Regional Cooperation to Track Mercury Deposition

Asia Pacific Mercury Monitoring Network

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Environment Canada

Ministry of the Environment
National Institute for Minamata Disease

National Institute of Environmental Research

National Atmospheric Deposition Program

National Institute for Environmental Studies, Japan

The Asia Pacific Mercury Monitoring Network (APMMN) is…

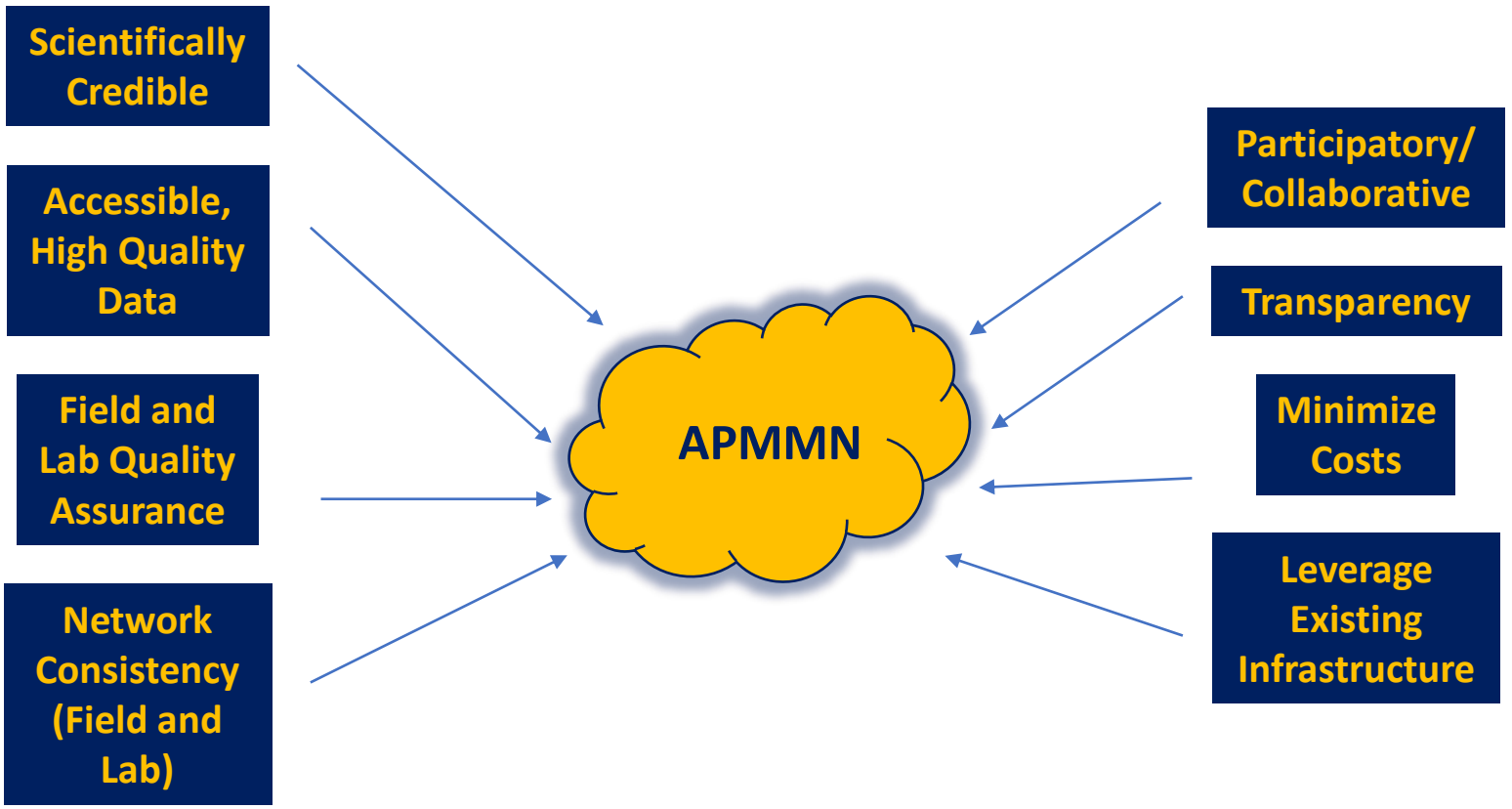
- A cooperative effort to systematically monitor mercury in precipitation and air throughout the Asia-Pacific region

- Involves many different and voluntary groups, including environmental ministries, federal government agencies, academic institutions, scientific research and monitoring organizations

APMMN Goal & Objectives

- Goal
  - Systematically monitor **wet deposition** and **atmospheric concentrations** of mercury in a network of stations throughout the Asia-Pacific region
- Objectives
  - Determine **status and trends** in concentrations of atmospheric mercury, and wet, dry, and total deposition
  - Develop a **robust dataset** for modeling and assessment
  - Assist partner countries in **developing monitoring and assessment capacity**
  - **Share data** and monitoring information

APMMN Network Principles



APMMN Wet Deposition Approach

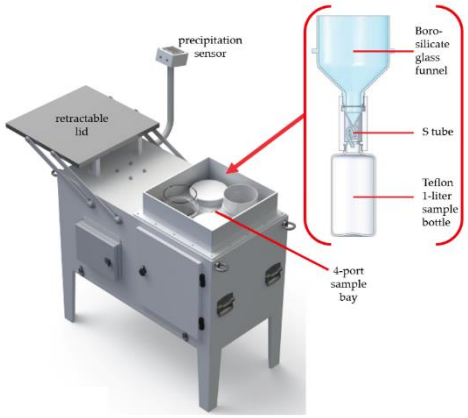
Chemical Analysis: Cold vapor atomic fluorescence spectroscopy (CVAFS) at National Central University, Taiwan

Mercury Forms: Total mercury wet deposition and precipitation concentrations

Meteorology: Precipitation depth measured onsite (best) or as close as possible to the sampler (within 5 km)

Sampling Frequency: One week; Tuesday – Tuesday

Site Types: Regionally representative; urban, remote, rural areas with estimated high levels of mercury and deposition; sensitive ecosystems



MIC-B

Aerochem 301

NCON 00-125-2

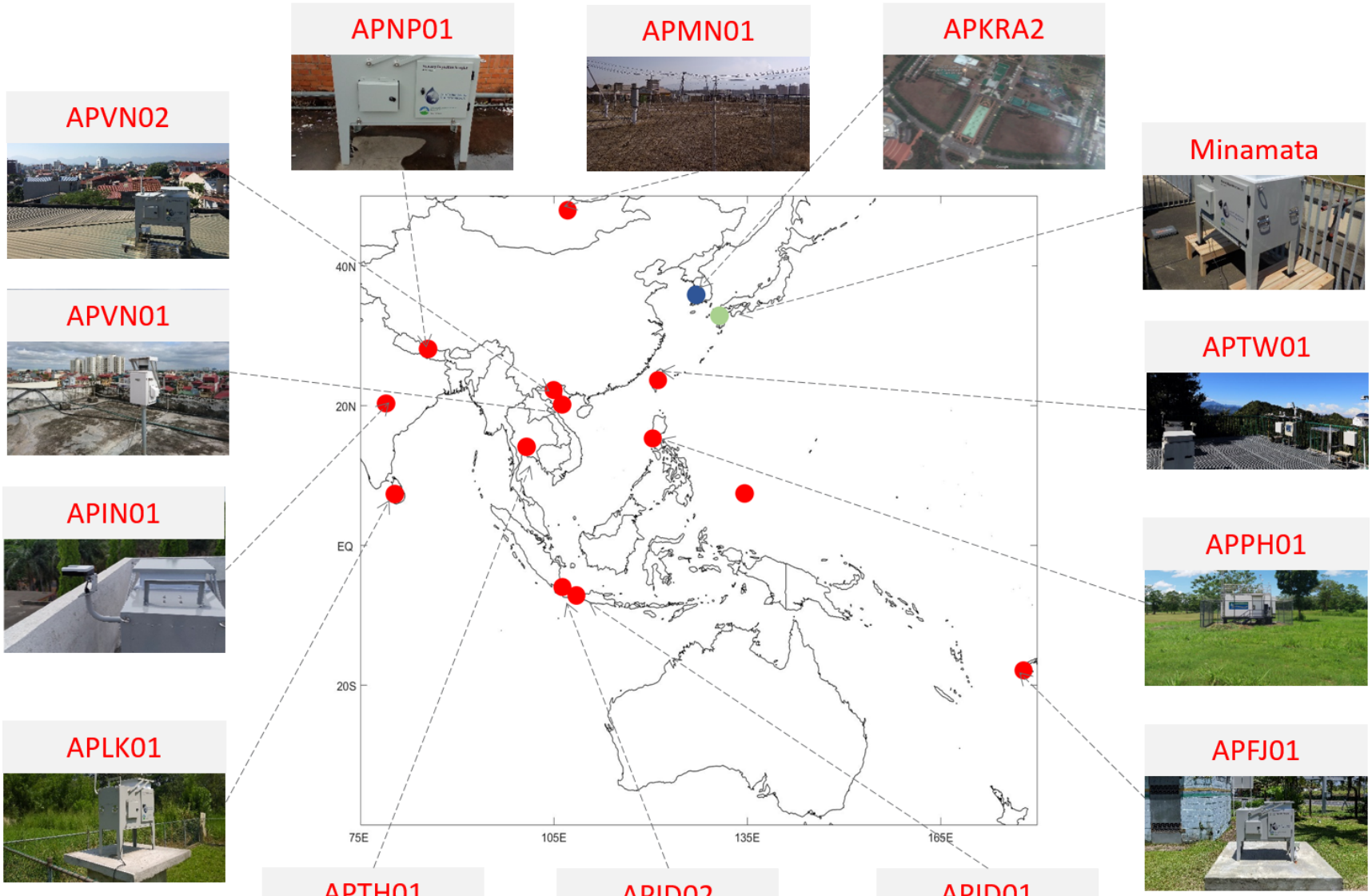
Coverage Expansion Since 2018

- **14** sites in 12 countries currently
- **9** sites established between 2018 and 2020
  - APPH01 in Philippines (2018/08)
  - APVN02 in Vietnam (2019/04)
  - APLK01 in Sri Lanka (2019/04)
  - APMN01 in Mongolia (2019/09)
  - APID02 in Indonesia (2019/10)
  - APFJ01 in Fiji (2019/11)
  - APNP01 in Nepal (2020/02)
  - APPW01 in Palau (2020/02)
  - APIN01 in India (2020/03)
- Collaboration with Dr. Kohji Marumoto (NIMD, Japan) for sampler inter-comparison since March 2020

APMMN Site Information

Country	Site ID	Sampler Model
Fiji	APFJ01	MIC-B
India	APIN01	MIC-B
Indonesia	APID01	ACM
	APID02	MIC-B
Korea	APKRA2	N-CON
Mongolia	APMN01	MIC-B
Nepal	APNP01	MIC-B
Palau	APPW01	MIC-B
Philippines	APPH01	MIC-B
Sri Lanka	APLK01	MIC-B
Taiwan	APTW01	MIC-B
Thailand	APTH01	MIC-B
Vietnam	APVN01	N-CON
	APVN02	MIC-B7

APMMN Site Map



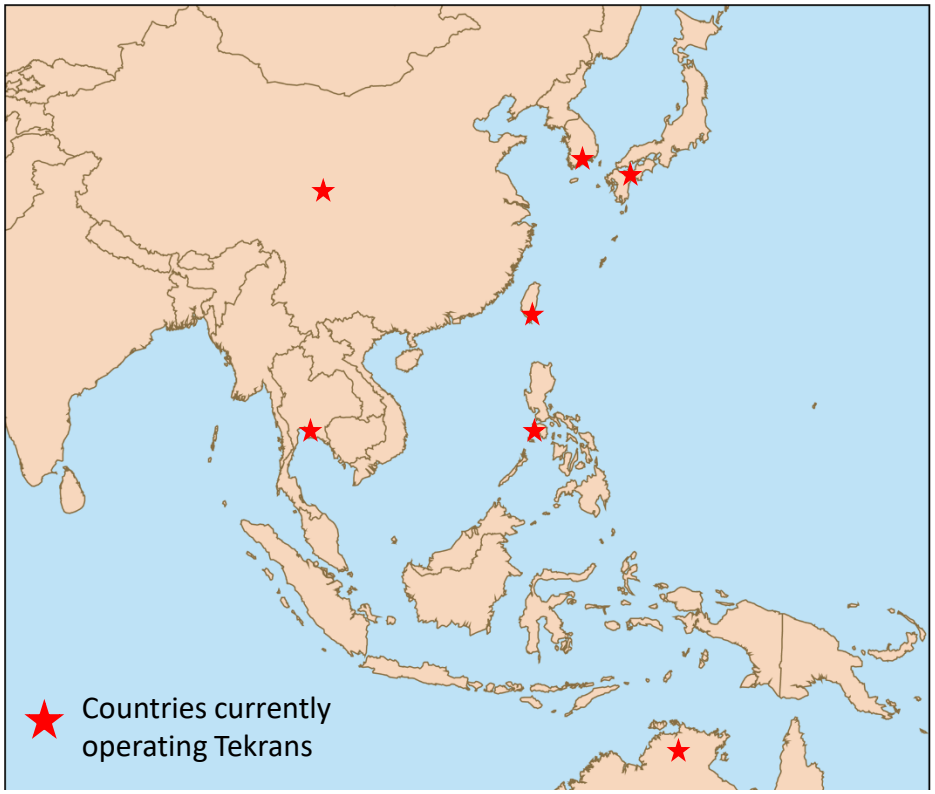
Inter-comparison of Wet Deposition Samplers

- There is no “standard” wet deposition sampler
- APMMN uses MIC-B type sampler, whereas NADP/MDN uses N-CON sampler. Japan uses KASC-02 sampler.
  - MIC-B vs N-CON : since January 2017
  - MIC-B vs MIC-B : since April 2018
  - KASC-02 added: since July 2020
  - Acid Preservation vs No Acid: since December 2018

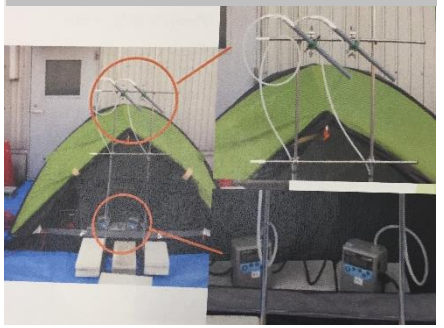
Atmospheric mercury monitoring

Tekran Automated Continuous Mercury Speciation System

- Measured concentrations of gaseous oxidized and particulate mercury are used to estimate dry deposition
- Concentrations obtained continuously
- Costly; difficult to operate and maintain



Gold Amalgamation Trap Method



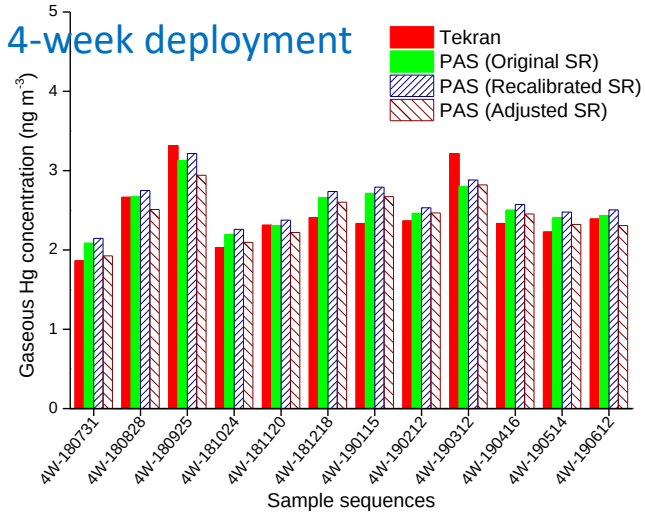
- Official method to monitor atmospheric mercury in Japan, conducted at 200+ monitoring sites monthly
- Portable instrument (gas scrubber. gold column, air pump)
- Daily/monthly sampling duration
- Lab analysis

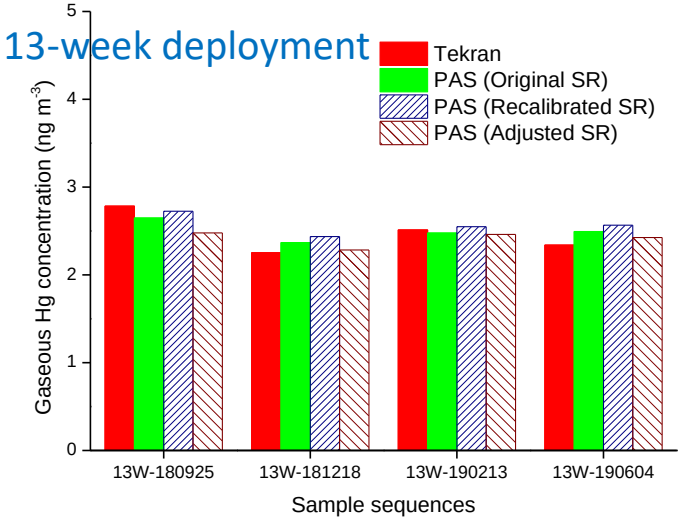
Passive Atmospheric Mercury Sampler

- Lower cost
- Easy to use and deploy
- No need for electricity and gases
- Improved spatial resolution
- Lab analysis needed

Passive Air Sampler Test at NCU

- From July 2018 to June 2019
- Side-by-side comparison with a Tekran system





What's next?

1. **Continue to bring in new partners and expand existing wet deposition network**
   - Distribute new mercury wet deposition samplers to new Pacific Island and SE Asia partners

2. **Continue to provide training and technical assistance**

3. **Atmospheric mercury monitoring network-building**

4. **Data management and analysis**

5. **Linkages to human health and ecological endpoints**