APPLICATION OF ISOTOPE HYDROLOGY IN WATER RESOURCES MANAGEMENT

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Content of Presentation

- Introduction
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- Activities related with Isotope Hydrology
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Introduction

- Myanmar is endowed with abundant water resources but here are problems, related to their uneven spatial and temporal distribution. The monthly distribution of river flows closely follows the pattern of rainfall , which means that about 80 percent flows during monsoon season (May-October) and 20 percent in the dry season (November-April)
- The north –south direction of Myanmar's mountain ranges is reflected in the flow of its major rivers, of which two are international.
- The total utilization of the nation's water resources is only about 5 percent of the potential. It is clear that the physical potential for further development of water resources in Myanmar is quite substantial. However with the increase of population and enhanced need for socio-economic development, the guiding principles of the NWP are crucial to support the desired green and sustainable development.
- Ground water is increasingly being used and will need further study based on reliable data collection and analysis for proper groundwater management through the country. Natural diffused arsenic contamination of ground water is a widespread problem.
- Climate change is a long-term effect. It is not only a long-term fact that look into the future. The vulnerability of Myanmar's water resources is evident. Climate change adds to the vulnerability and the demands on adequate water resources management.

National Water Policy

- The National Water Policy (NWP) of Myanmar is the first integrated water policy for the watersheds, rivers, lakes and reservoirs, groundwater aquifers and coastal and marine waters, approved in March 2014.
- ***By 2020 Myanmar has become a water efficient nation with well-developed and sustainable water resources based on fully functional integrated water resources management system.***

What is Isotope Hydrology?

- Isotope hydrology is a nuclear technique that uses isotopic dating to measure and estimate the age, origins, and the movement of water within the hydrologic cycle.
- The isotopes in water can be traced through water sources to determine where the source is, how it is recharged, and if it is at risk of contamination.
- Why Use Isotope Hydrology?

  - Of all the water on Earth about 2.5% of it is freshwater sources.

  - Most of this water is locked in the icecaps, in soil moisture, or in deep underground aquifers

  - Water is key for development of life. According to the IAEA about 1/3 of the global foods come from irrigation, which requires sustainable ground water sources.

  - About 1.1 billion people today go without freshwater and 2025 2/3 of the world's population may live in countries with high shortages of water.

- Applications of radioisotope in hydrology are based on the general concept of “tracing” in which intentionally introduced isotopes or naturally occurring (environmental) isotopes are employed.
- A comprehensive understanding of a ground water system is necessary for a sustainable resource development without adverse effects on the environment.
- Natural isotopes applied in isotope hydrology are ^{14}C, $^{3}H(T)$ which are arisen from the reaction of nitrogen and neutron from cosmic radiation.
- Stable isotopes such as ^{18}O, ^{2}H are applied to determine water recharge mechanism and interaction between surface and ground waters.

IAEA TC Program – MYA7006 (2016 - 2017)

"Establishment of Infrastructure for Application of Isotope Hydrology in Water Resources Management"

Scope

- To establish the monitoring structure from the field sites
- To build the capacity in the application of isotopic techniques in groundwater resources investigation
- To establish the facilities for the application of isotope methodology for sustainable management of water resources
- To investigate the groundwater flow dynamics, recharge rate and quality for sustainable groundwater resource management in Myanmar

Vision and Mission

- **Vision**

To establish the database for the groundwater resource management by application of isotope hydrology.

- **Mission**

To establish the database for the isotopes and chemical composition of groundwater resource management by application of isotope hydrology.

Objectives

- To develop the human resources and facilities to improve technology and practical work in the sustainable groundwater resource management in Myanmar.
- To strengthen the capability of infrastructure for application of isotope techniques in water resources management.
- To prevent the contamination of surface water and groundwater.
- To establish the database for the isotopes and chemical composition of groundwater resource management by application of isotope hydrology.

Coordinate and Cooperate with other Related Water Agencies

- Department of Atomic Energy (DAE) of the Ministry of Education
- Department of Research and Innovation (DRI) of the Ministry of Education
- Irrigation and Water Utilization Management Department (IWUMD) of the Ministry of Agriculture, Livestock and Irrigation.
- Department of Meteorology and Hydrology (DMH) of the Ministry of Transport and Communication
- Directorate of Water Resource and Improvement of River systems (DWIR) of the Ministry of Transport and Communication
- Currently, several government agencies and departments under different Ministries are engaged independently both in surface and groundwater use but the extent and type of use are different from one another.

Activities

- Expert Mission (14.7.15 to 16.7.15)

  Objectives :

  - To do need assessment and awareness of the isotopic technique in groundwater resources management
  - To select sites for the implementation of the National project by coordinating and cooperating with other related water agencies

- National Workshop on Application of Isotope Techniques in Water Resources Assessment, Fieldwork Designing and Sampling Demonstration (15-8-16 to 19-8-16)

  Objectives:

  - To give the knowledge on isotope hydrology
  - To get the experience on fieldwork designing and sampling – (in Kyaunggon Township, Ayeyarwaddy Division)

Expert Mission of 2016-2017 TC projects (14.7.15 to 16.7.15)
at MOST Head Office, Nay Pyi Taw.

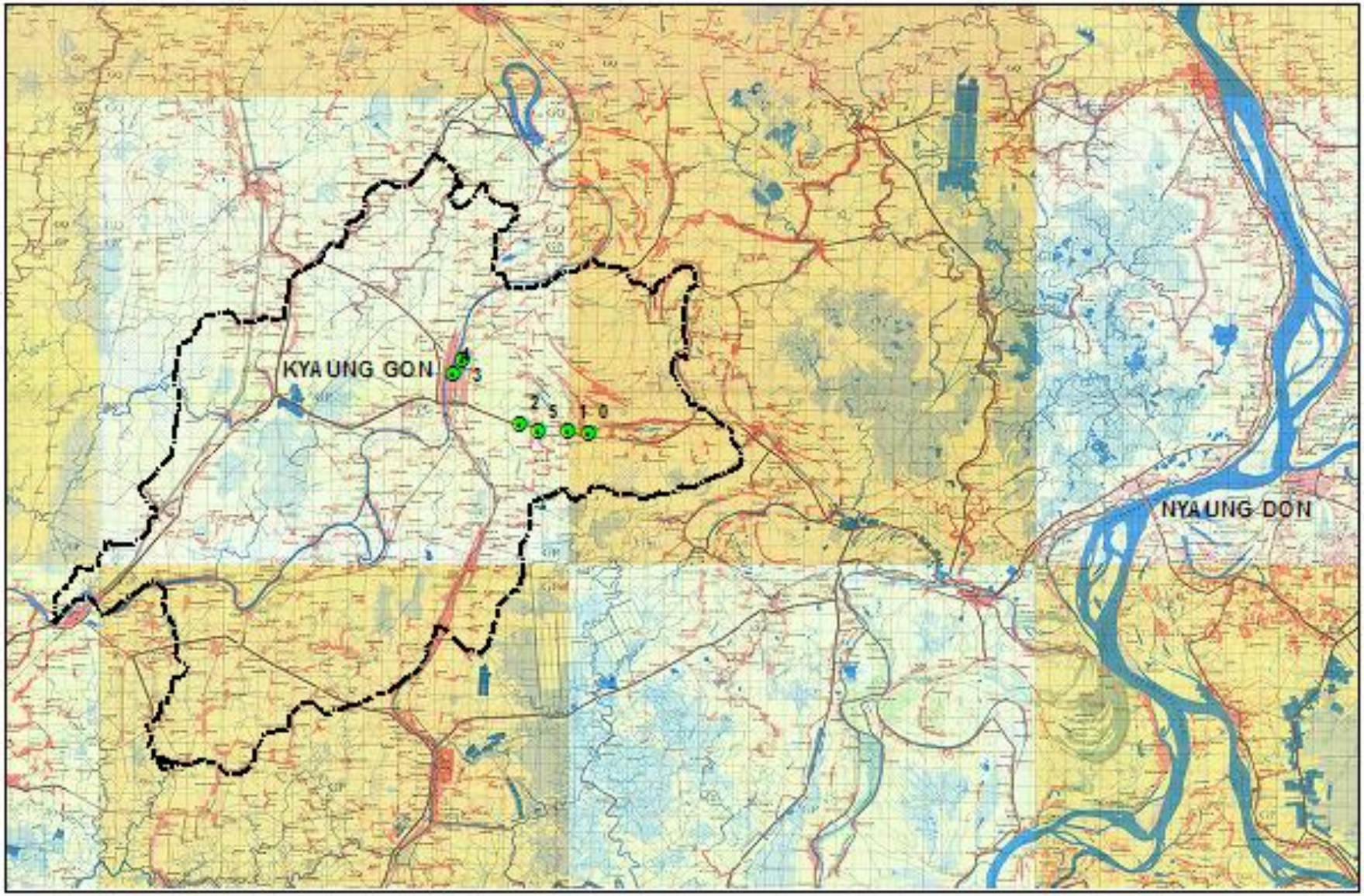

National Workshop on "Application of Isotope Techniques in Water Resourc
Assessment, Fieldwork Designing and Sampling Demonstration"
(MYA 7006)
15-19 AUGUST 2016
YANGON,
Mandalay vi Palace
15/08/2016 09:32


18/08/2016 15:24

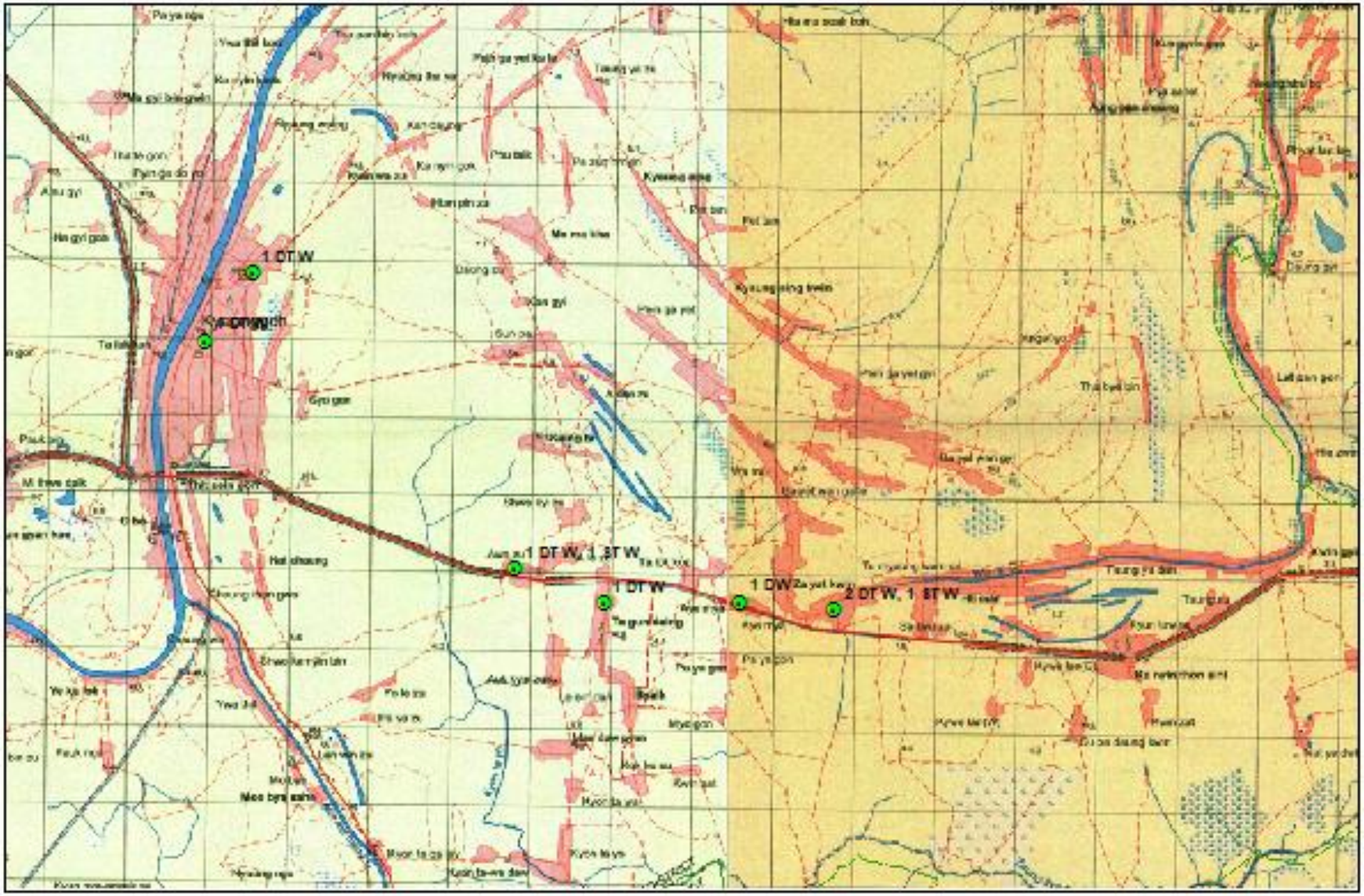
Fieldwork Designing and Sampling

- Township: Kyaunggon Township
- Division: Ayeyarwaddy Division
- Samples: 9 samples from 8 tube wells and 1 dug well
- Date: 16 – 8 – 2016

TOWNSHIP LOCATION AND FILED STOPS



COLLECTED WATER SAMPLES



Water Samples collected from Kyaunggon Township, Ayeyarwaddy Division

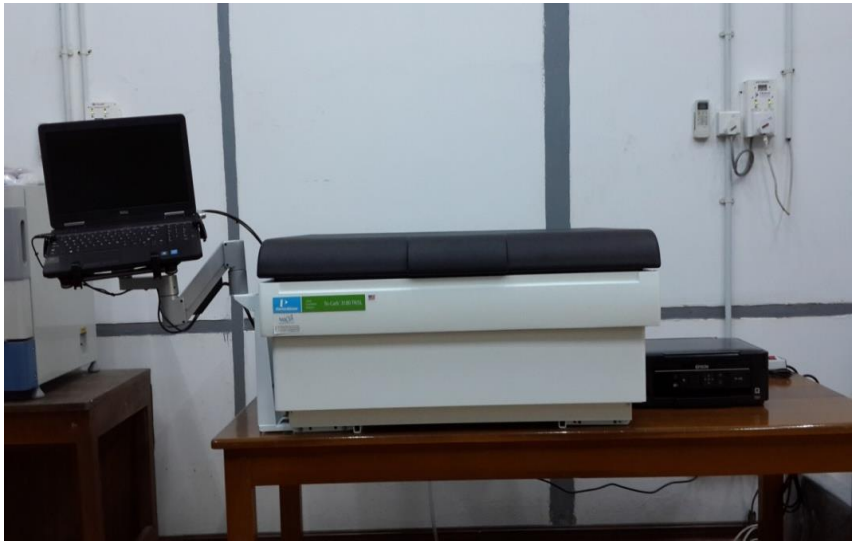
Sr. No.	Sample No.	Location	Type	Latitude	Longitude	SWL (ft)	Depth of Well (ft)	Screen Level (ft)
1	Sample 1	DRD, Zayat Kwin Village, Kyauggon Township, Ayeyarwady Region	Deep Well	N= 20° 45.015'	E= 97° 04.126'	8'	400 ft, Phi = 4"	380-470'
2	Sample 2	Daw Thaung kywe House, Zayat Kwin Village, Kyauggon Township, Ayeyarwady Region	Shallow Well				110 ft, Phi = 11/2"	
3	Sample 3	WRUD, Zayat Kwin Village, Kyauggon Township, Ayeyarwady Region	Deep Well	N= 20° 45.015'	E= 97° 04.126'	16'	409 ft, Phi = 4"	
4	Sample 4	Zayat Kwin Village, Kyauggon Township, Ayeyarwady Region	Deep Well	N= 20° 45.015'	E= 97° 04.126'	20'	600 ft, Phi = 4"	480-500'
5	Sample 5	No. (2) Quarter, Pyinnyar Yarmi Monastry, Mhaw Thay Village, Kyaunggon City	Deep Well	N= 20° 45.012'	E= 97° 04.126'	13'	600 ft, Phi = 4"	430-475'
6	Sample 6	Dhamma Sargi Oak Twin Monastry, Thit Seint Gon Group, Sut Kwin Village, Ayeyarwady Region	Deep Well	N= 20° 45.015'	E= 97° 04.126'	25'	400 ft, Phi = 4"	360-380'
7	Sample 7	U Aung Myo Kyi, Awa Su Village, Tagondaing Group, Ayeyarwady Region	Deep Well	N= 20° 45.015'	E= 97° 04.126'		600 ft, Phi = 4"	
8	Sample 8	U Than Nyunt House, Awa Su Village, Tagondaing Group, Ayeyarwady Region	Shallow Well	N= 20° 45.015'	E= 97° 04.126'	5'	80 ft, Phi = 1 1/2 "	
9	Sample 9	Khay Mar Thi Monastry. Aye Mya Village, Byke Group, Ayeyarwady Region	Dug Well	N= 20° 45.015'	E= 97° 04.126'	1.08-0.7 = 0.38 m	22.5 ft Phi=6'	

Send to IAEA for Isotopic Analysis

Visit to the Laboratories

Isotope Hydrology Laboratory

• Installed Equipment
- Tri-Carb 3180TR/SL Liquid Scintillation Analyzer (LSA)
• Required attached-systems with LSA
- Enrichment system for ^{3}H
-Sample preparation system ^{14}C
Liquid water isotope analyzer will be set up.



- Stainless steel Containers for standard sample

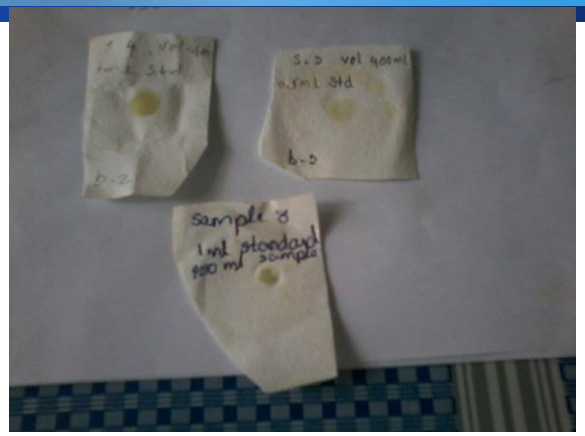
Analysis on water samples

- Chemical Analysis is done at Hydrology lab at the Department of Research and Innovation DRI), Yangon.

- Isotope Analysis is done at the IAEA Laboratory (^{18}O, ^{2}H and T)

Chemical Analysis of DRI Laboratory

COD Analysis



Arsenic Testing

COD Analysis

pH Meter

DO Analysis

Conclusion

- Our national TC project has being implemented to establish the infrastructure for application of isotope hydrology in water resources management.
- Ground water samples were collected from various places in Kyaunggon Township and chemical and isotope Analysis on samples were done at the DRI laboratory and at the IAEA laboratory.
- On establish the TC project, human resources for isotope hydrology through training, fellowship, scientific visit and expert mission and equipments can be obtained with the support of IAEA.
- The data obtained by applying isotope hydrology can be supported for establishment the database for the isotopes and chemical composition of groundwater resource management in Myanmar.
- By collaborating with other water agencies, fruitful data can be obtained for water resources management in Myanmar.

Thank you for your attention.