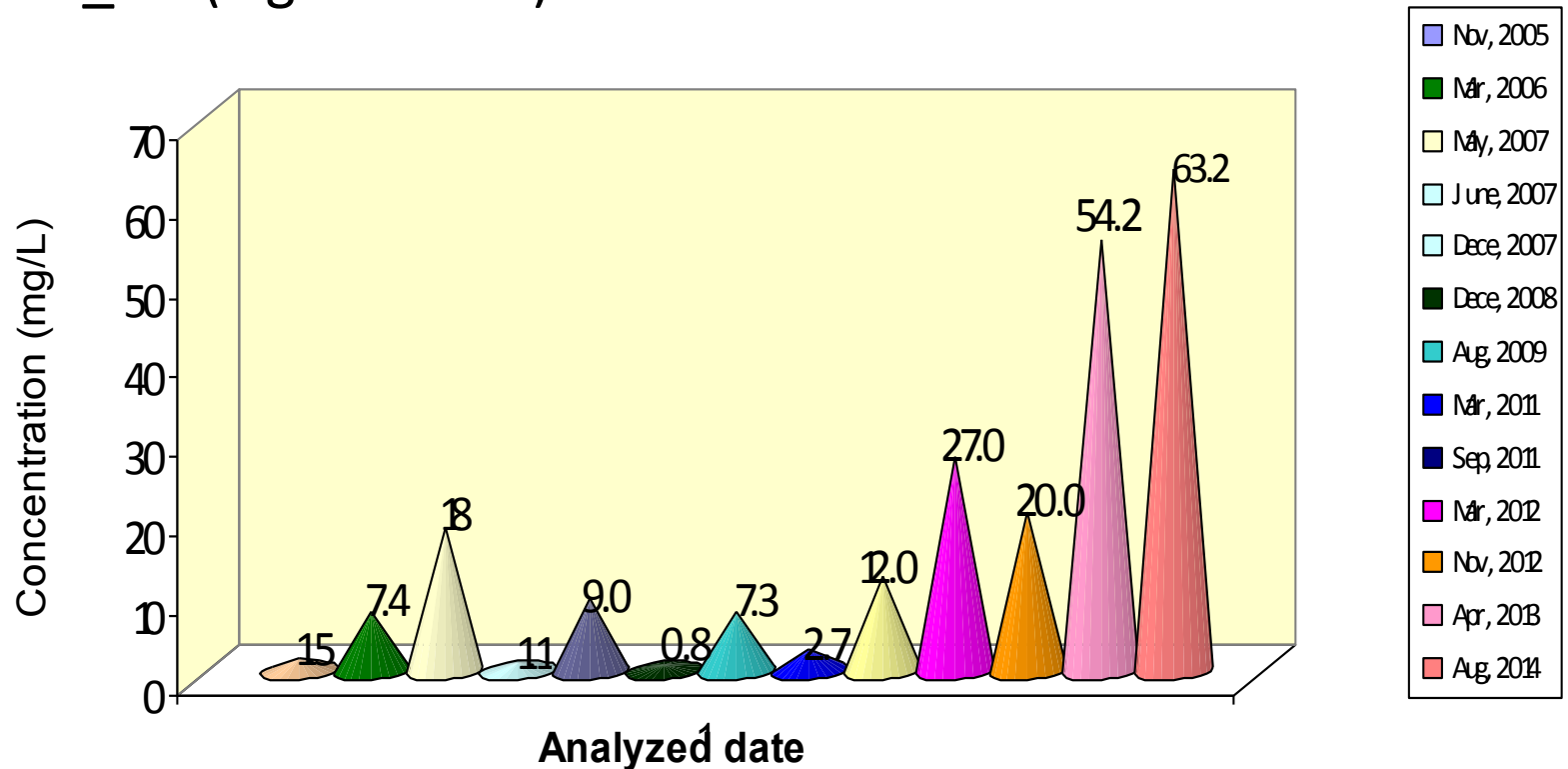
- Sewage
- Leakage from septic tanks
- Pit latrines
- Irrigation channels
- Fertilizer

Health concerns

- Blue baby Syndrome
- Effect on aged people
- Effect on pregnant women
- Cancer in those with heart disease

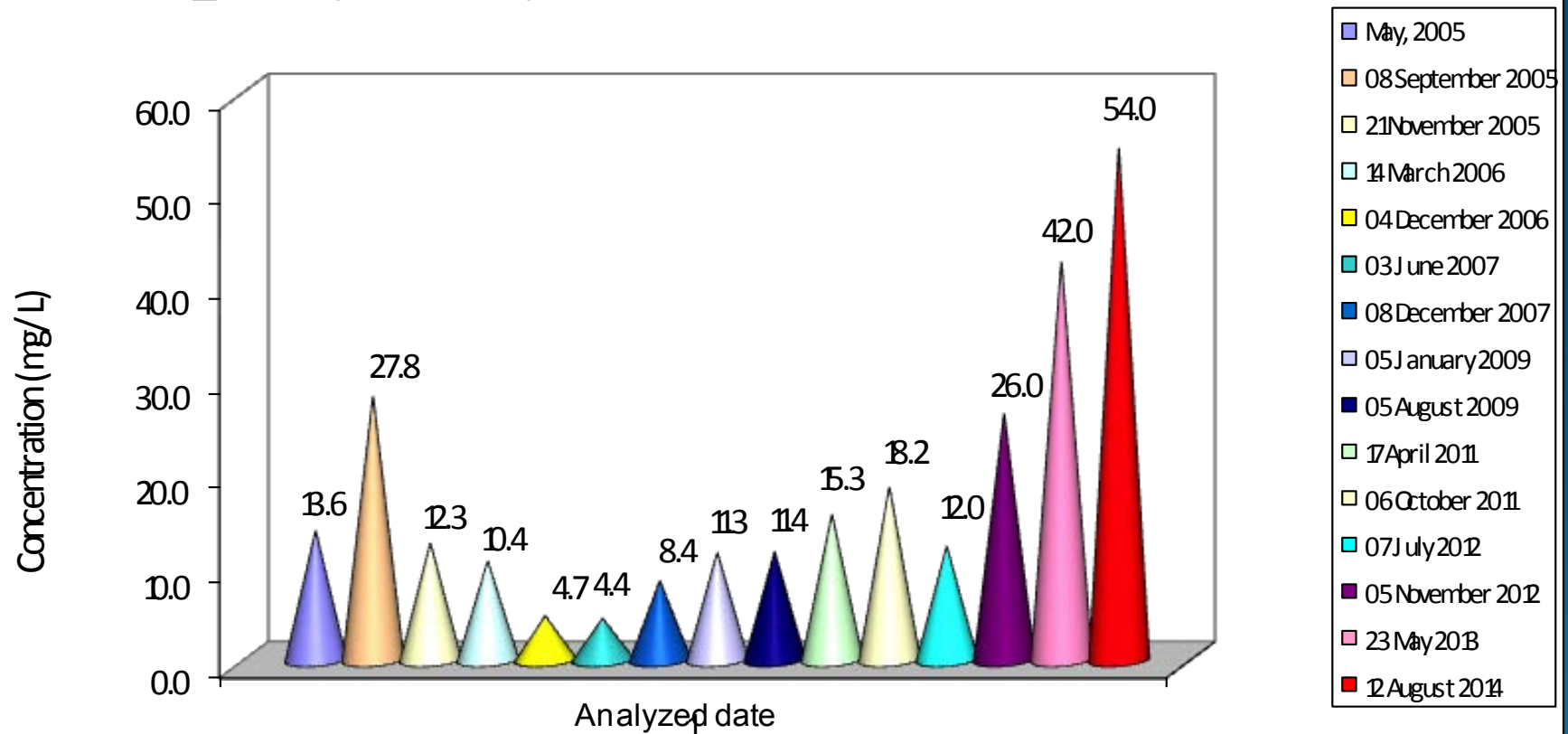
Time series Nitrate contamination increasing trend in Kabul city.

GWW_ID12 (Bagrami district) Time series Ntrate concentration Value

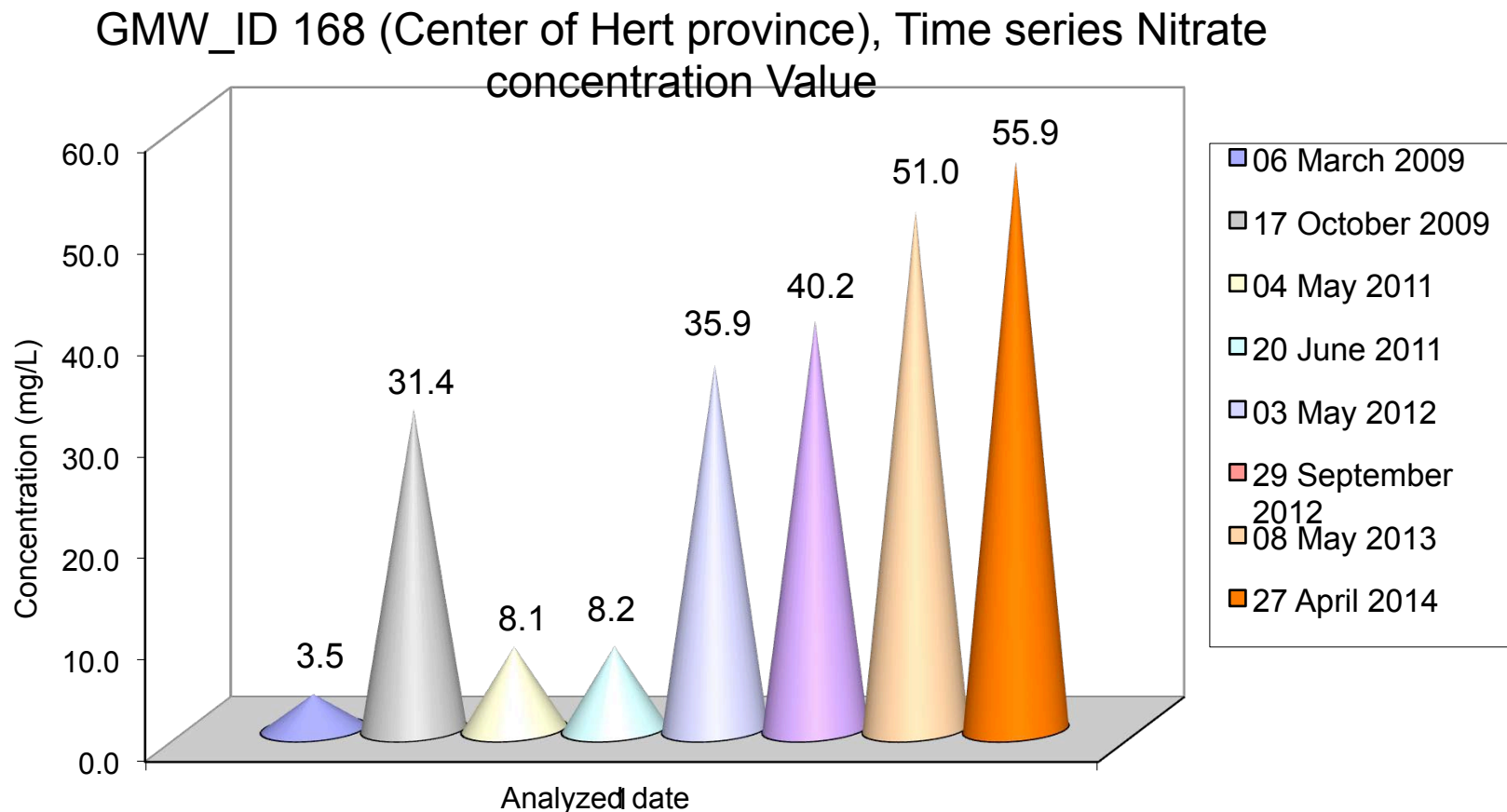


Time series Nitrate contamination increasing trend in Jalalabad city.

GMW_ID 32 (Jalalabad), Time series Nitrate concentration Value

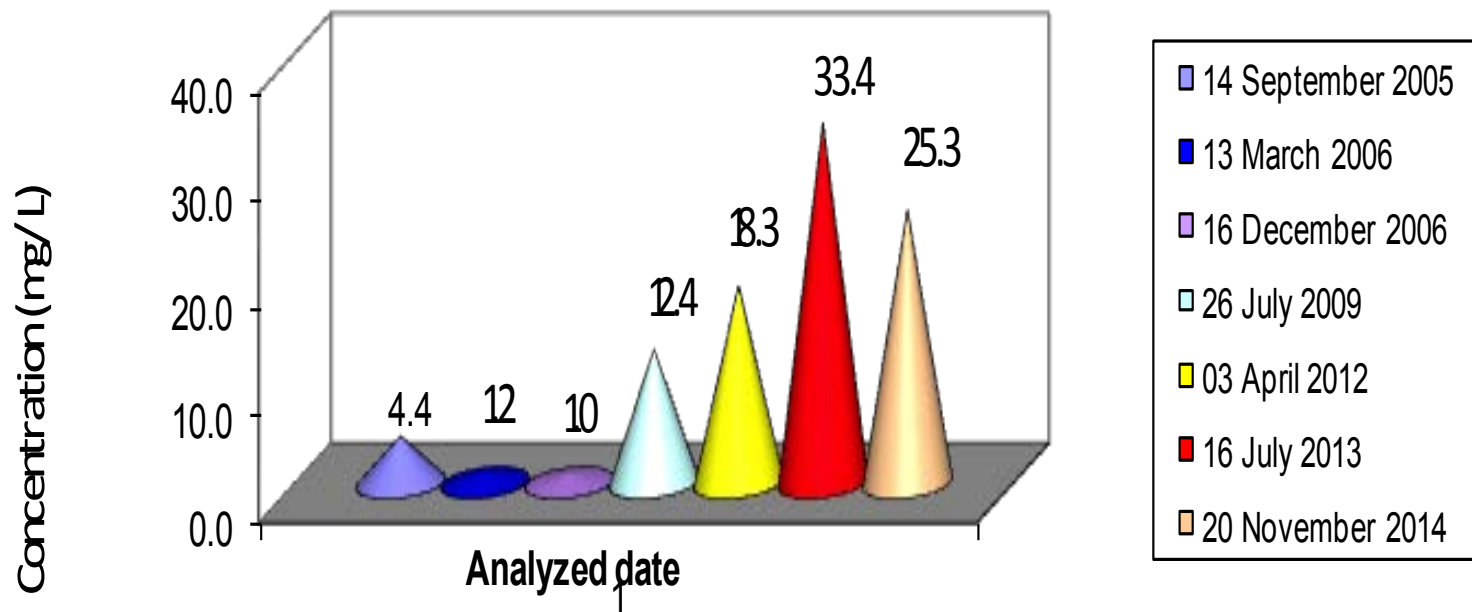


Time series Nitrate contamination increasing trend in Herat city.



Time series Nitrate contamination increasing trend in Mazr-e-Sharif city.

GW_ID91(Mazar-e Sharif), Time series Nitrate concentration Value

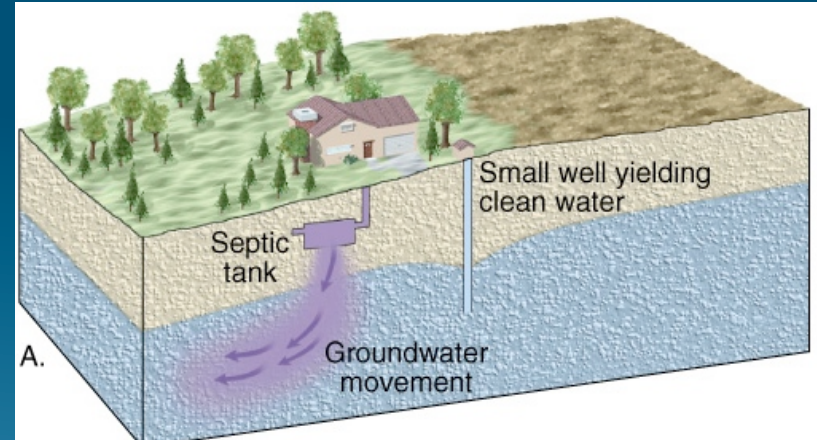
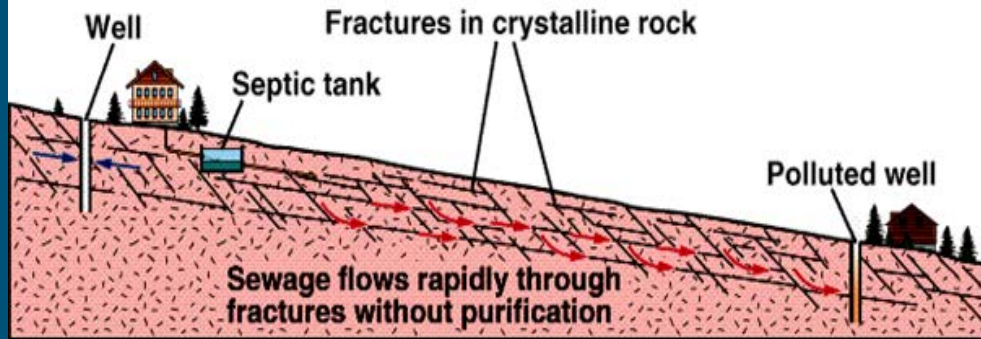


Causes of Nitrate contamination in Kabul city

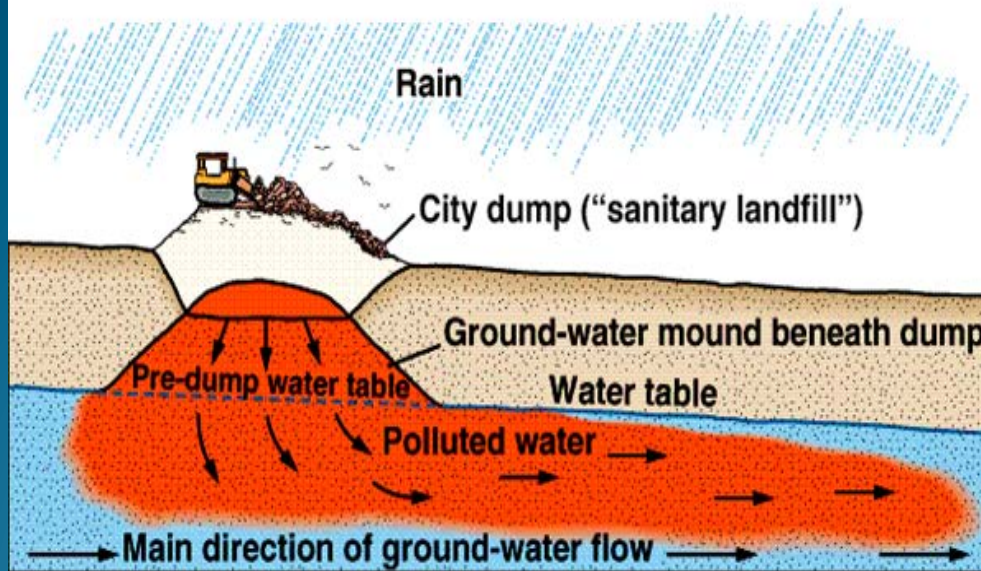


Transportation Model of contamination to the Groundwater

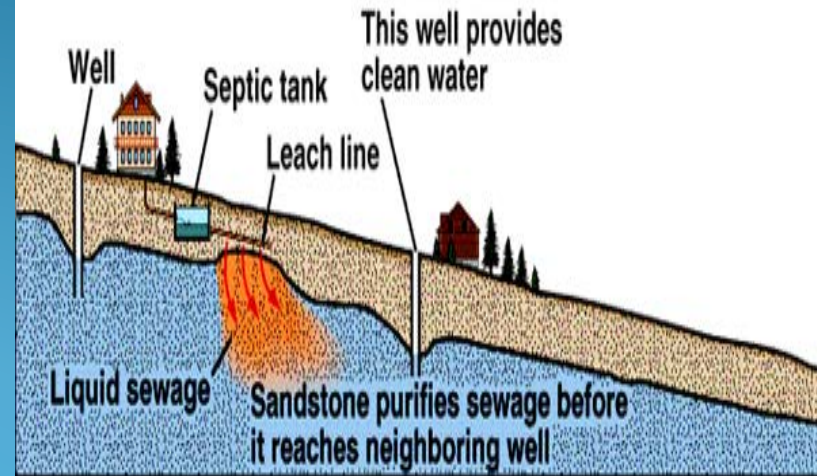
Contamination from Open Fractures



Ground-Water Mound

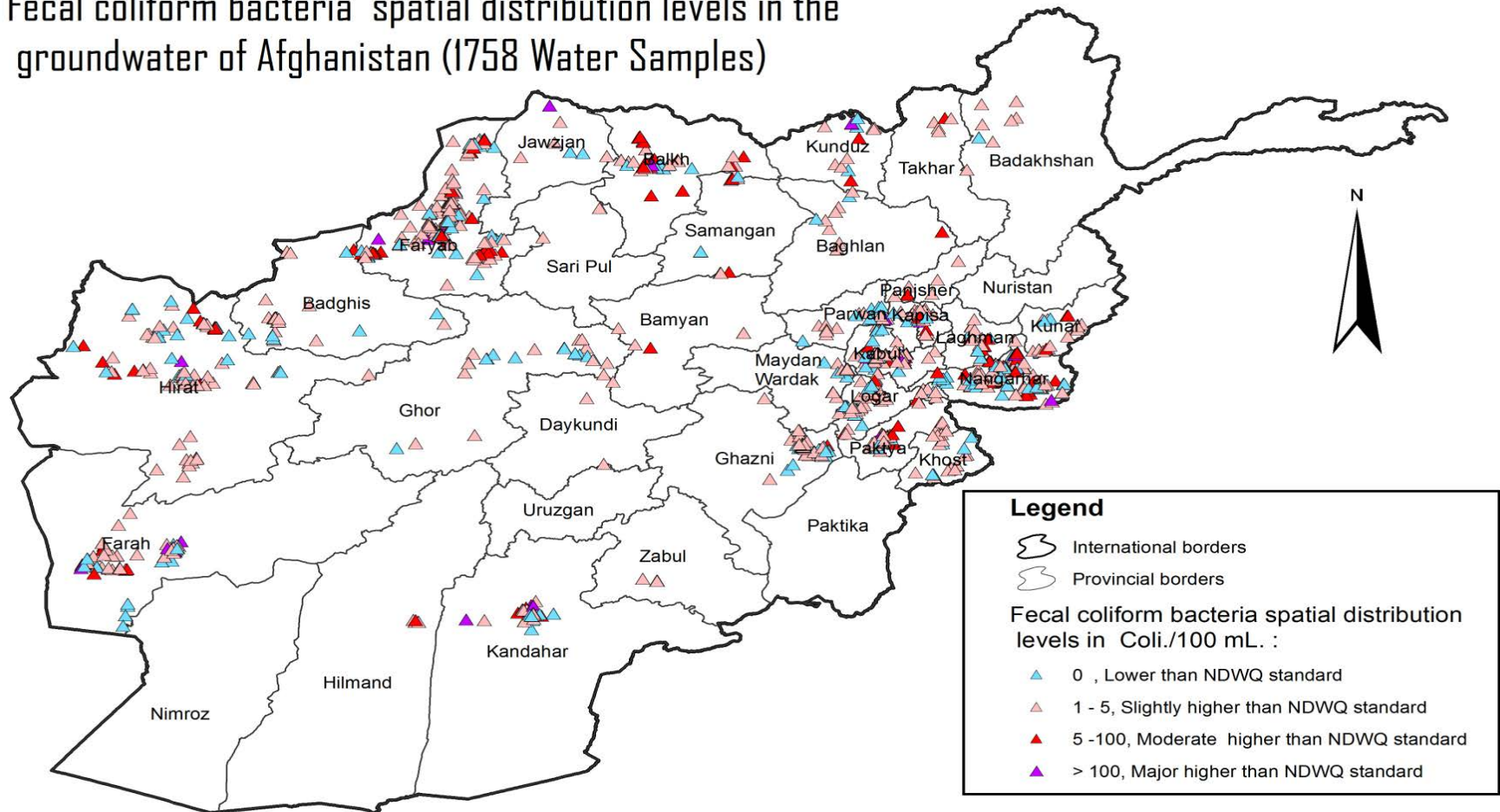


Sewage Contamination



Fecal coliform bacteria contamination in Afghanistan

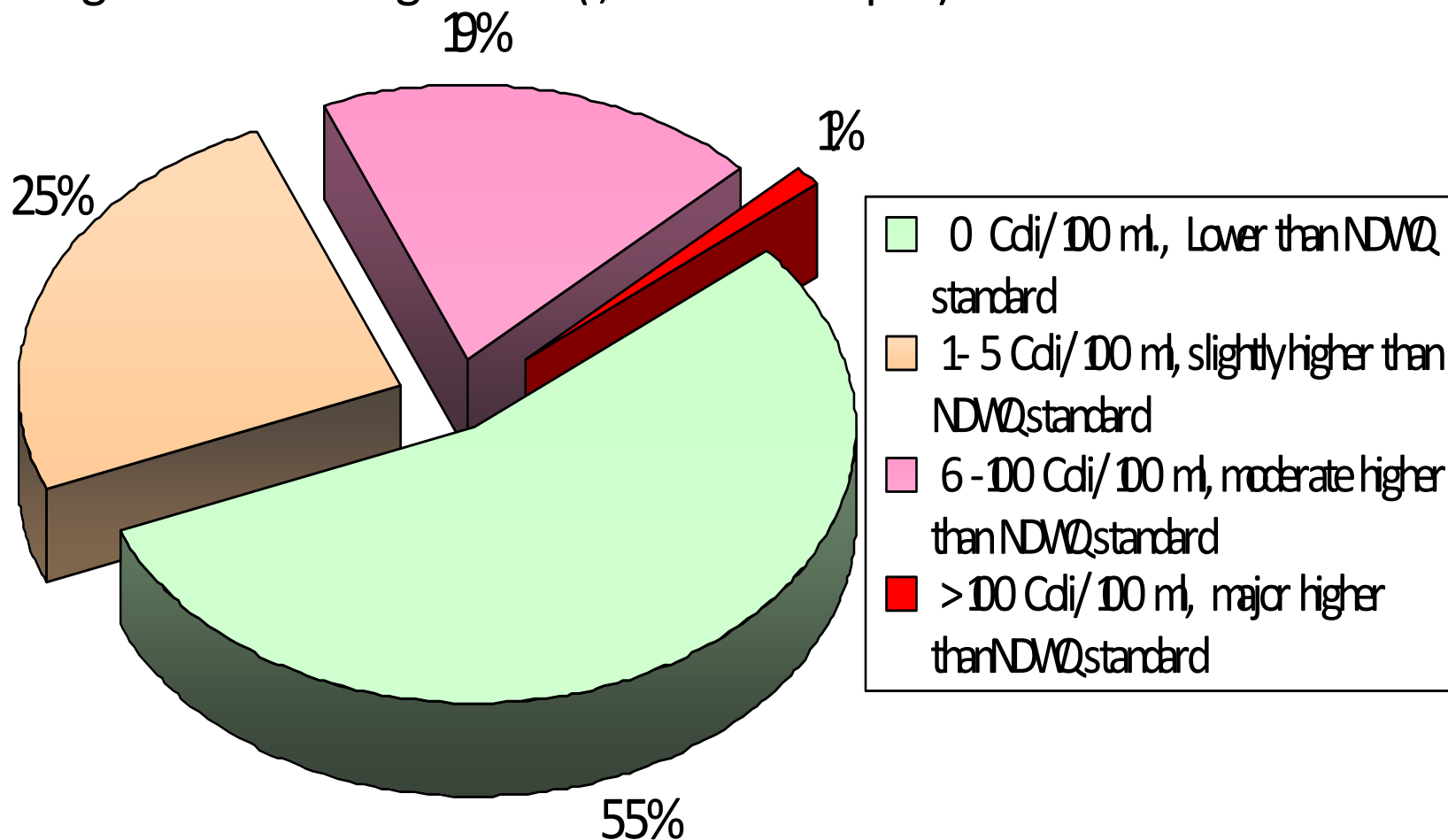
Fecal coliform bacteria spatial distribution levels in the groundwater of Afghanistan (1758 Water Samples)



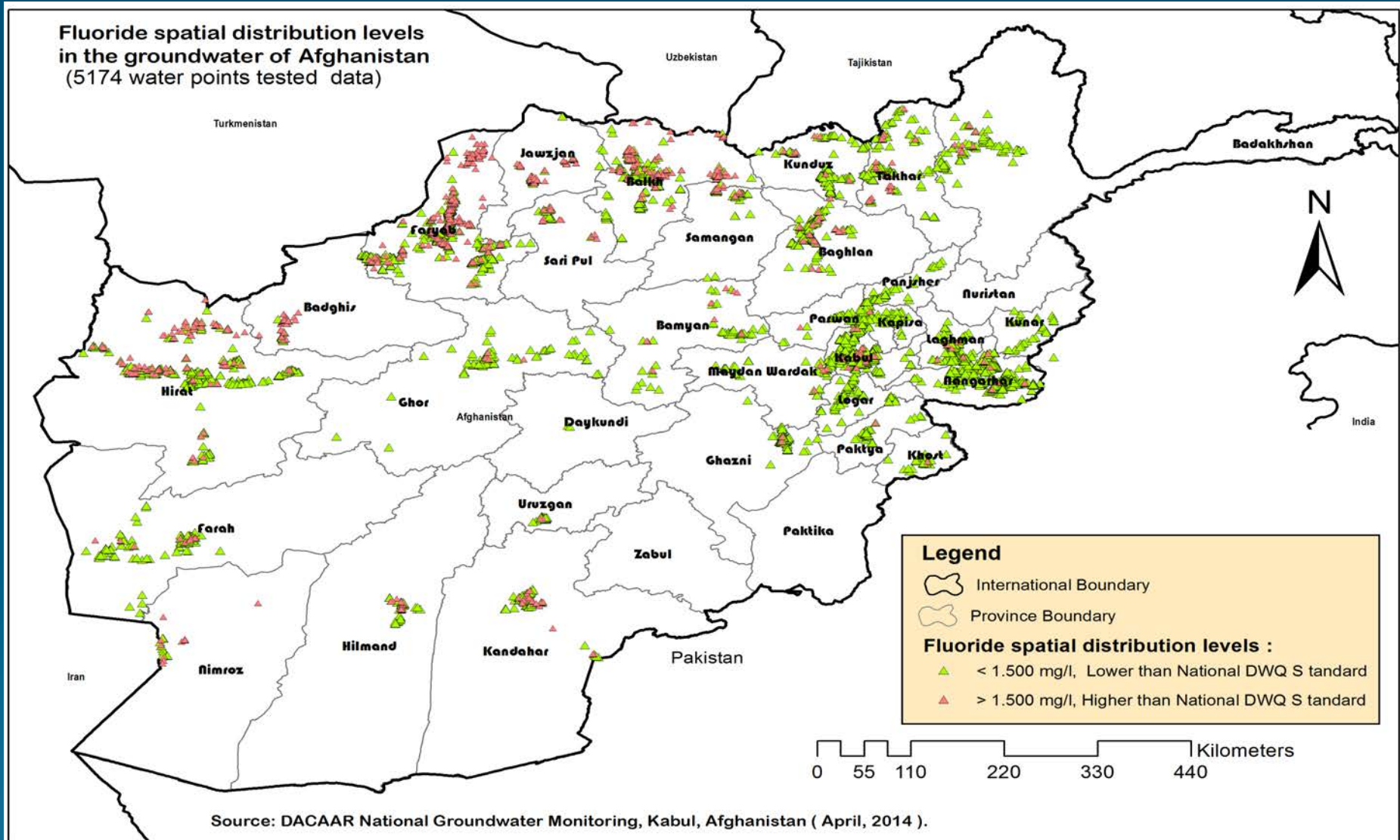
Source: DACAAR National Groundwater Monitoring, Kabul, Afghanistan (Mayr, 2014).

0 55 110 220 330 440 Kilometers

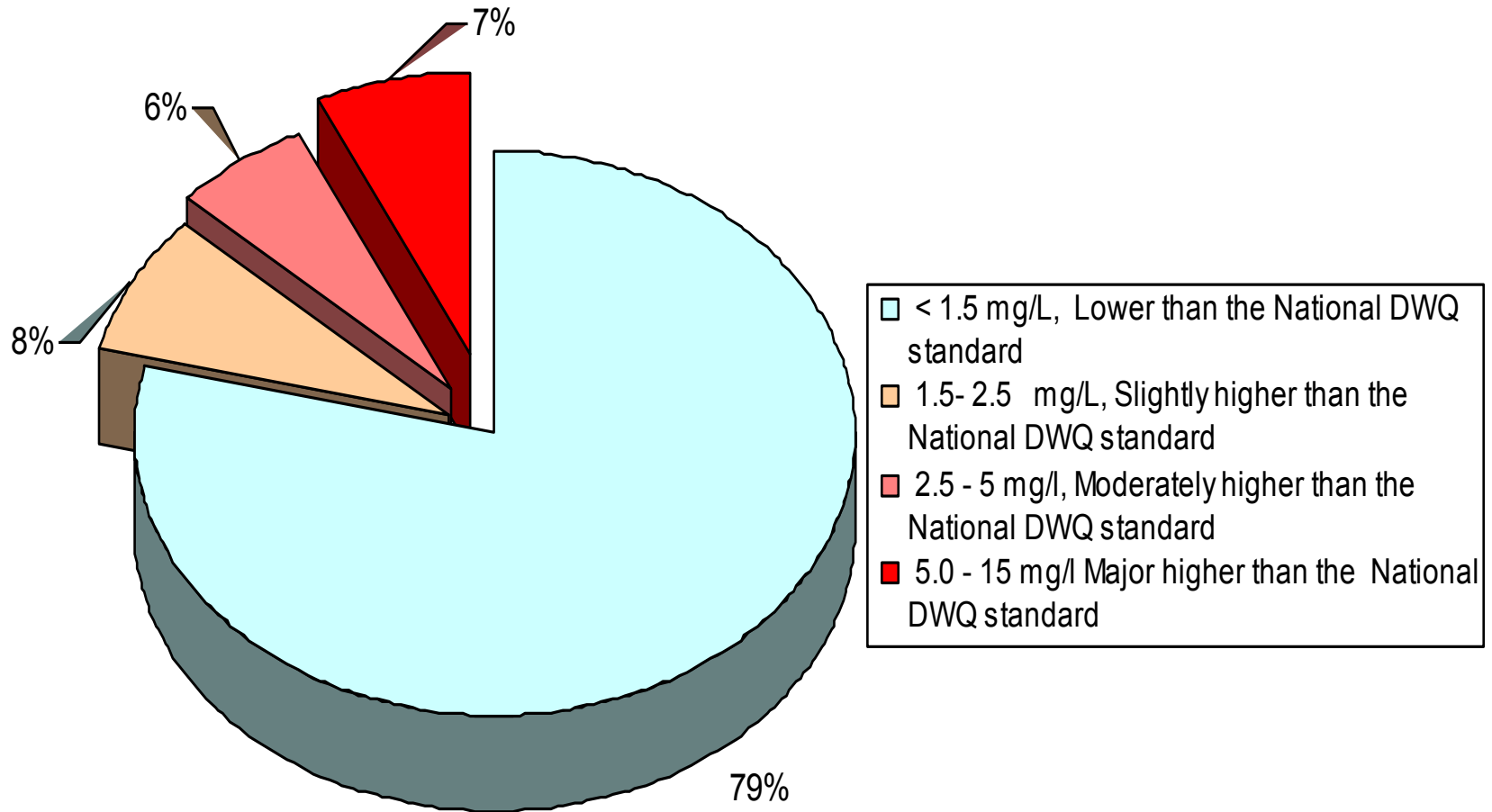
Percentage of fecal coliform bacteria distribution levels in the groundwater of Afghanistan (1758 water samples)



Fluoride contamination in Afghanistan

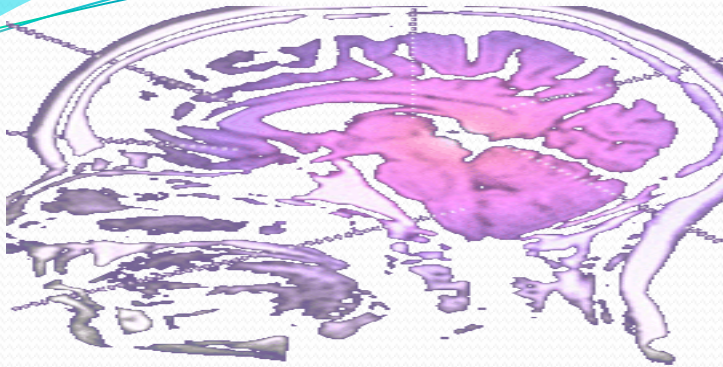


Percentage of Fluoride distribution levels in the water points of Afghanistan (5174 water points tested data)

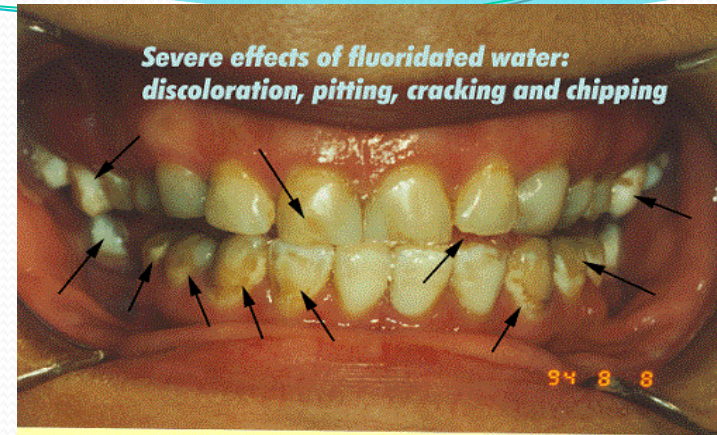


Impact of fluoride on human health due to excess dose

Fluoride (mg/l)	Effects on human body
Below 0.5	Dental Caries
0.5 to 1.0	Protection against dental caries. Takes care of bone and teeth
1.5 to 3.0	Dental fluorosis
3 to 10	Skeletal fluorosis (adverse changes in bone structure)
10 or more	Crippling skeletal fluorosis and severe osteoclerosis



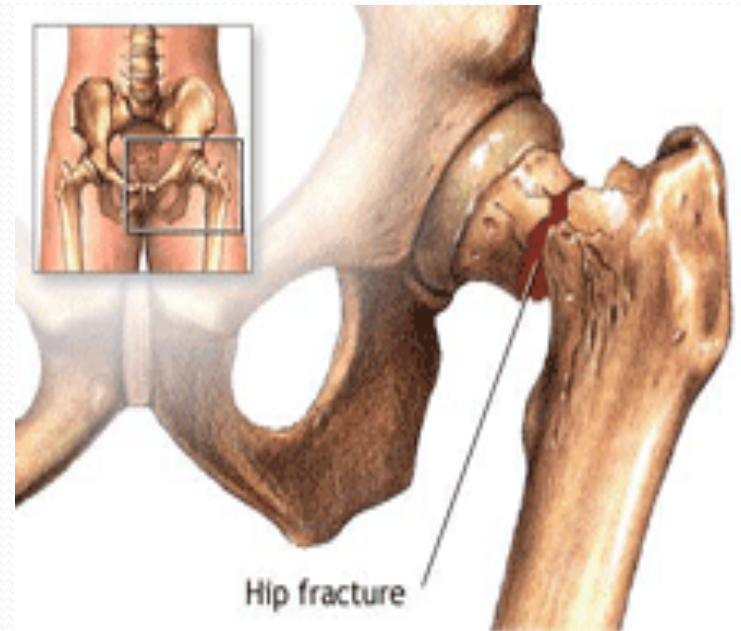
Fluoride effect Brain



Dental Fluorosis



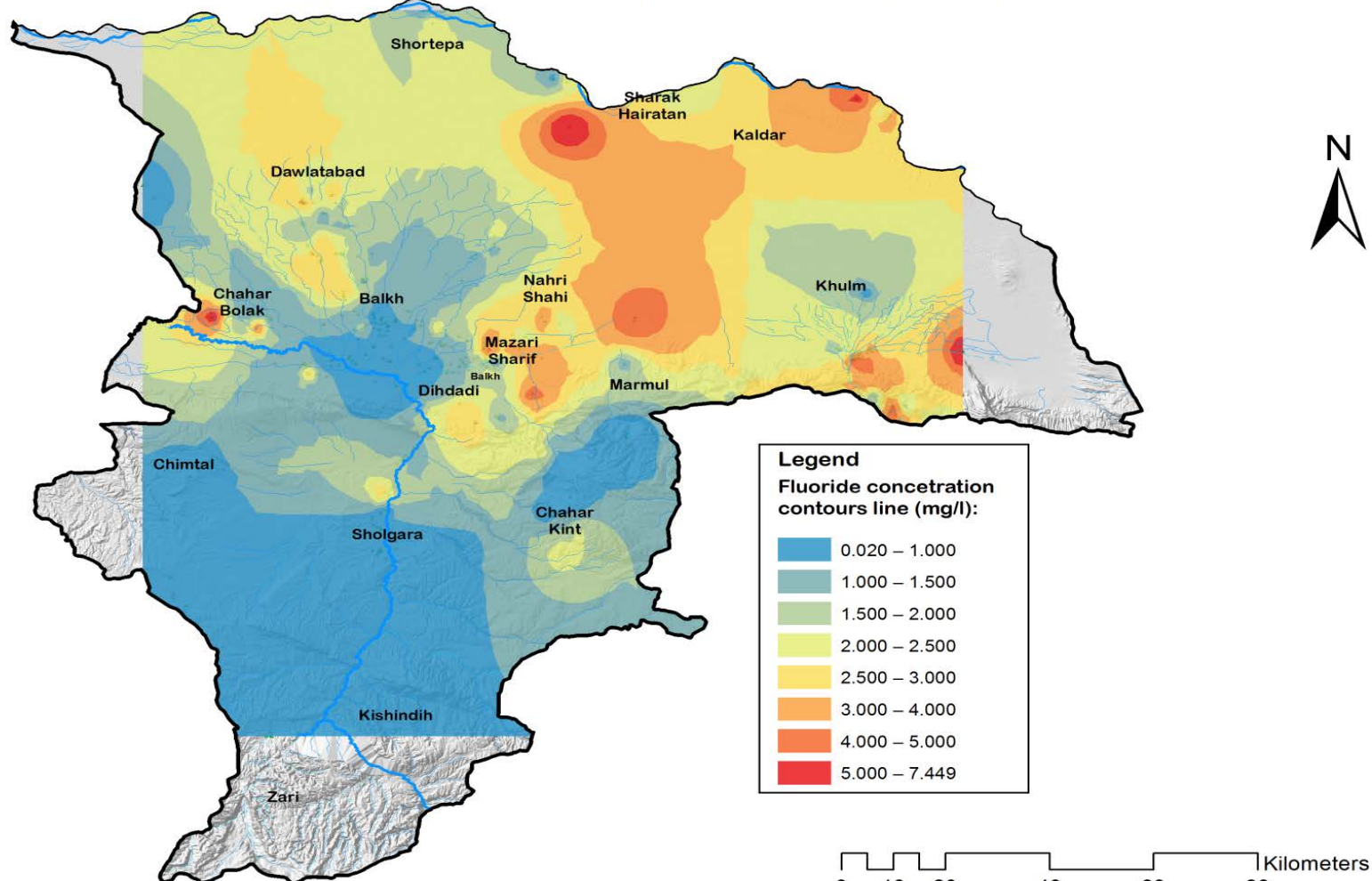
Fluoride and Arthritis



Bone Fluorosis

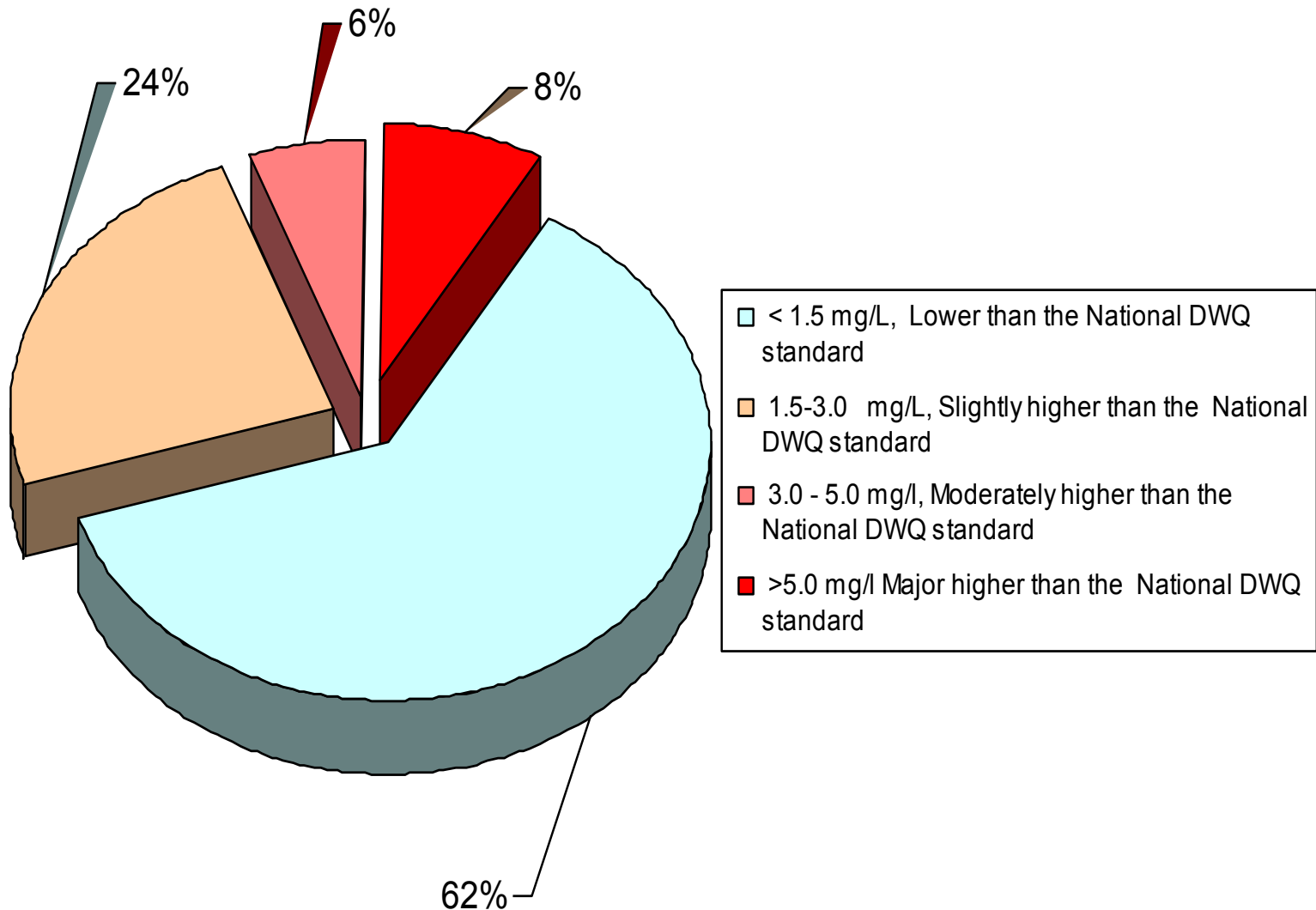
Fluoride contamination in Balkh Province

Fluoride concentration interpolated contour lines in the groundwater of Balkh province (380 water points tested data)



Source: DACAAR National Groundwater Monitoring, Kabul, Afghanistan (April, 2014).

Percentage of Fluoride distribution levels in the water points of Balkh province
(380 water points tested data)

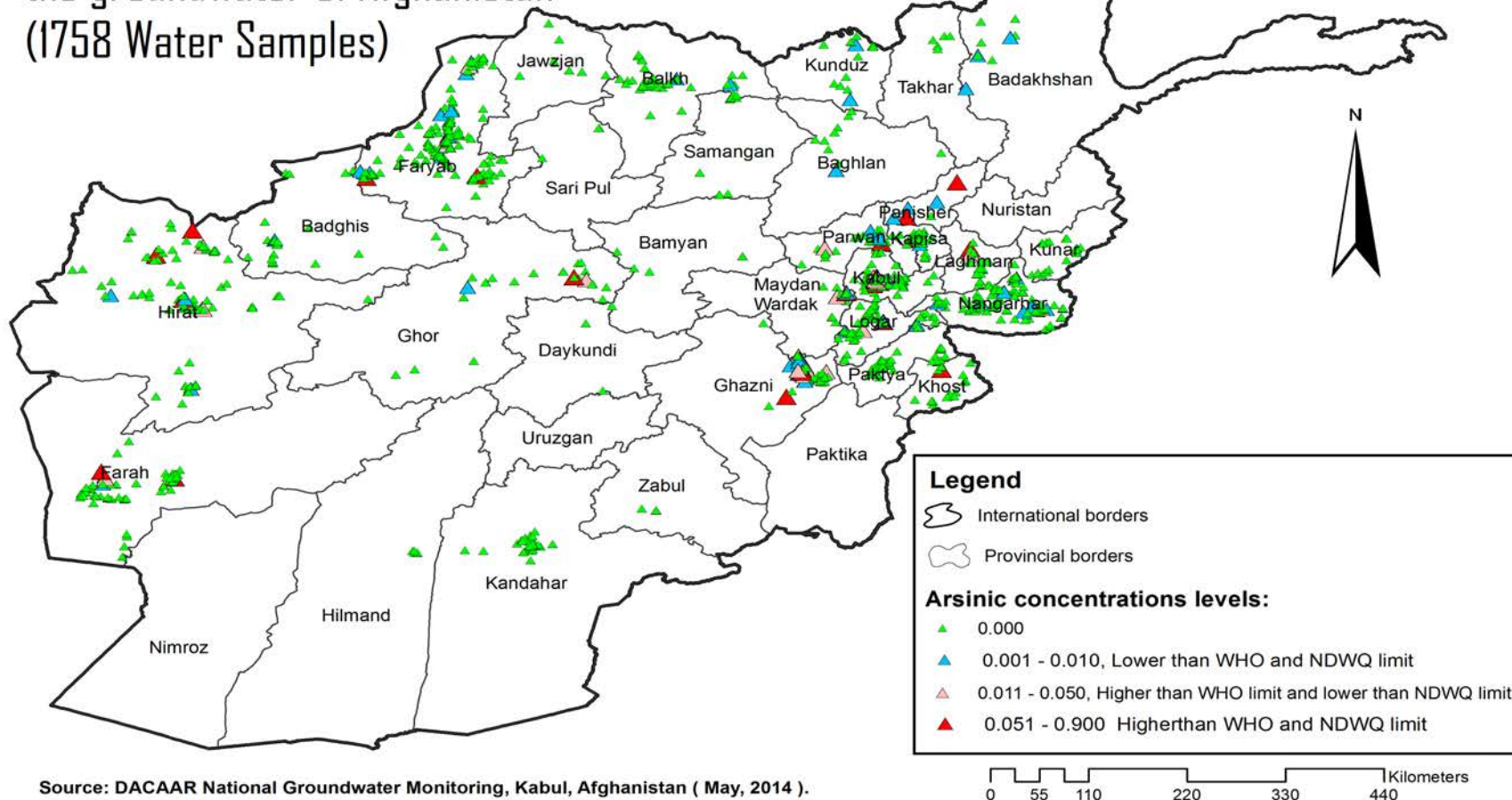


Effect of Human Health due to High Content of Fluoride in Drinking Water Sources in Balkh Province



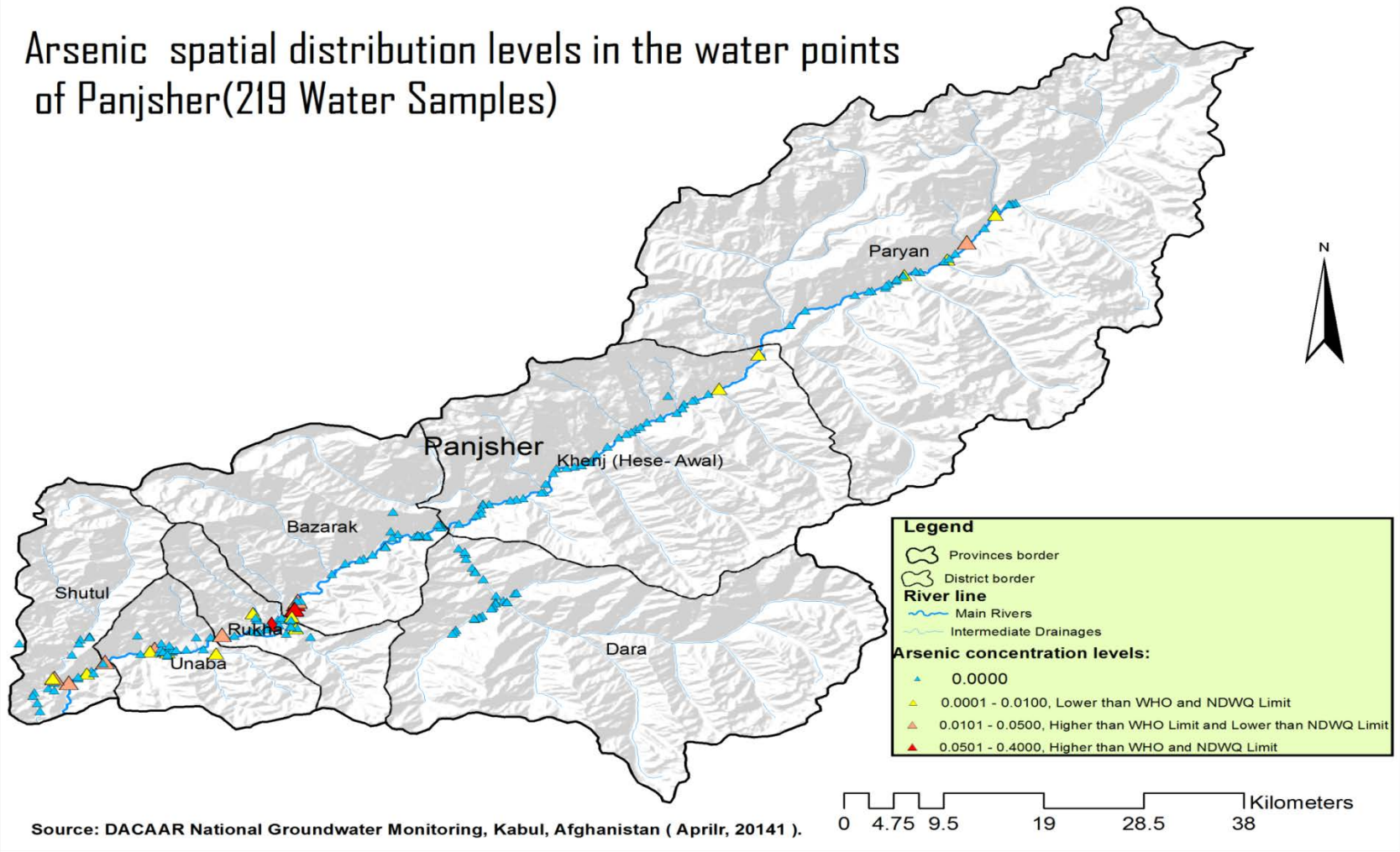
Arsenic contamination in Afghanistan

Arsenic spatial distribution levels in the groundwater of Afghanistan (1758 Water Samples)



Arsenic Contamination in Panjsher Province

Arsenic spatial distribution levels in the water points of Panjsher (219 Water Samples)



Arsenic Health effects:

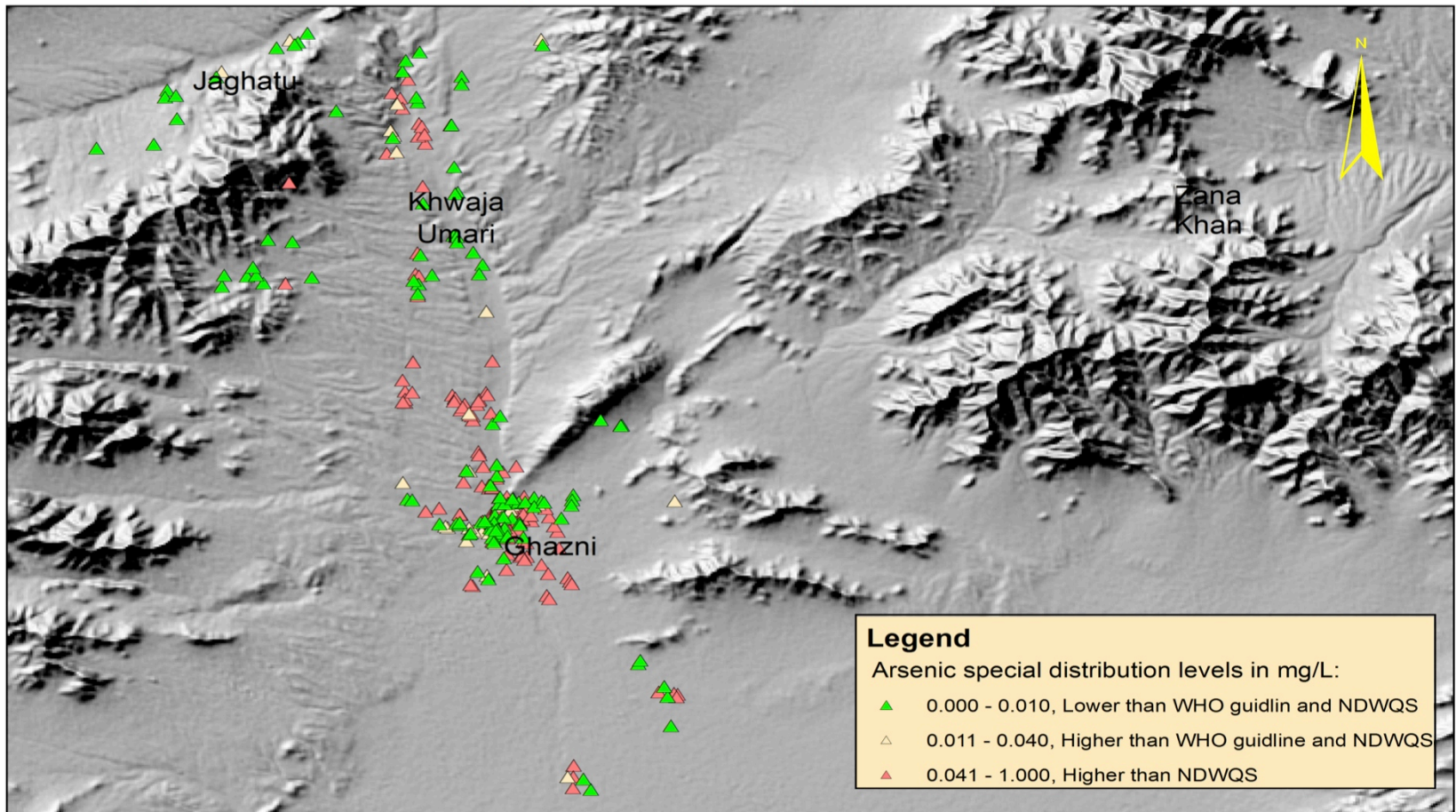
- Cancers-bladder, lungs, skin, kidneys and nasal
- Passages, liver and prostate
- Arsenic effect nervous system as well as heart and blood vessels
- Birth defects and reproductive problem

Arsenic Health effects in Panjsher province.



Arsenic Contamination in Panjsher Province

Arsenic spatial distribution levels in the groundwater of Ghazni province Ceter (348 Water Samples)

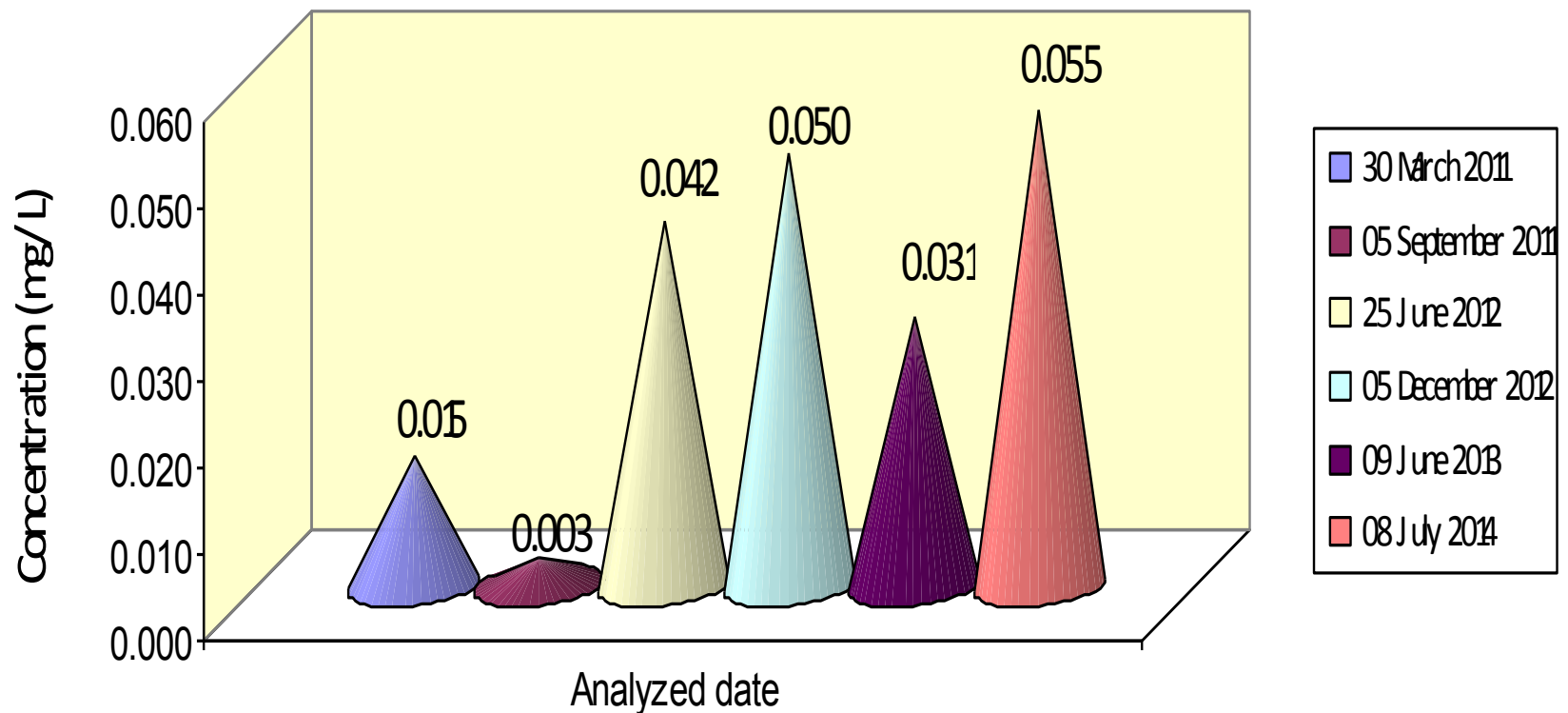


Source: DACAAR National Groundwater Monitoring, Kabul, Afghanistan (October, 2011).

0 2.25 4.5 9 13.5 18 Kilometers

Time series Arsenic contamination trend in Ghazni city.

GWID B9 (Ghazni City) Timeseries Arsenic concentration Value

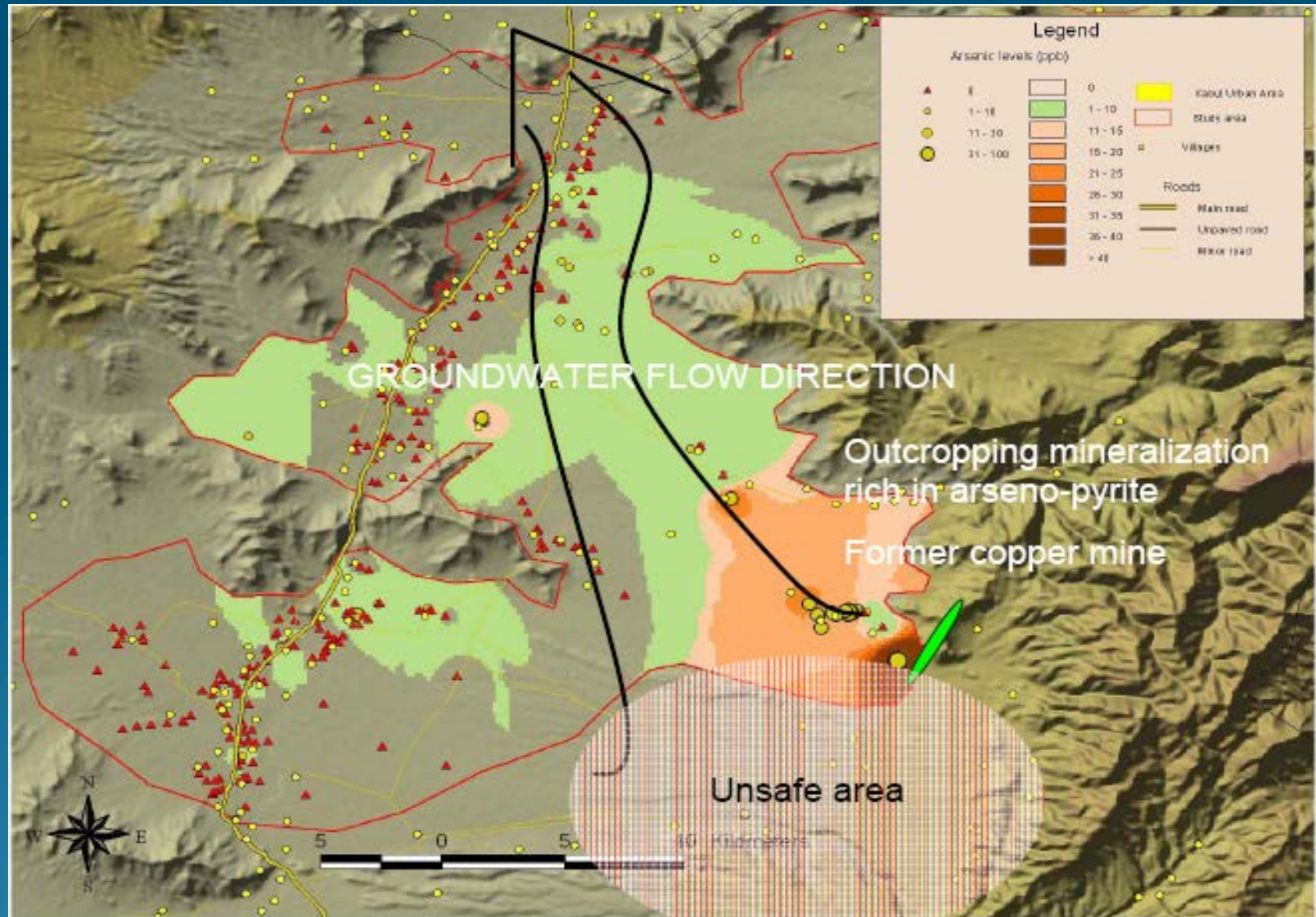


Arsenic Health effects in Ghazni province.

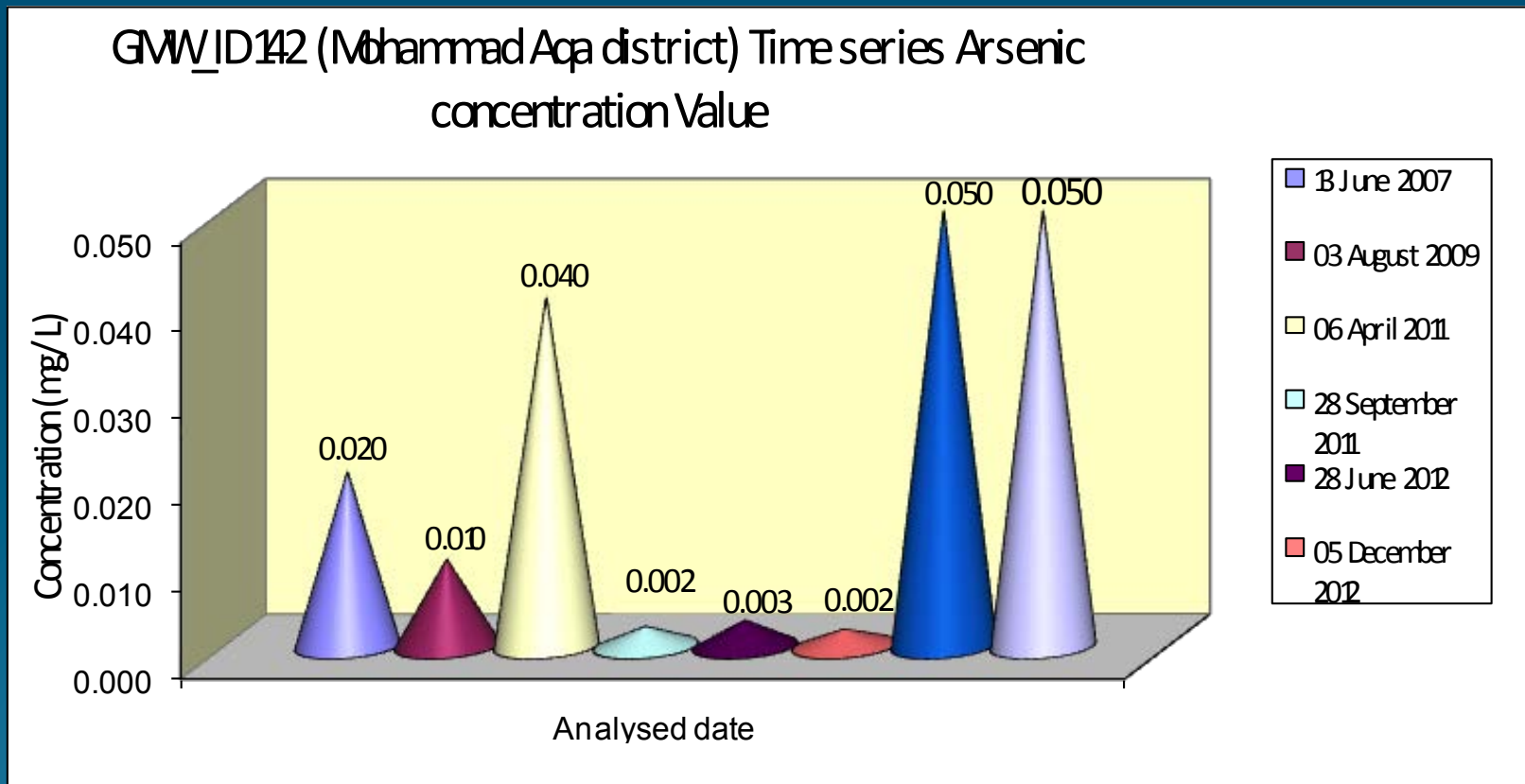


Arsenic contamination in Logar Province

DACAAR

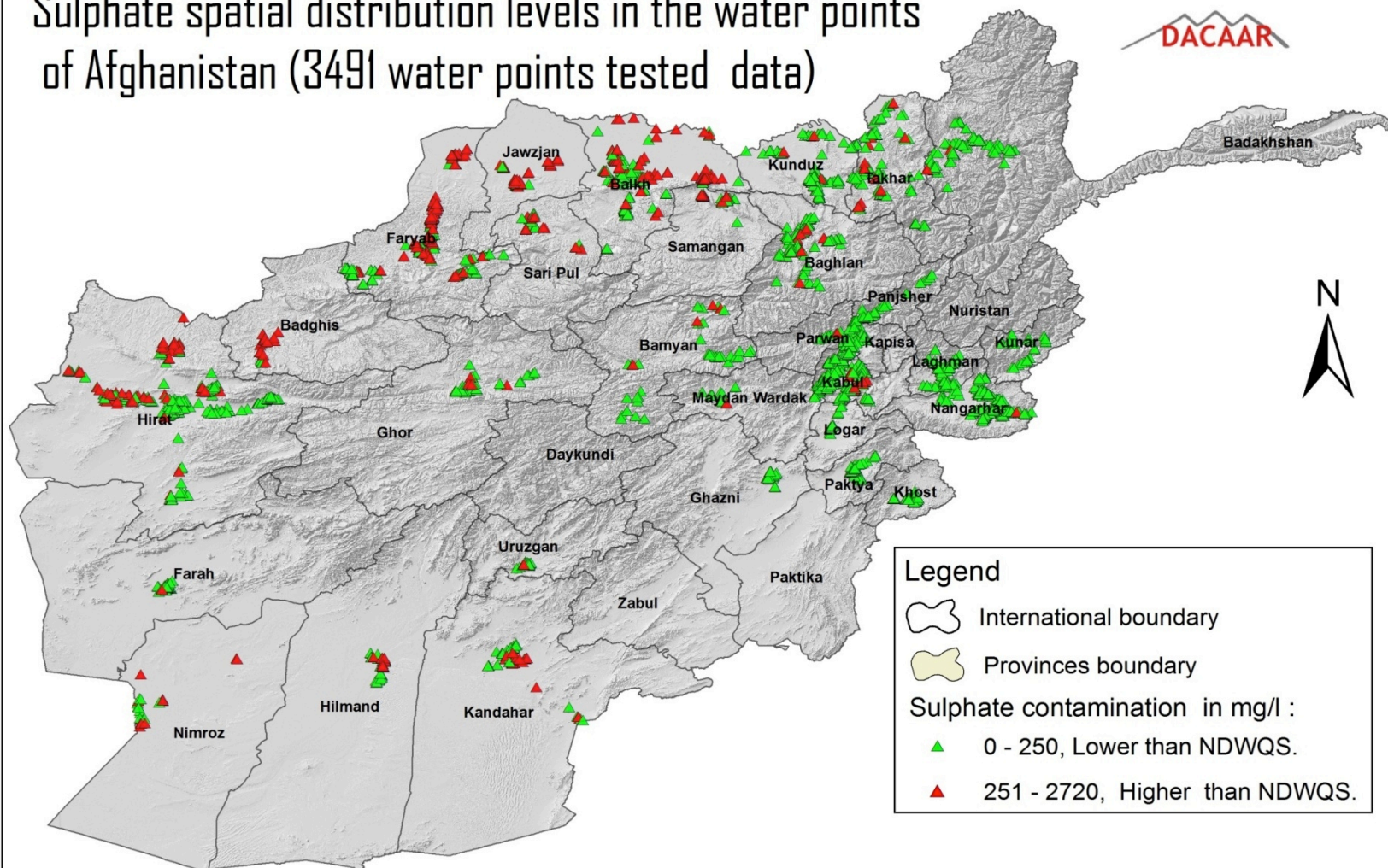


Time series Arsenic contamination trend in Mohammad Agha district.



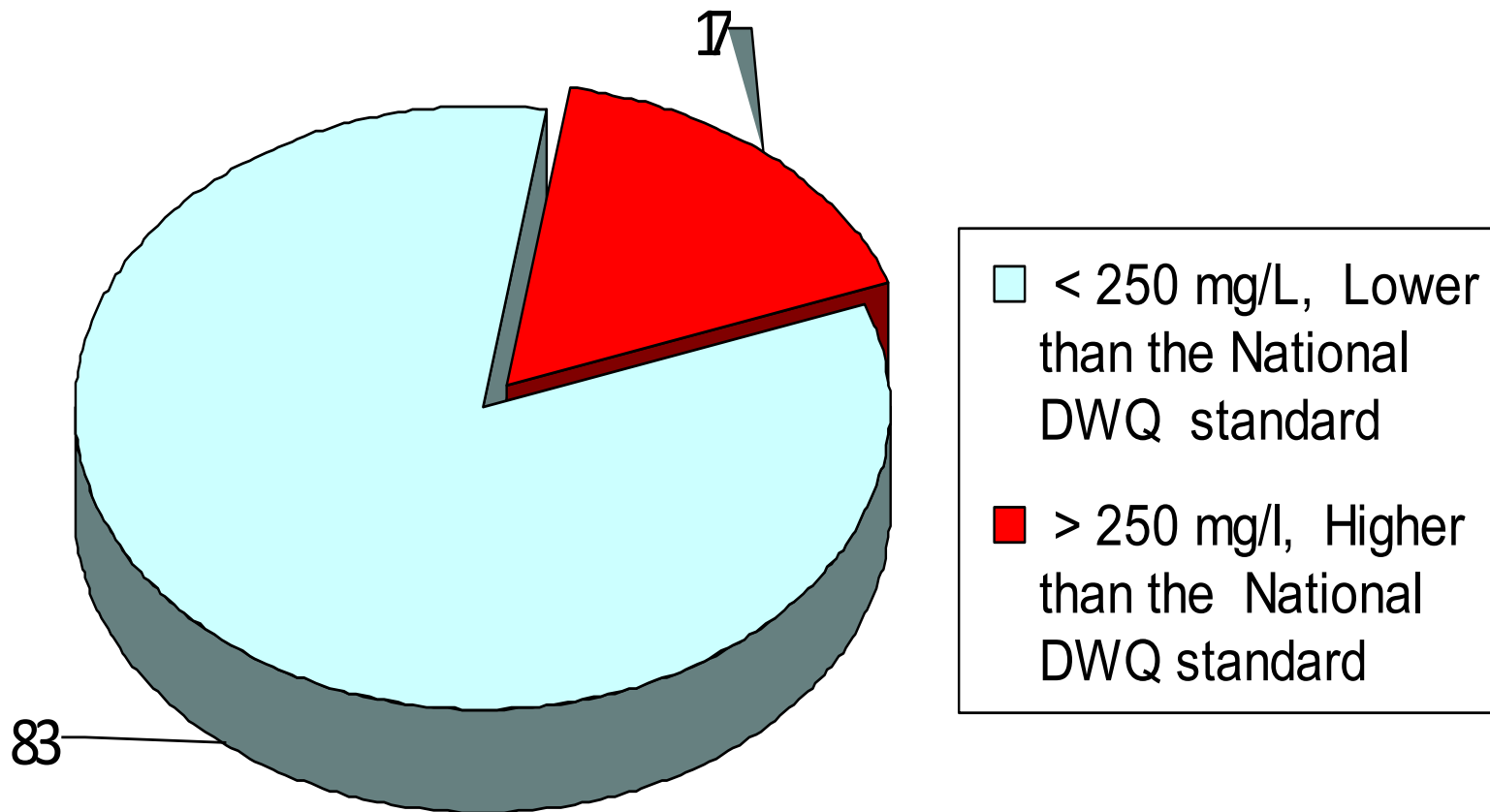
Sulphate contamination in Afghanistan

Sulphate spatial distribution levels in the water points of Afghanistan (3491 water points tested data)



Source: DACAAR National Groundwater Monitoring, Kabul, Afghanistan (August, 2014).

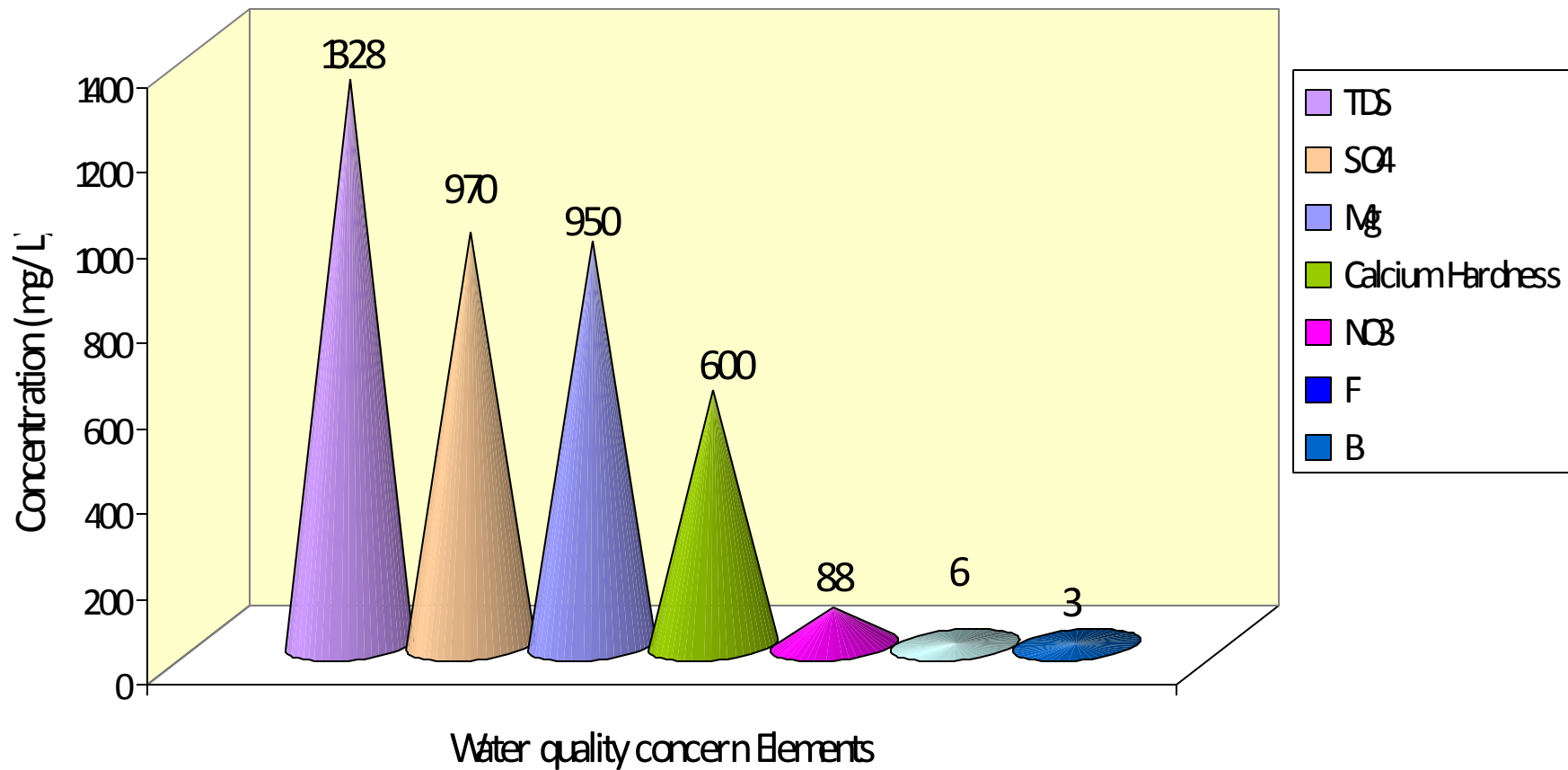
Percentage of Sulphate distribution levels in the water points of Afghanistan (3491 water points tested data)



Qala-i- Naw (Centre of Badghis province) pipe scheme

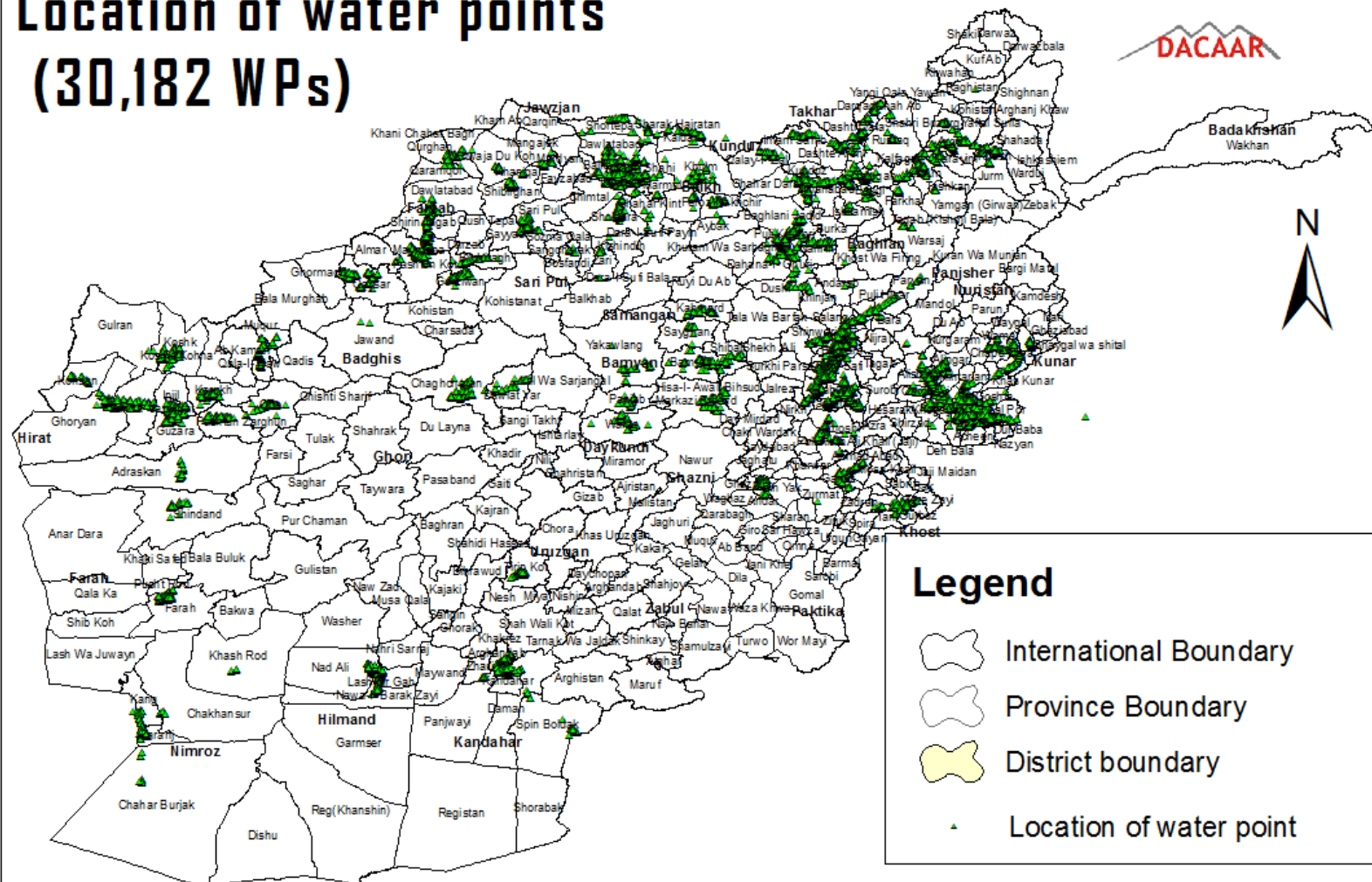


Qala-i-New water supply system based on the Qarghito Spring



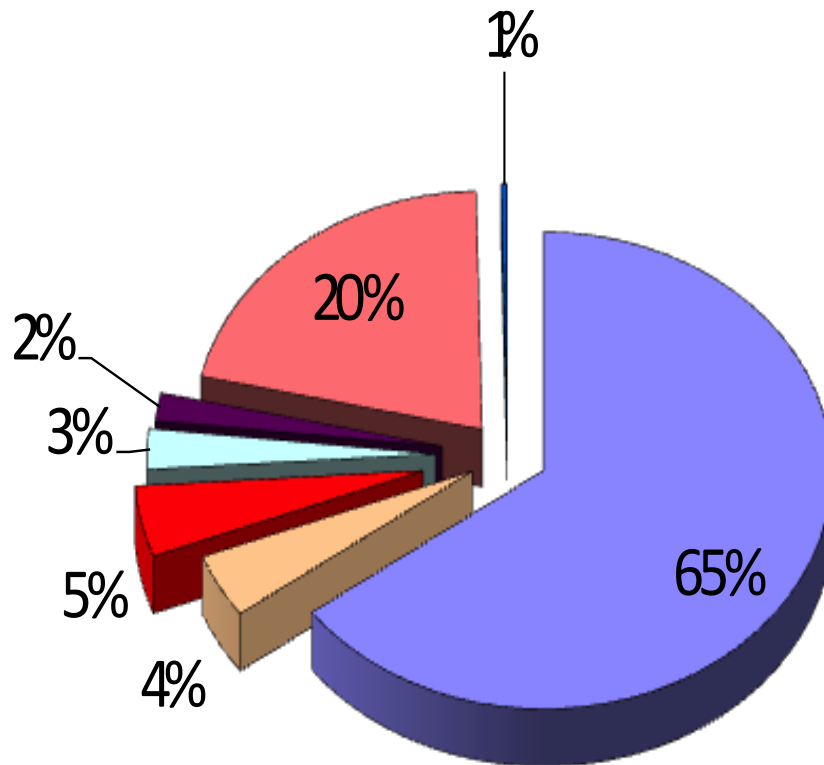
Quantitative status of WPs functionality

Location of water points (30,182 WPs)



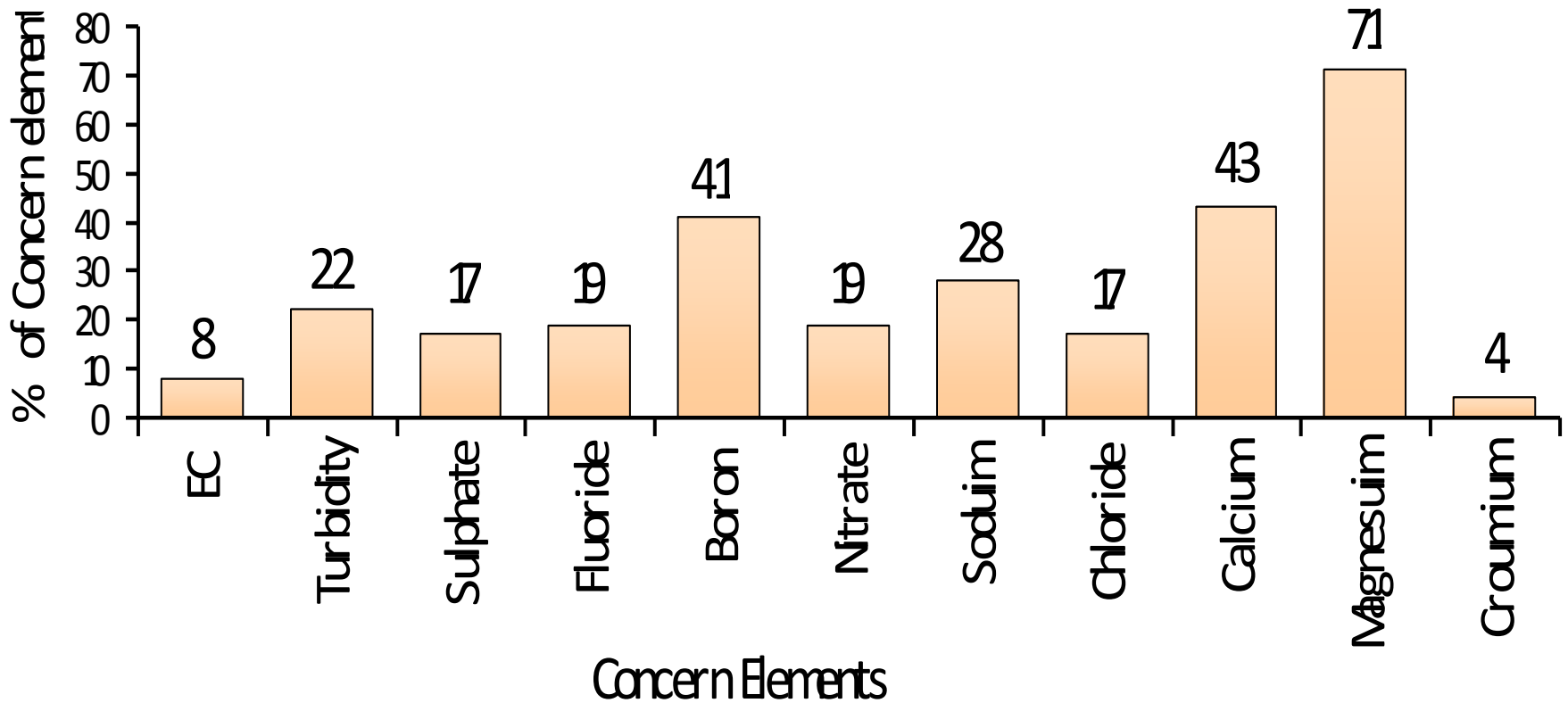
Source: DACAAR National Groundwater Monitoring, Kabul, Afghanistan (August, 2014).

Water points functionality (working condition) status

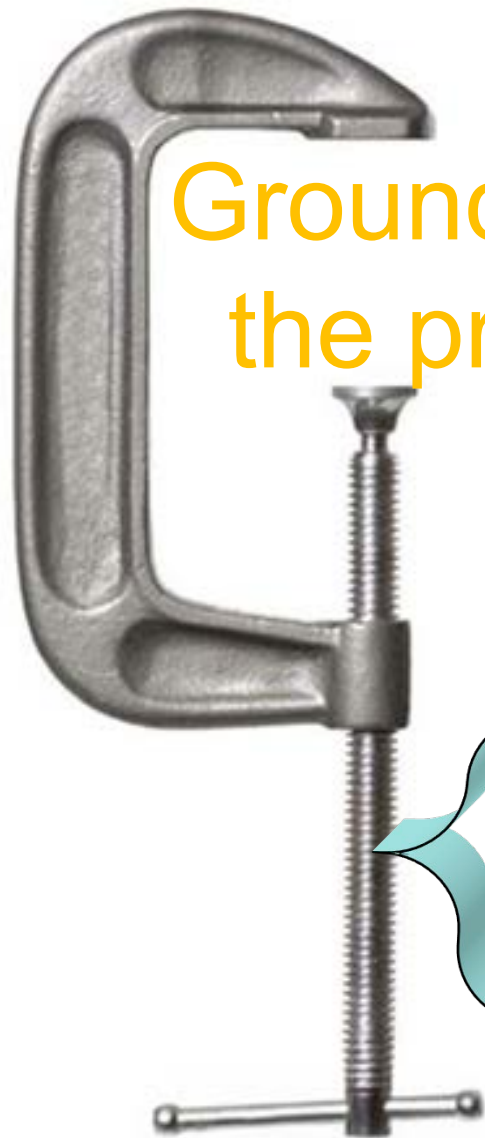


- Functional
- Working with bucket
- Dried up
- Collapsed
- Plugged/ Abandoned
- Multiple Problem
- Enclosed

Percentage of Concentrations exceeded NDWS (3481WSs)



Early Warning Signal



Groundwater is under
the pressure

Climate
Change
Over
exploitation
Population

Prevent
water
relevant
unexpected
events
rather
waiting
for them to
occur

Challenges facing water resources:

- Inadequate management of water Resources
- Inadequate efforts for WR development, protection, conservation and sustainability
- GW dependent country, insufficient GW storage and very high population growth
- Over-exploitation, dewatering aquifer, and Deteriorating WQ
- Climate change and efficient and effective policy
- and strategy for mitigation and adoption

Challenges.....



- Insufficient of data and data information systems
- Insufficient WR policies, legislation, and enforcement.
- Insufficient research of alternative water sources
- Difficulty in quantifying the WR potential

Recommendations and policy relevant options

- Management initiative and improvement
- Enabling environment
- Initiate technical or conservation and protection measure
- Building the capacity of water sector professionals
- Conducting research projects

Thank you for
your attention