

**MITIGATION OF THE WATER  
SCARCITY CAUSED BY SEVERE  
DROUGHTS IN SRI LANKA**

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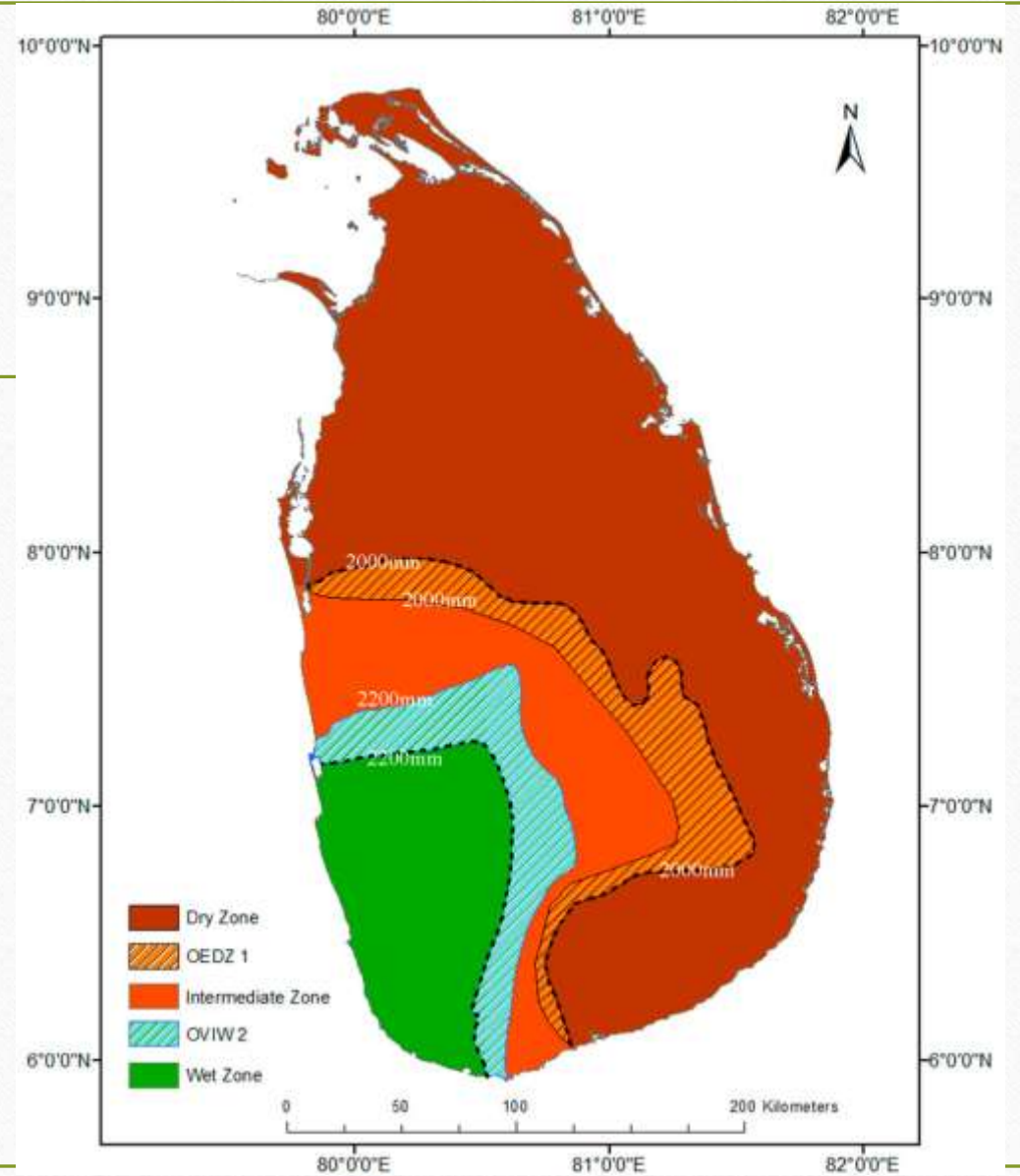
# Description of Problem to be Addressed

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- More than 2/3<sup>rd</sup> of Sri Lanka belongs to “Dry” and “Arid” zones where the annual rain fall is below 1900mm & 1200mm respectively. The main water supplying method of dry zone is large tanks and shallow wells. Most of them run totally dry for several months during drought period in each year, causing hardship to locals.

# Climatic zones in Sri Lanka

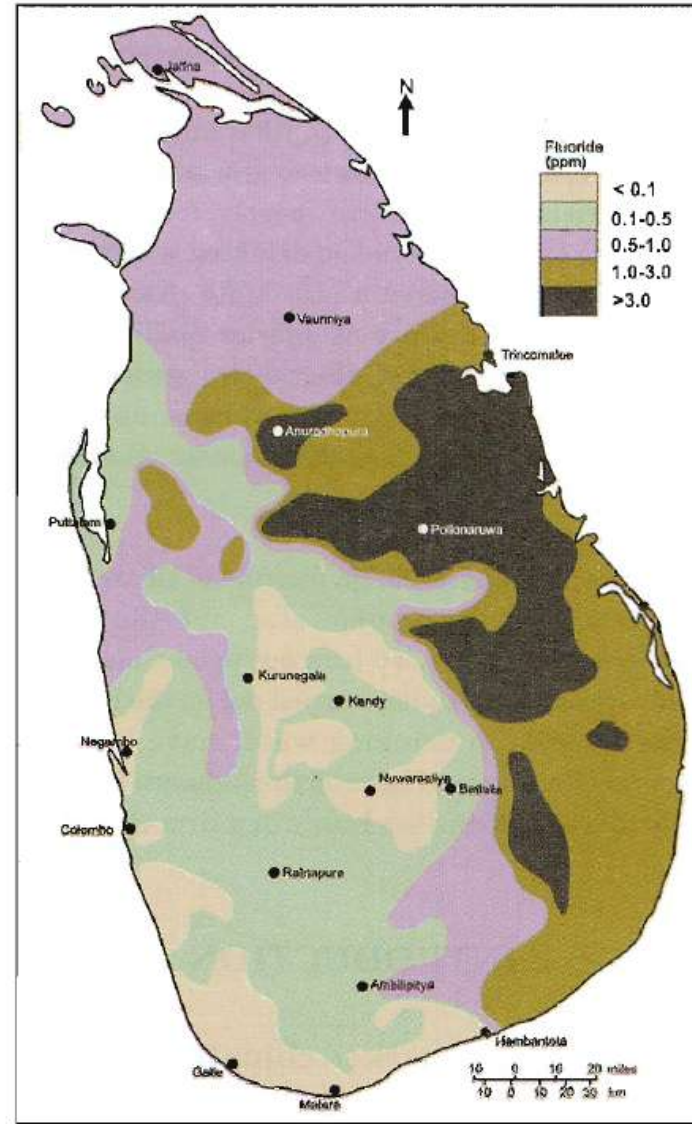
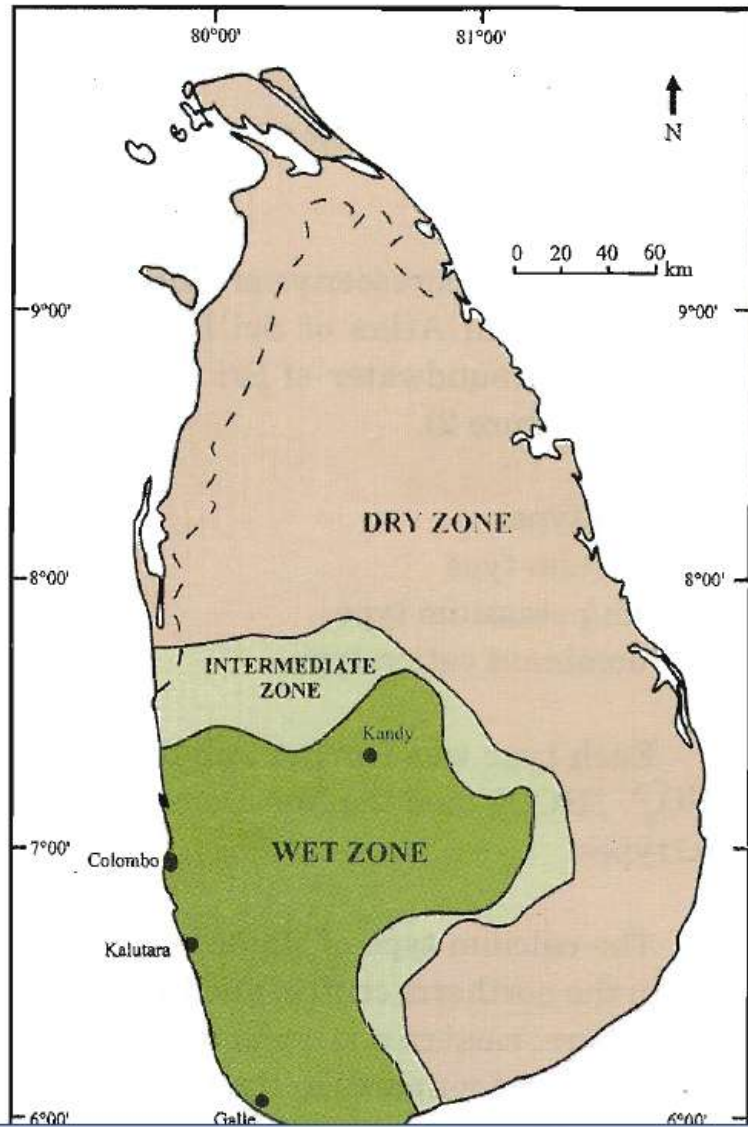
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# Problem with drinking water in the dry zone

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- Quality of the surface and near-surface water is very poor. This is evident from the water quality analysis as well as the data on chronic water born diseases in the area.
- Surface water is highly contaminated with agrochemicals as well as natural pollutants such as fluoride
- In the years with severe droughts, people in dry zone face serious problem of finding clean drinking water

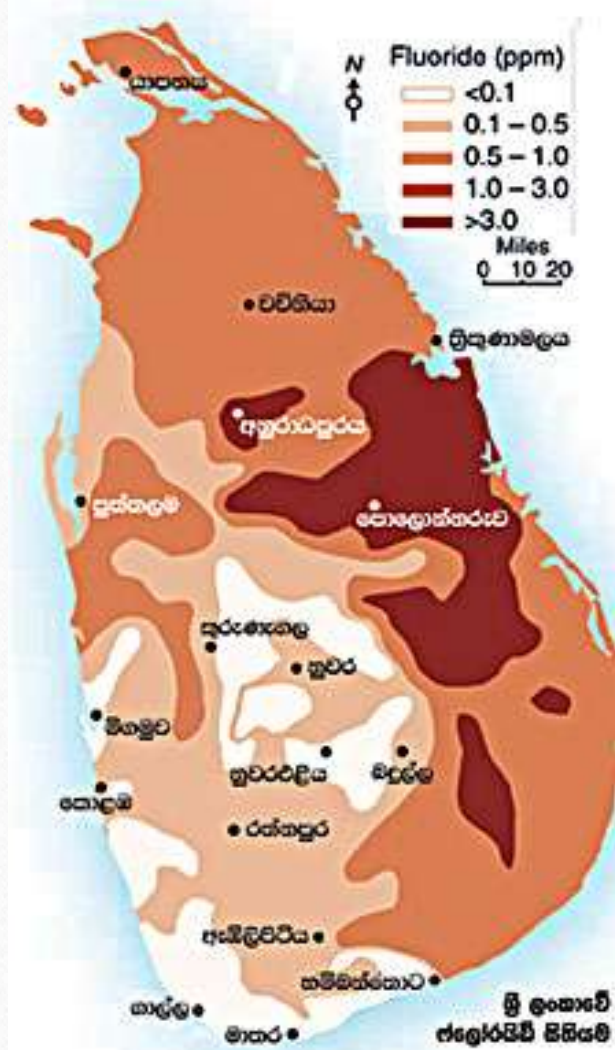


Distribution of fluoride

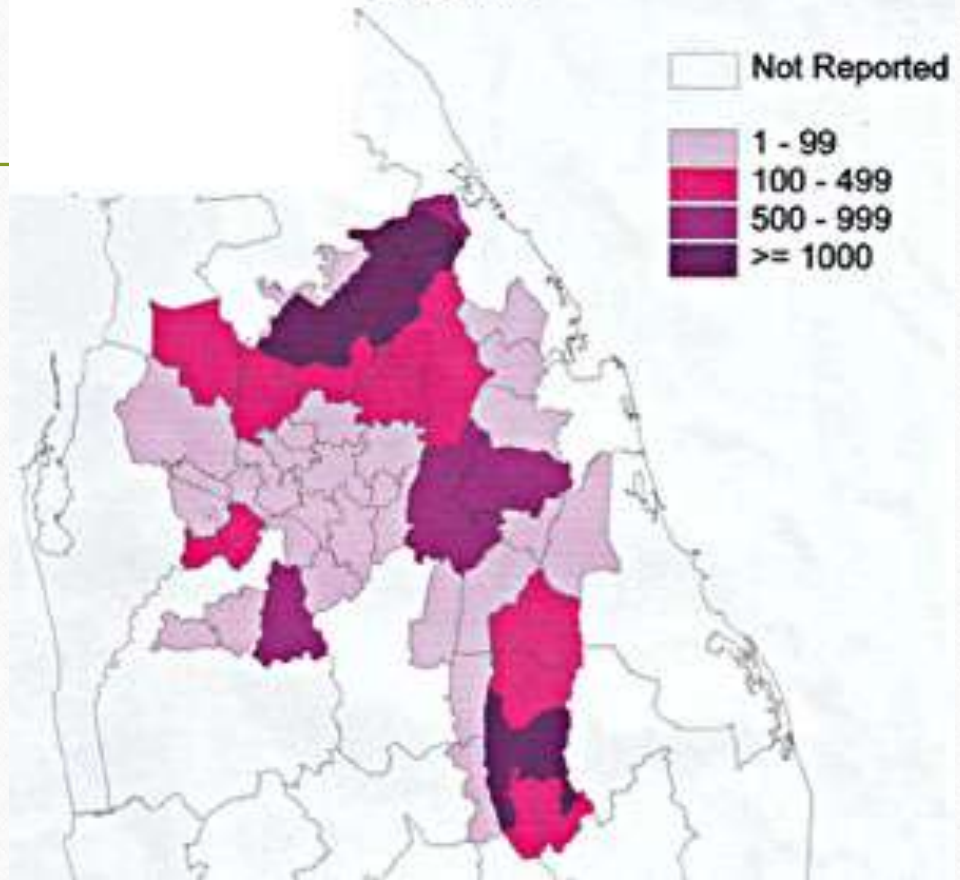
# Current Situation

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- Chronic Kidney Disease of unknown etiology (CKDu) is spreading in the dry zone. Although there is no agreement about the exact cause, it is clear that CKDu has direct and strong connection with surface water
- During drought periods, government supplies drinking water from other areas, transported using tankers, or even as bottled water, to the people in affected areas. This is a costly and temporary solution.
- It is important to address the root of the problem and find a long-term solution rather than providing temporary relief during drought periods.



Number of CKDu Patients in Divisional Secretarial Area Level Sri Lanka





# Proposed solution to mitigate the drinking water problem in the dry zone of Sri Lanka

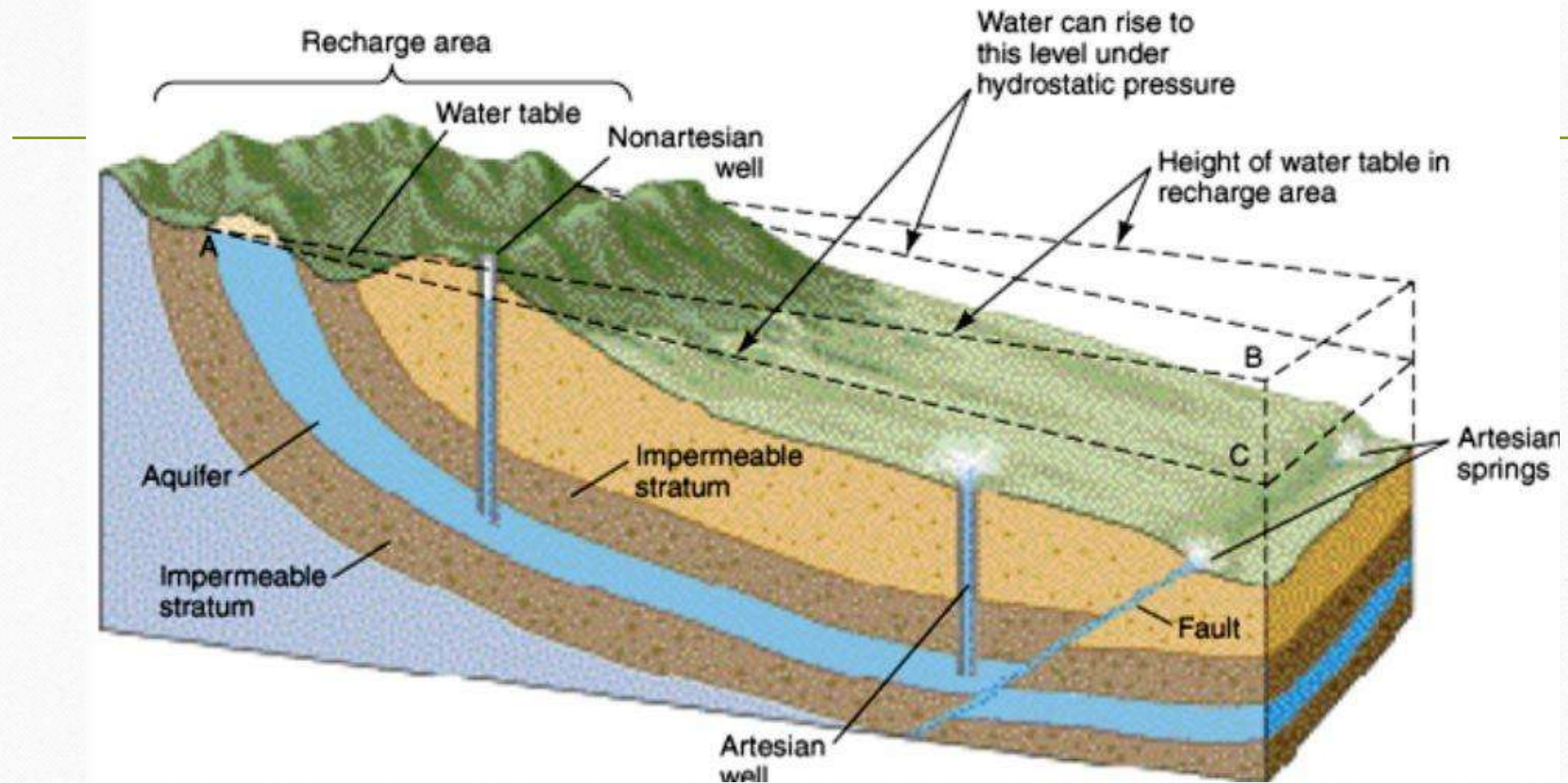
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Most of water acquiring systems in that area is shallow depths and are affected by droughts and contamination.

There are deep confined aquifers, which are fed and recharged by the wet highlands. They are not affected by contamination.

Tapping those deep water reservoirs through deep tube wells and distributing in a systematic manner will provide a permanent solution to the drinking water problem.

# Groundwater model

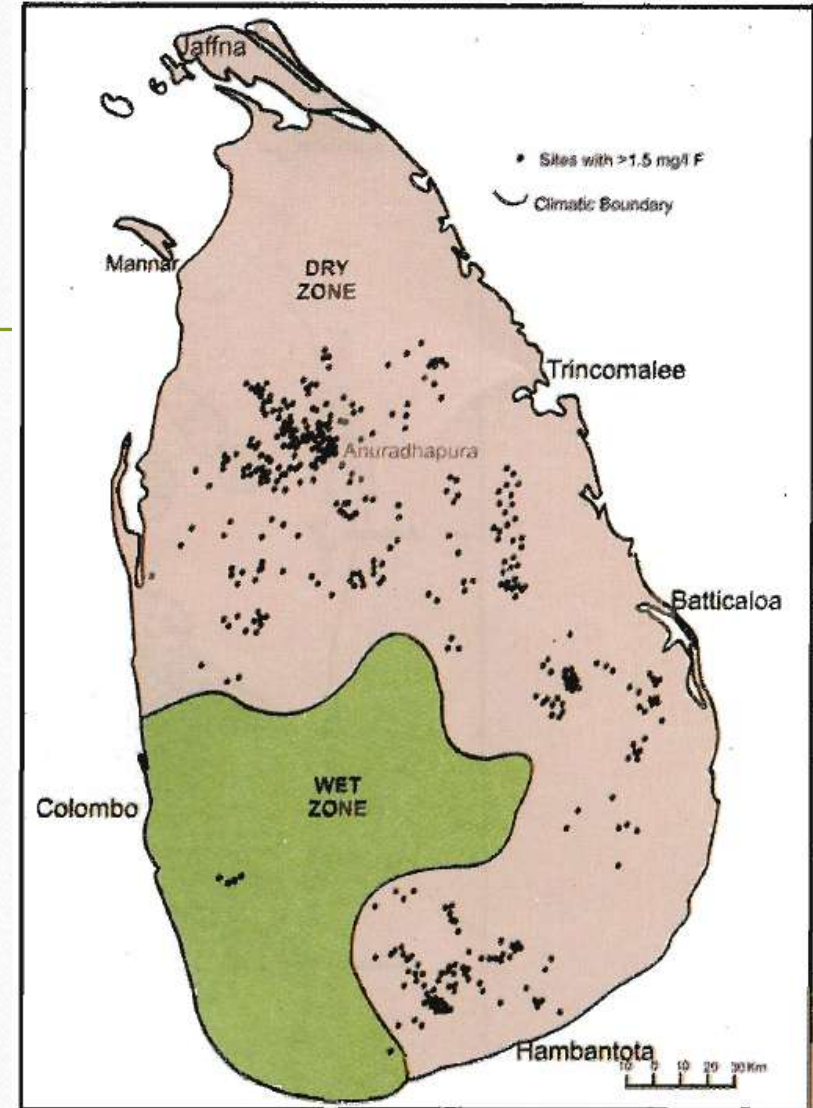


# Methodology proposed

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- Use of modern geophysical techniques to investigate the deep groundwater resources for drinking water and assessing the quality, quantity as well as the environmental impact of the extraction of groundwater
- Establish storage facilities and systematic distribution system with the government intervention
- Transfer of modern knowledge to a wider community and developing policies and a sustainable system for distribution of clean drinking water

Distribution of  
Fluoride in deep wells  
in Sri Lanka  
(Dissanayake, 1991)



# Methodology

## Geophysical Techniques

- ❖ Magnetotelluric (MT) Survey (deep down to 100's of km)

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- ❖ Time Domain ElectroMagnetic (TDEM) soundings (near surface)
- ❖ Magnetic Survey (near surface– about 200m depth)
- ❖ Resistivity Survey (near surface)

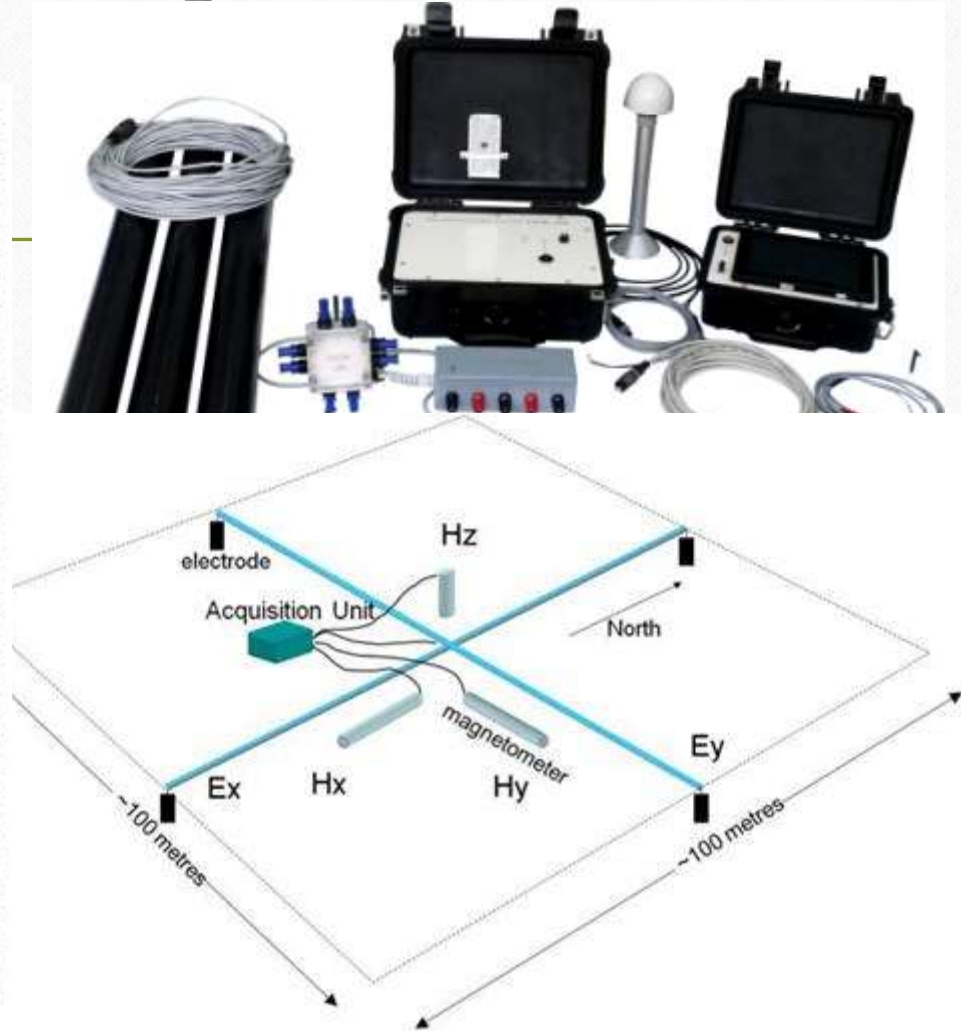
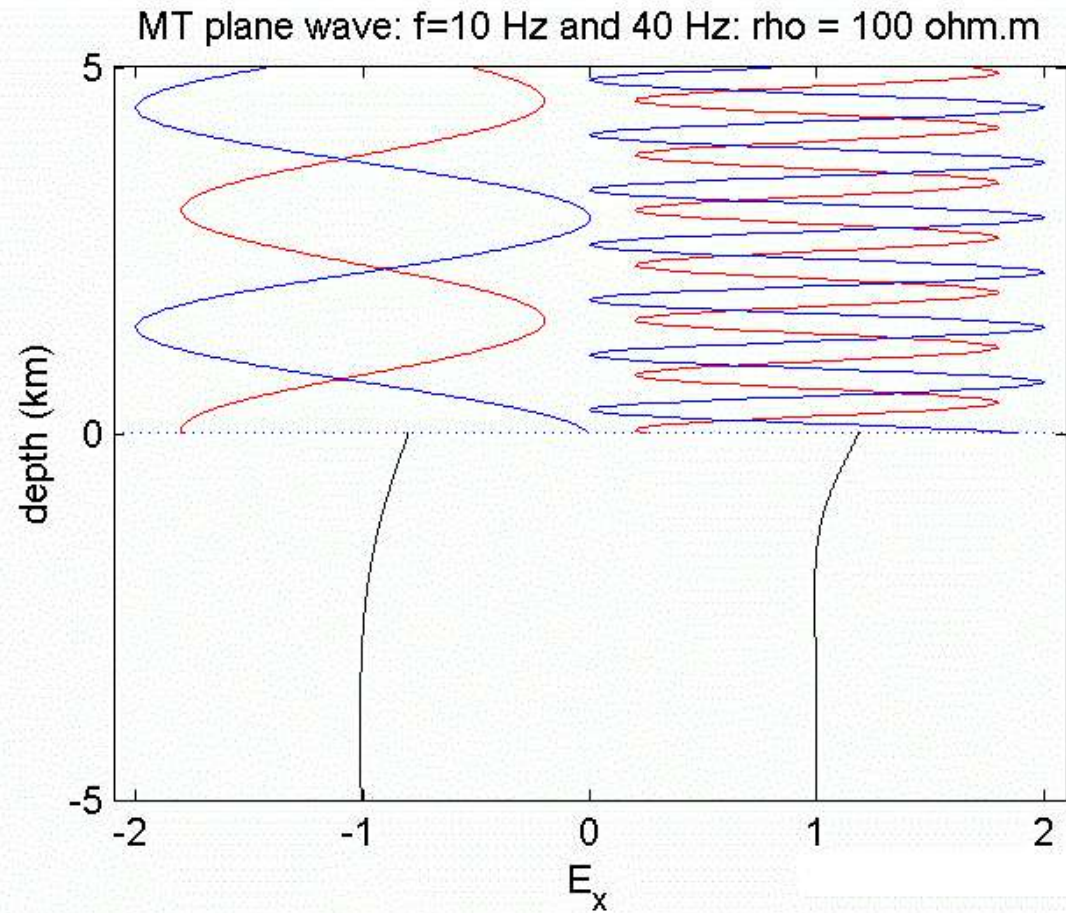
## Geochemical Techniques

- ❖ Measuring chemical & physical parameters of water

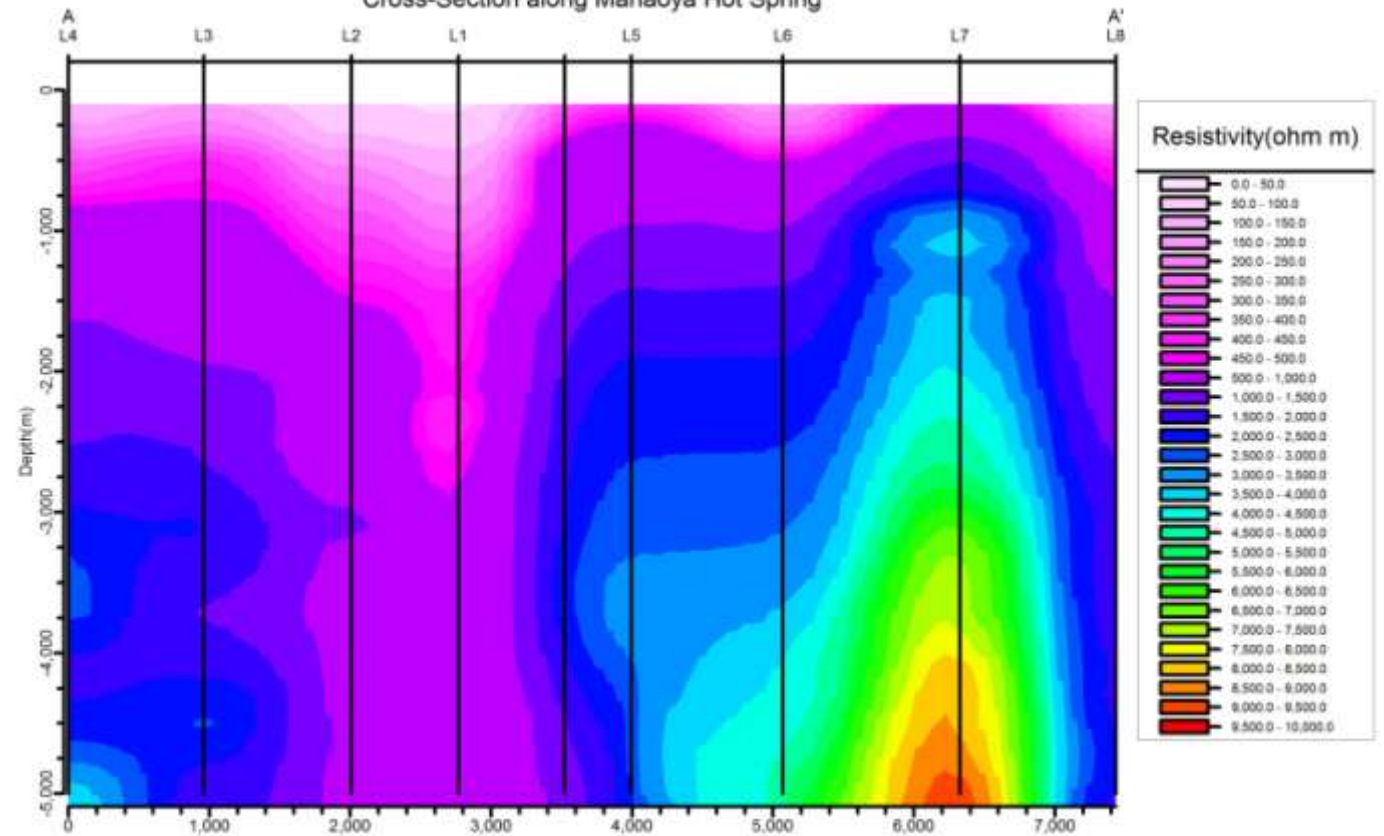
## Geological Mapping

- ❖ Mapping structural features

# Magnetotelluric (MT) – A passive method

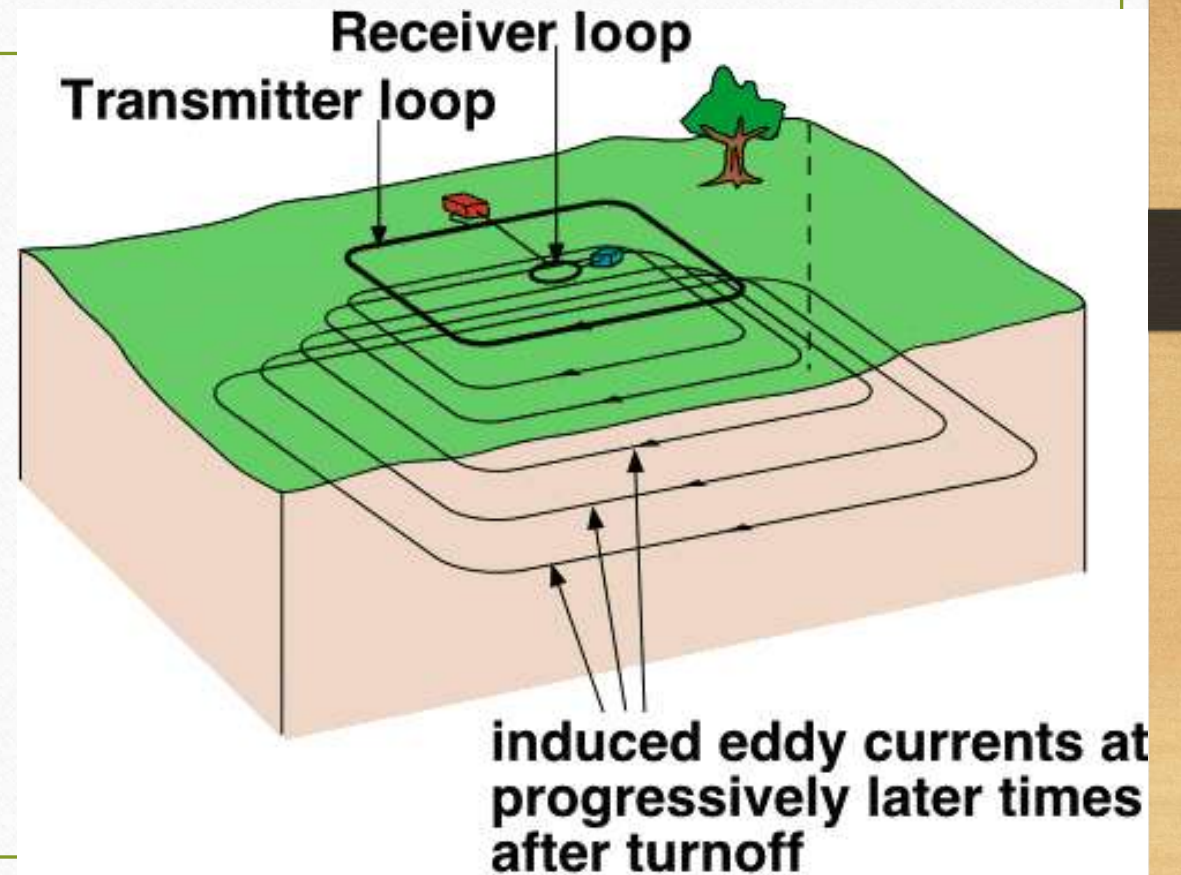


Cross-Section along Mahaoya Hot Spring



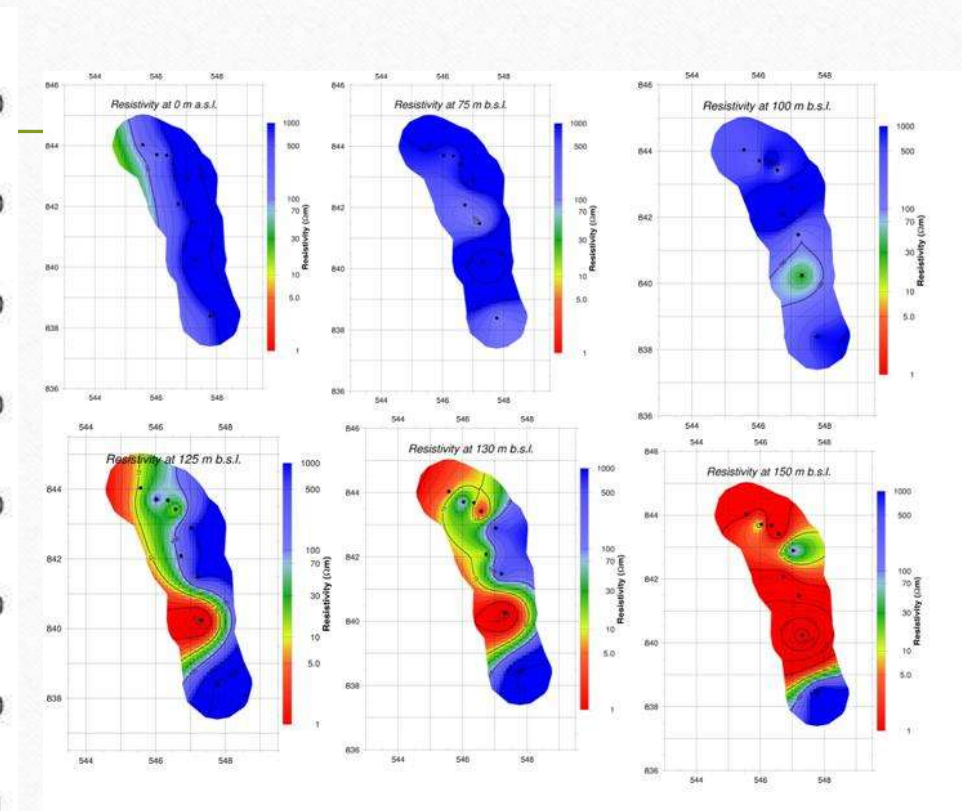
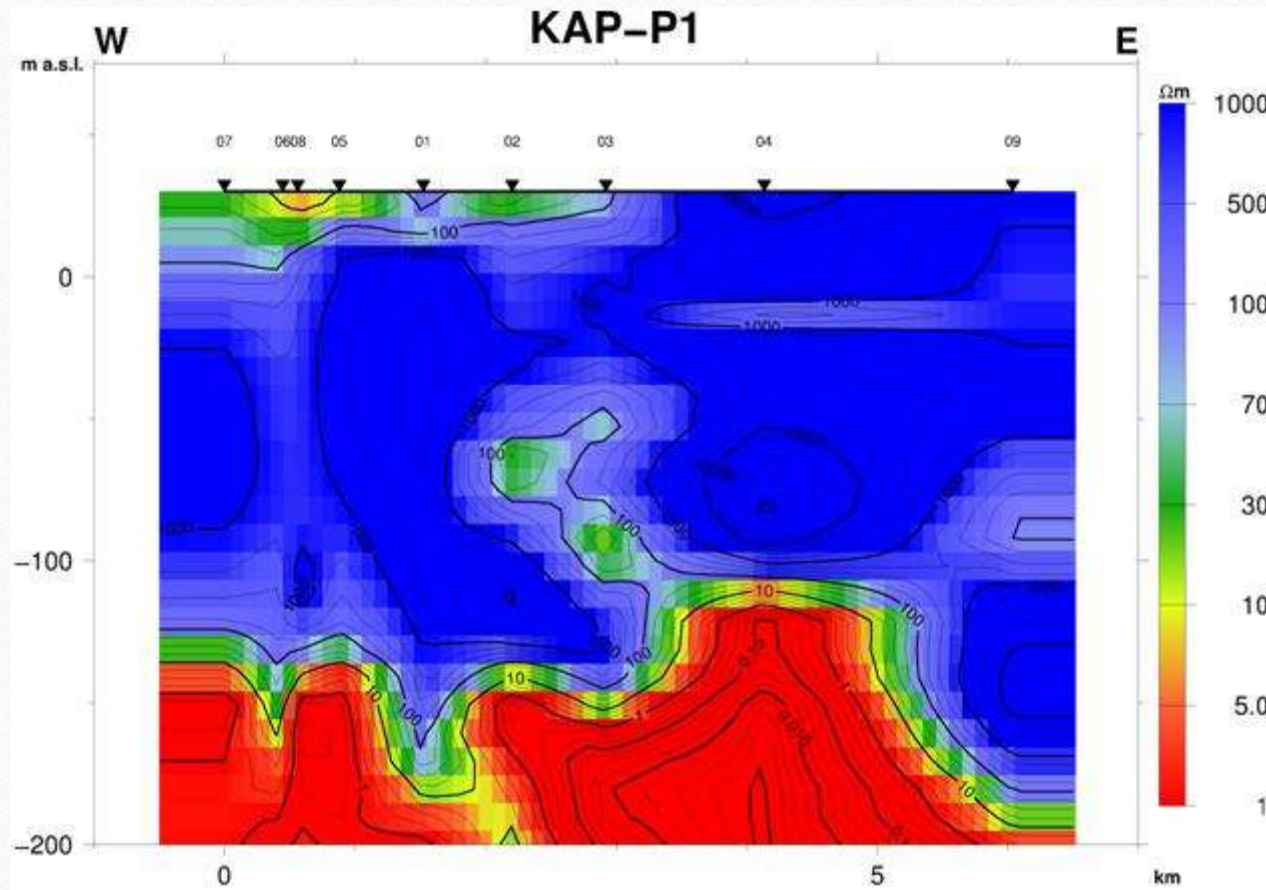
# Time-Domain Electro-magnetic (TDEM)

- Does not inject current into ground
- Induces EM field in the ground and measures earth's response
- Response is measured when the source is turned off → signal/noise ↑





# Time-Domain Electro-magnetic (TDEM) results



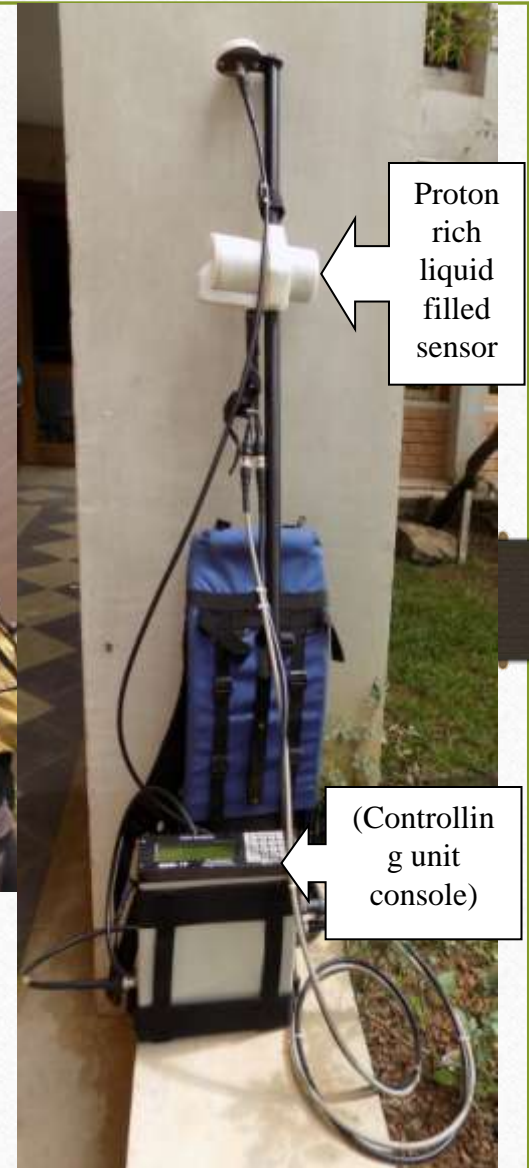
# Resistivity and Magnetic techniques



Resistivity meter

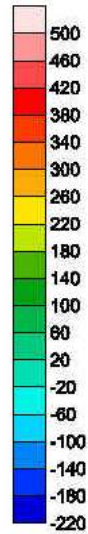
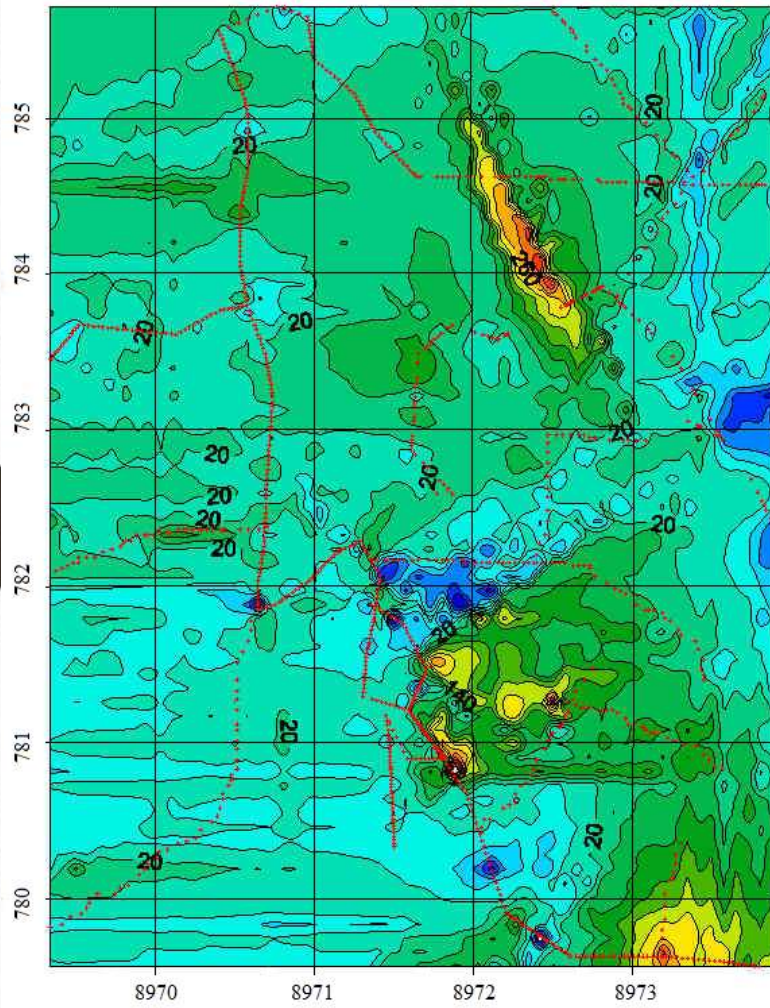


Portable magnetometer

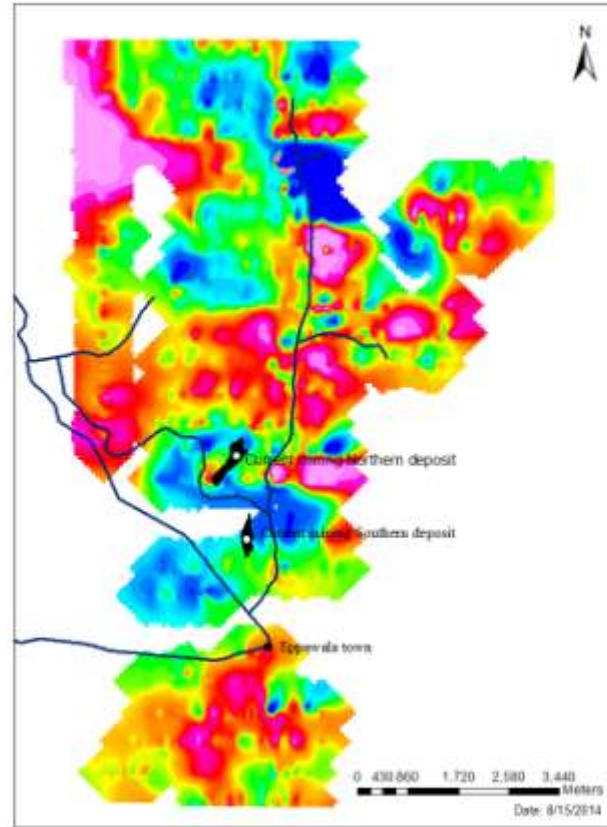


Proton rich liquid filled sensor

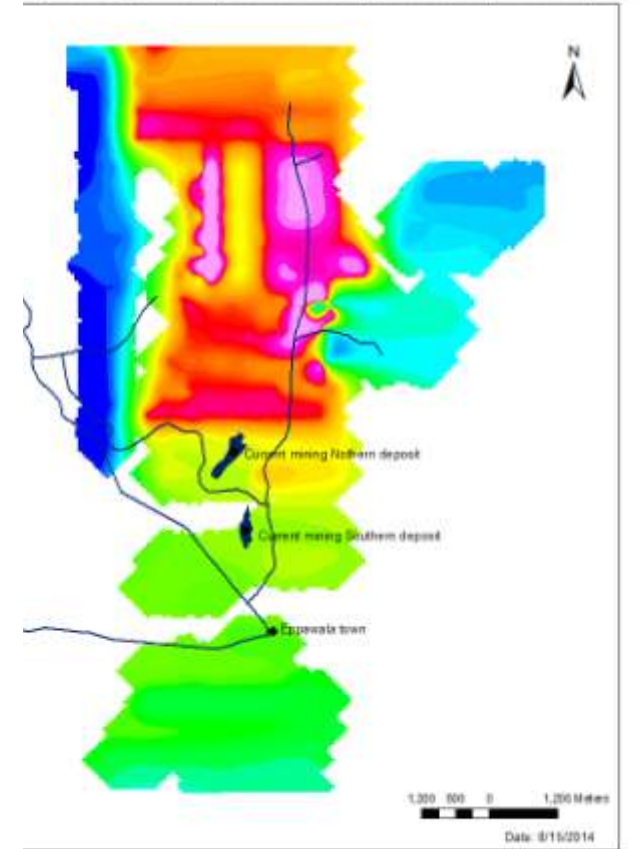
(Controlling unit console)



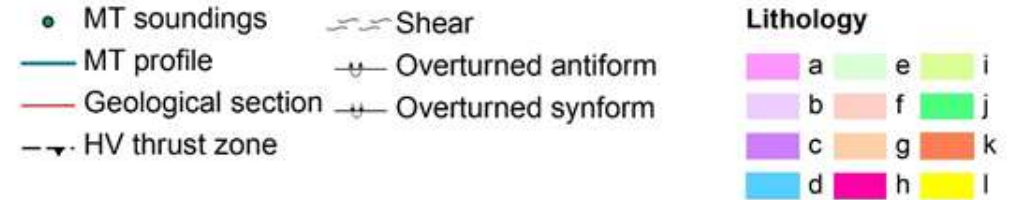
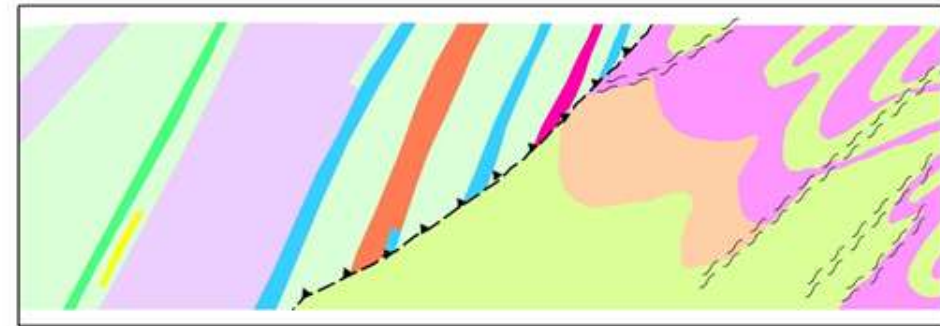
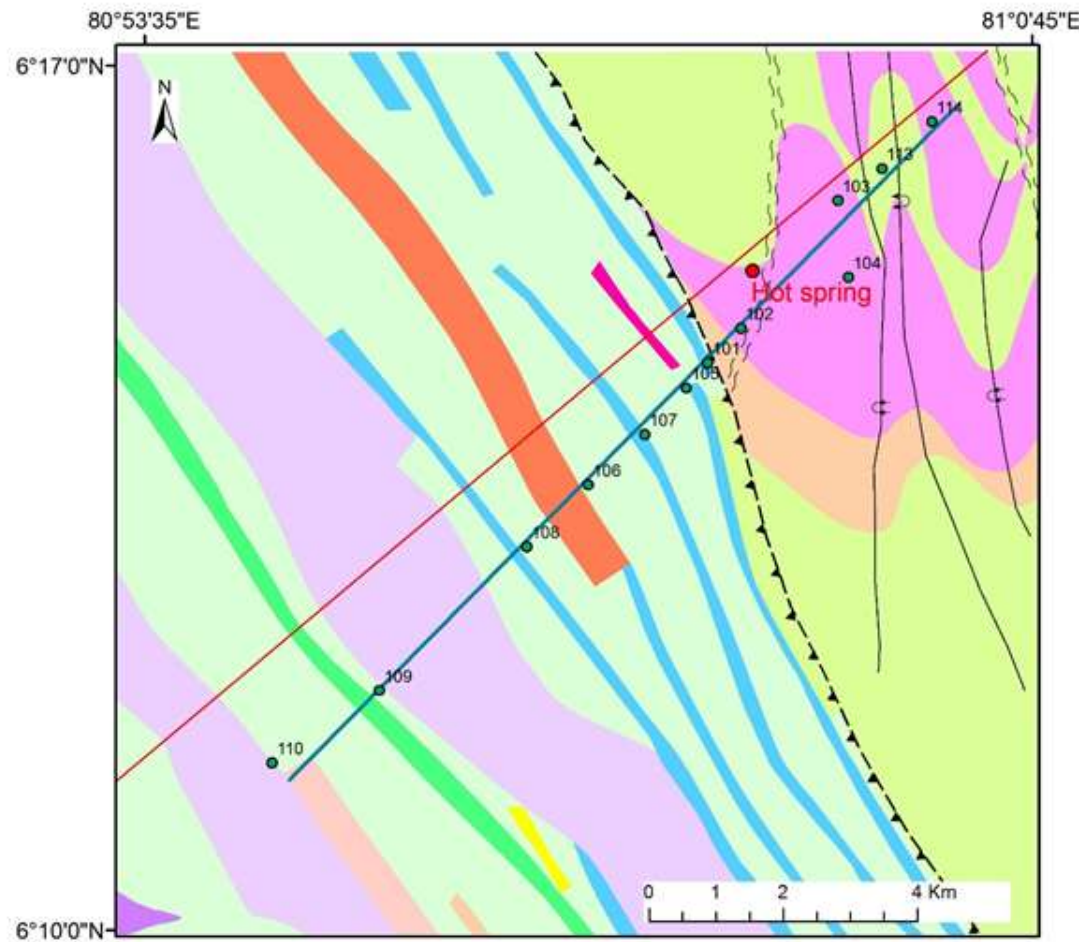
Magnetic anomaly map over Eppawala apatite deposit



Analytical signal map over the Eppawala apatite deposit



# Geological Mapping



## Geological cross section of Mahapalassa area.

a- garnet gneiss, b- charnockitic gneiss , c- charnockite, d- marble, e- garnet biotite gneiss, f- quartzo feldspathic gneiss, g- garnetiferous quartzo feldspathic gneiss, h- pegmatite, i- hornblende biotite gneiss, j- hornblende gneiss, k- garnet sillimanite biotite gneiss, l- quartzite

# Recommendations

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- Prepare detailed map of aquifers and the potential water capacities of them in a regional scale
- Use geophysical techniques and geological data to identify potential water resources
- Establish deep wells to extract the uncontaminated ground water
- Conduct pump tests and geochemical tests to estimate the quality and quantity of water
- Build storage tanks and efficient distribution system
- Train local people to maintain the facilities

