



INTERNATIONAL WATER RESOURCES ASSOCIATION'S
1st ISLANDS WATER CONGRESS
FAROE ISLANDS - SEPTEMBER 4-6, 2024



*International
Water Resources
Association*



JARÐFEINGI
Faroese Geological Survey

The Role of Isotope Hydrology in Supporting Water Management in Small Island Developing States

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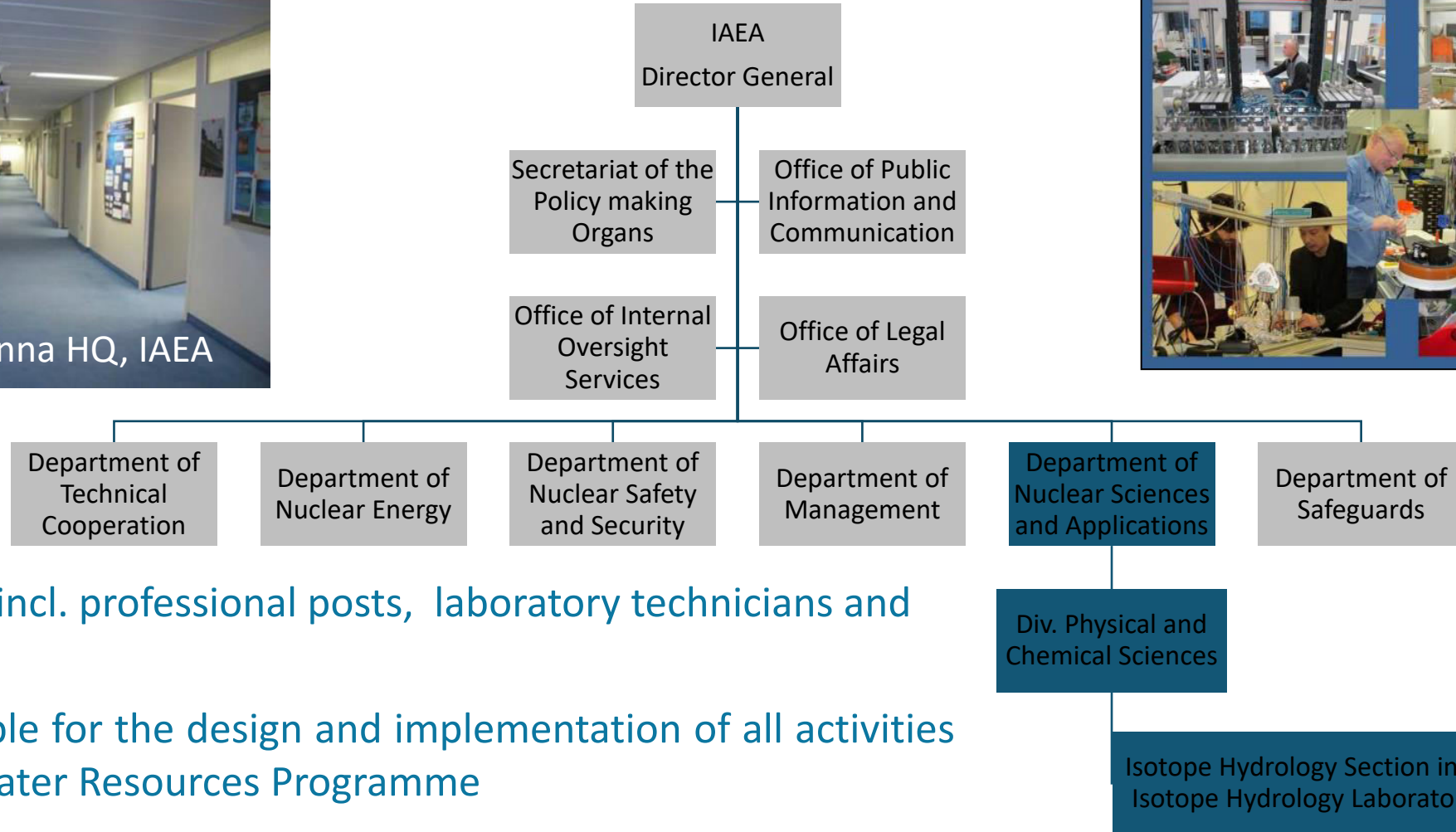
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- Introduction
- Challenges
- Isotope Hydrology Applications to Support Water Management
- Conclusion



Introduction: IAEA and Water Resources



- About 30 staff, incl. professional posts, laboratory technicians and support staff
- IHS is responsible for the design and implementation of all activities of the IAEA's Water Resources Programme

Objectives: to provide Member States with science-based information and technical skills on isotope hydrology that will help them to better assess and manage their water resources

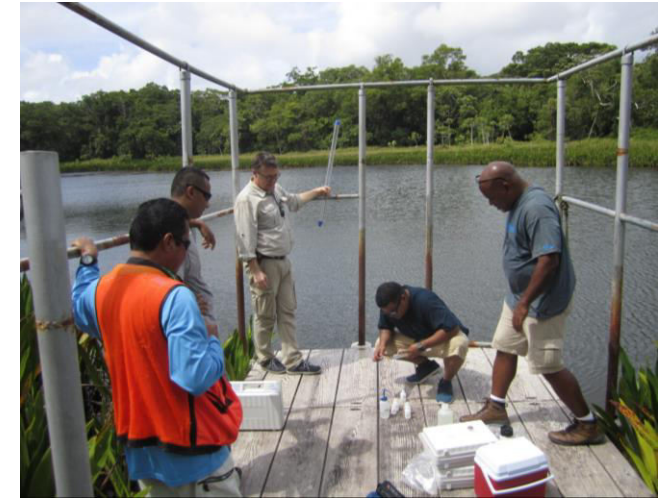
Introduction: Small Islands and IAEA

The IAEA Technical Cooperation Programme is involved in **49 projects** with **54 Small Islands Member States**, addressing ocean pollution, microplastics monitoring, cancer care, nutrition, and water resource management

The IAEA Water Programme collaborates **with 17 Small Islands**, reflecting a growing concern over freshwater access due to climate change

Most Small Islands participate in national and regional projects that apply isotope hydrology to better understand their freshwater resources and contribute to the Global Network of Isotopes in Precipitation, with long-term cooperation (over 5 years) with Cuba, Jamaica, Mauritius, Haiti, and Vanuatu

IAEA Water Programme efforts include establishing and ensuring the sustainability of isotope and water laboratories, mapping groundwater and surface water, facilitating equipment shipments, training specialists, and integrating them into global isotope networks



Water sampling in Palau (credits: O. Kracht)



Water sampling in Mauritius (credits: Y. Vystavna)

Small Islands challenges

- 65 M or about 1% of the global population lives in the Small Islands in Developing States (SIDS)
- SIDS are vulnerable to the climate change (typhoon, tsunami, sea-level rise, El Nino impact) and have significant gaps in capacities, finance and technology to address these issues
- They are less visible in the broader landscapes of diplomacy, technology and knowledge transfers
- On average SIDS experience disaster losses 7 times higher than other countries
- Groundwater depletion and salinization
- Water pollution and water scarcity

<https://www.iaea.org/topics/climate-change/the-iaea-and-cop/cop27/nuclear-beyond-energy-supporting-island-states-affected-by-climate-change-with-scientific-innovations>



Water meter is not touching reservoir surface in Mauritius (credits: Y. Vystavna)



COP27: Jamaica and Malta
Matthew Samuels, Jamaica's Minister of Economic Growth and Job Creation, speaks at the COP27 #Atoms4Climate side event, which focused on supporting island states affected by climate change with scientific innovations. (Photo: A.Evrensel/IAEA)

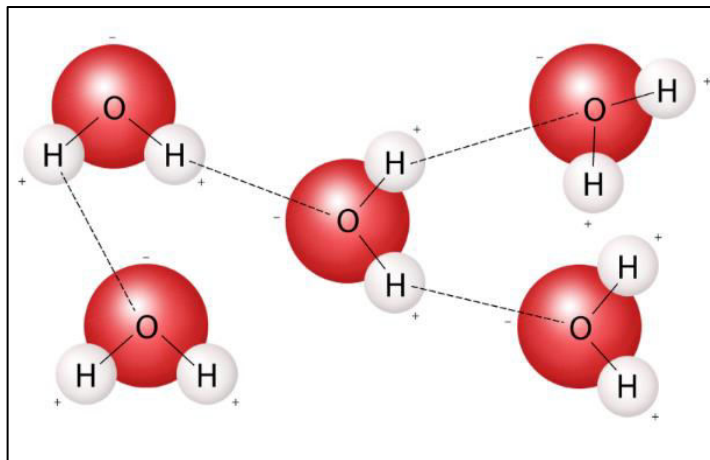
We use nuclear techniques to investigate isotopic “fingerprints” to discover:

- Where the water came from
- How it got to its current location
- How long it has been there
- How long will it last
- What are the sources of pollution

➔ **Water Sustainability**

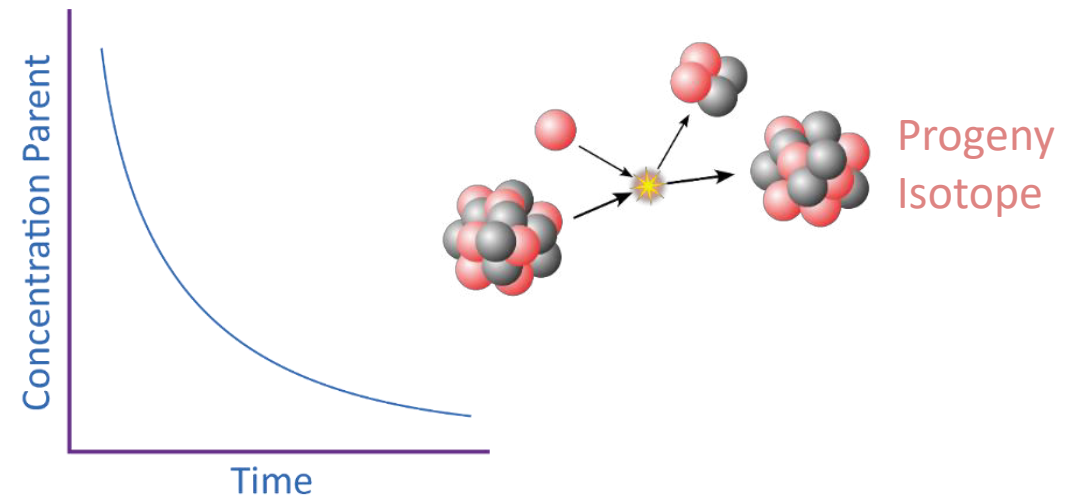
Stable Isotopes

- Abundance constant, but distribution changes
- Used to quantify interactions between different reservoirs



• Radioactive Isotopes

- Concentration affected by radioactive decay
- Used to examine the duration of processes



Where the rain come from?

SAINT LUCIA

❖ Isotope hydrology

- **Water isotopes provide insights into the origin and movement of water**
- **Understand surface water-groundwater interaction and source of pollution**

WRMA uses Isotopic Hydrology to safeguard groundwater resources (Saint Lucia Government)



...Vulnerable to climate change and lack resilience to shocks

SAINT VINCENT AND THE GRENADINES

❖ IAEA

- **Train technical personnel to monitor water quality**
- **Establish South-South cooperation to address the deficit of skilled**
- **Provide the water monitoring equipment**

Water treatment plant at Jennings, in the high hazard volcanic zone. High turbidity disrupting the operation of the plant. (image: Bernard Maloney, C.W.S.A.)



MALTA

...Suffering from droughts

❖ Isotope hydrology

- Understand groundwater recharge processes
- Estimate water resource availability



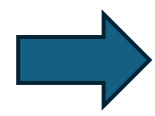
Understand and protect limited resources in the light of climate

CYPRUS

How old is our groundwater?

❖ Isotope hydrology

- Radiocarbon and noble gases to date old groundwater (100 - 1000 years)
- Assess groundwater vulnerability to climate change



Improve groundwater management



We rely on surface waters and want to know more about them

THE REPUBLIC OF VANUATU

❖ Isotope hydrology support

Most of the rural population depend on rivers, creeks or springs as sources of water supply (even rainwater)

- Understand interaction between surface water

and groundwater

- Estimate water balance in catchments

- Identify changes driven by droughts on the

water cycle



Creek water input located at Mele uphill (left) and concrete & galvanised storage tanks for Mele rural water supply. Source: Nath et al., 2006.

FIJI

We want to have access to clean water

- Salinization
- Pollution by mining, industry and agriculture



❖ IAEA response

- Establishing national capabilities for the systematic characterization and assessment of water resources

Ability to generate national data and improve water management

MAURITIUS

We should understand nitrate pollution sources

❖ IAEA response

- Development of the laboratory facilities to trace the nitrate pollution sources
- Mapping of water pollution in the Atlas to identify the pollution hotspots and support the decision-making

- Agricultural activities
- Illegal sewage disposal
- Animal breeding

“ Conventional chemistry will tell you how much nitrogen pollution there is in a river, but not where this pollution comes from. Analysing the isotopes of nitrate can give this kind of information.

— Ioannis Matiatos, Isotope Hydrologist, IAEA

...Many common problems and stressors but very different local

Diversity of environmental, hydrogeological conditions and water supply

Water supply is often based on surface water use and roof water harvesting

Groundwater resources are often found in complex, fractured aquifers (

Seawater intrusion is a common challenge for most islands

Disparities in technology access and monitoring capacities

IAEA **building laboratories** to enable country to generate national data