

# Securing Safe and Clean Environment

## Nuclear Techniques in Harmful Algal Bloom (Red Tide) Studies

IAEA designated the PNRI as the IAEA Collaborating Center on Harmful Algal Bloom (HAB) studies in 2005 and 2010. The PNRI conducted R&D on the Receptor Binding Assay (RBA). PNRI participated in the validation work leading to the approval of the RBA by the Association of Official Analytical Chemists (AOAC) in 2011 as the analytical tool for paralytic shellfish poisoning.

The PNRI is transferring the RBA technology to the end-user, Bureau of Fisheries and Aquatic Resources, as an alternative to mouse bioassay.

Presently, the PNRI, in cooperation with the University of the Philippines Marine Science Institute is undertaking various researches on HABs, sharing expertise and accepting trainees from IAEA Member States. These researches include bioaccumulation kinetics, core sediment dating and detection of ciguatera toxin.



*Left: Collection of harmful algae in Juag Lagoon, Philippines, to quantify Pyrodinium Bahamense cell density and paralytic shellfish poisoning toxins level*

*Right: RBA trainee from Cuba with PNRI chemist*

## IAEA Water Availability Enhancement Project (IWAVE)

The Philippines is one of the three pilot countries for the IAEA Water Availability Enhancement Project, or IWAVE, which aims to enhance national capabilities to assess the availability, quality, and sustainability of water resources, contributing to the United Nations Millennium Development Goal of increasing access to clean drinking water by 2015.

The PNRI, the National Water Resources Board and the Mines and Geosciences Bureau are implementing this project in Region 2 in Luzon and Region 10 in Mindanao, integrating isotope hydrological and hydrogeological data for a more effective groundwater assessment.



*PNRI undertakes sampling missions in Regions 2 (Luzon) and 10 (Mindanao) for groundwater age determination using isotope techniques with IAEA expert Takuya Matsumoto*



*Sample analysis for isotope hydrology studies at the Isotope Ratio Mass Spectrometry Laboratory*





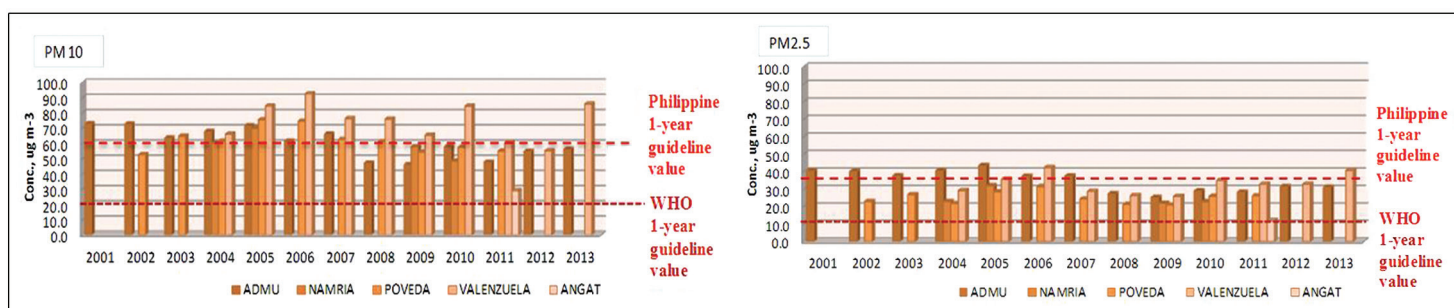
## Air Pollution Source Apportionment

PNRI undertakes air pollution studies in Metro Manila using nuclear and nuclear-related techniques. It operates monitoring stations for both coarse (PM10) and fine (PM2.5) air particulates.

PNRI uses the energy-dispersive X-Ray Fluorescence Spectrometry which is non-destructive and can provide a multi-elemental analysis of air particulate matter in less than 15 minutes. Traditional methods can only analyze elements individually, taking several days or longer. Source apportionment studies in Metro Manila have identified traffic-related activities as comprising 49 to 57 percent of the fine fraction air pollutant sources among various stations. Addressing these problems can greatly reduce our fine particulate pollution including black carbon which can bring about better air quality and contribute to the mitigation of climate change.



*Gent Sampler set-up at an air monitoring station*



*Results on Coarse and Fine Particulates from 2001 to 2013*

## Assessment of Pollutant Loading in Manila Bay

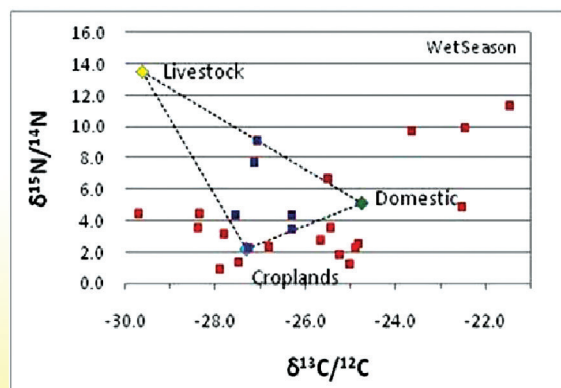


*Location of the Pampanga River Basin*

There is a need to identify sources (natural and anthropogenic) of pollutants entering Manila Bay. PNRI and the Bureau of Soils and Water Management (BSWM) used the stable isotope technique to trace the anthropogenic inputs (domestic, livestock, and croplands) from the Pampanga River Basin to Manila Bay.

The mixing models revealed that domestic and cropland sources contributed dominantly in the pollution along the Pampanga River Basin leading to Manila Bay. The findings were presented to the stakeholders and the Department of Environment and Natural Resources (DENR) in early 2014.

DENR is again contracting PNRI and BSWM to replicate the study with the three other river basins discharging to the bay to get a complete picture of the pollution loading in Manila Bay. In compliance with the order of the Supreme Court, DENR undertakes the restoration of the bay's waters to the Class SB classification, a water quality standard "fit for swimming, skin-diving, and other forms of contact recreation."



*Three-source mixing models for particulate organic matter along Pampanga River during wet season.*