

Environmental Mercury Monitoring in Taiwan



Environmental Protection Administration
TAIWAN

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行政院環境保護署
Environmental Protection Administration
Executive Yuan, R.O.C. (Taiwan)

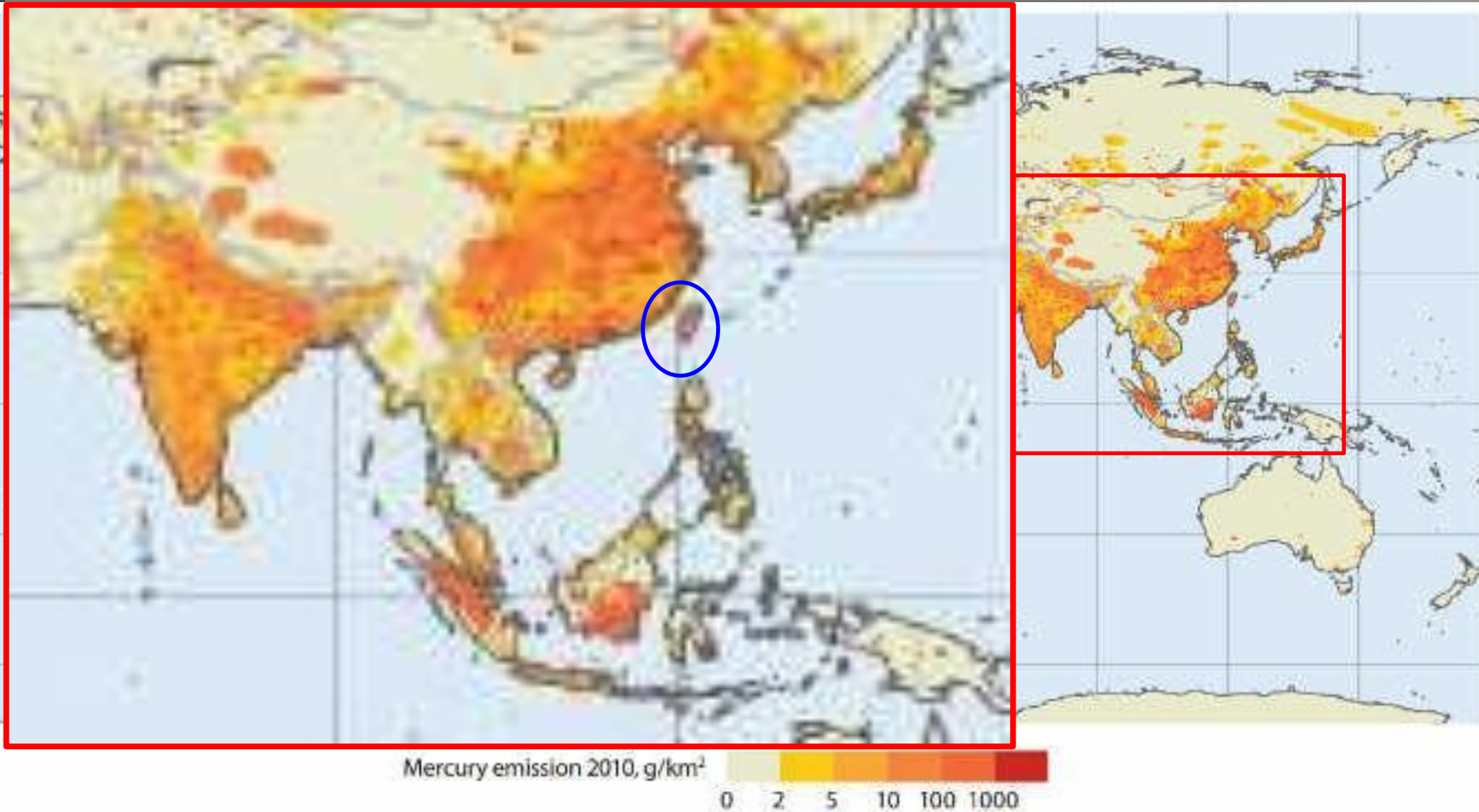
Outlines

1. Background

2. Mercury monitoring of Environmental Medium in Taiwan

3. The recycling experience of mercury lamps and batteries

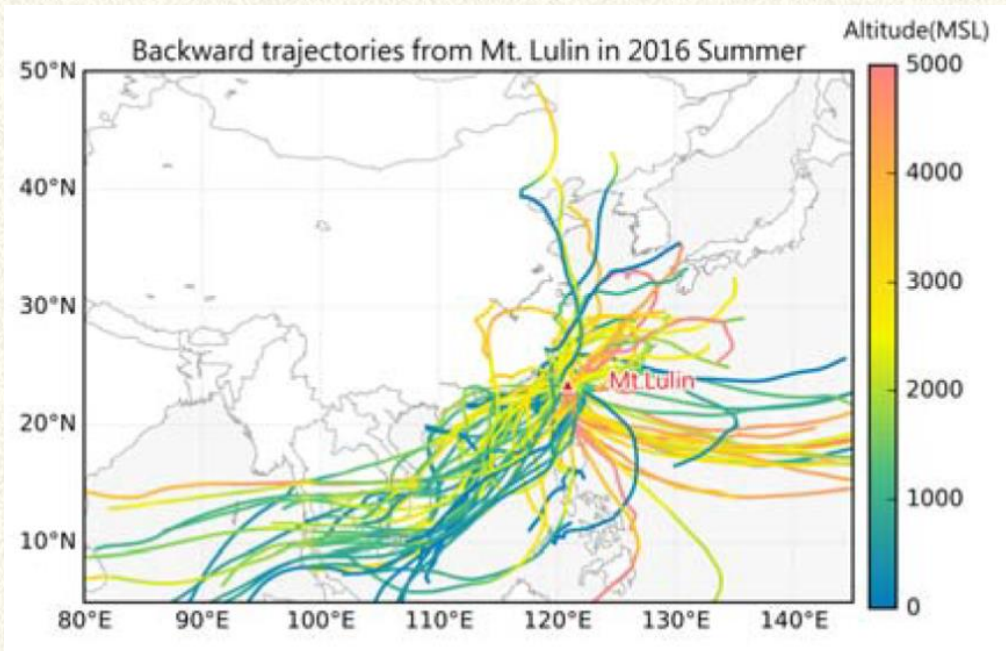
Background



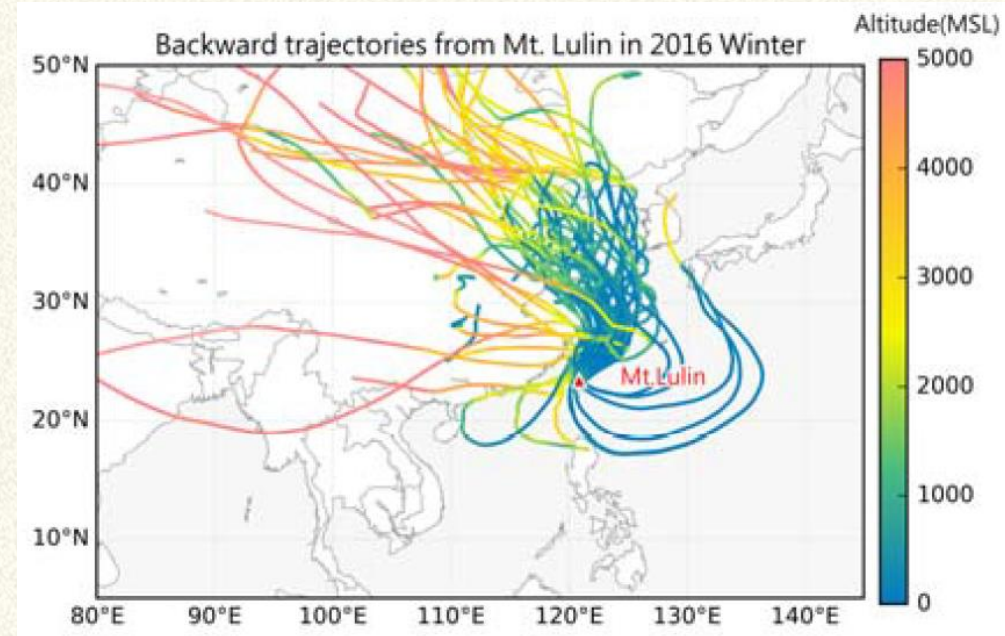
Global distribution of anthropogenic mercury emissions to air in 2010. (US EPA website)

Background

Backward Trajectories from middle Taiwan (Mt.Lulin) in 2016



In summer

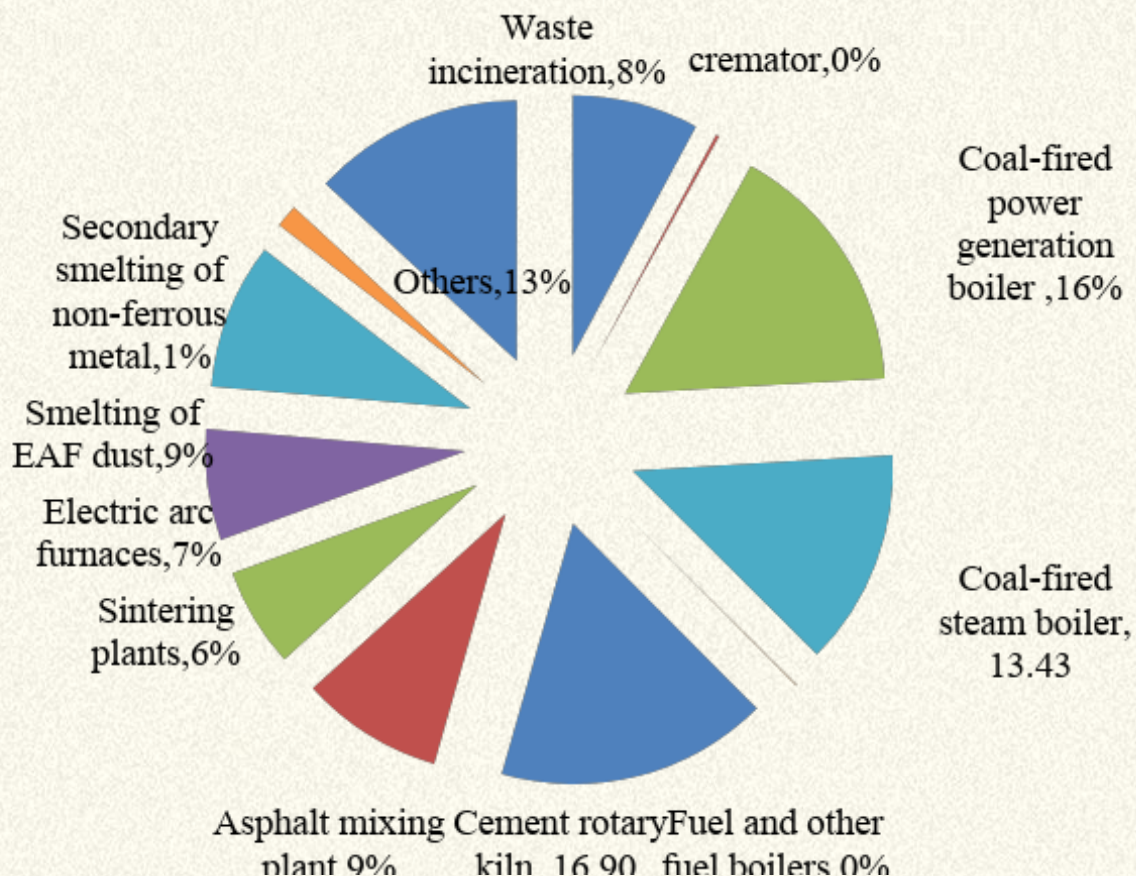


In winter

Background

Mercury emissions inventory (2016)

category	mercury emission (ton/y)
Waste incineration	0.156
cremator	0.004
Coal-fired power boiler and Cogeneration Boiler	0.318
Coal-fired steam boiler	0.267
Fuel and other fuel boilers	0.001
Cement rotary kiln	0.336
Asphalt mixing plant	0.176
Sintering plants	0.123
Electric arc furnaces	0.137
Smelting of EAF dust	0.181
Secondary smelting of non-ferrous metal	0.028
Others	0.261
Total	1.989



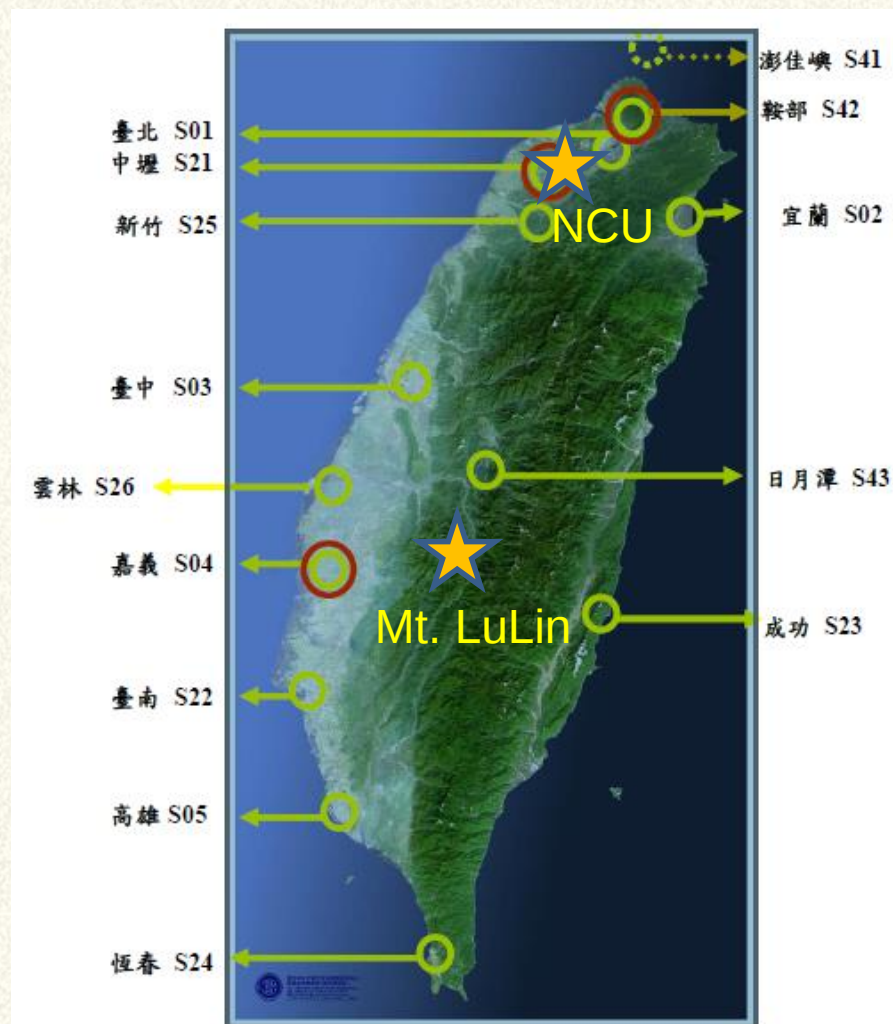
Major sources: cement rotary kiln, coal-fired steam boiler, coal-fired power generation boiler, and smelting of EAF dust

Mercury Monitoring of Environmental Medium

Atmospheric Hg Monitoring

- Gaseous Element Hg, gaseous oxidized Hg, and particulate-bound Hg (Mt.LuLin Monitoring Station)

- Wet Deposition (Mt. LuLin and NCU by MIC-B samplers, another 12 sites based on acid rain sampler)



Locations of sites

Mercury Monitoring of Environmental Medium

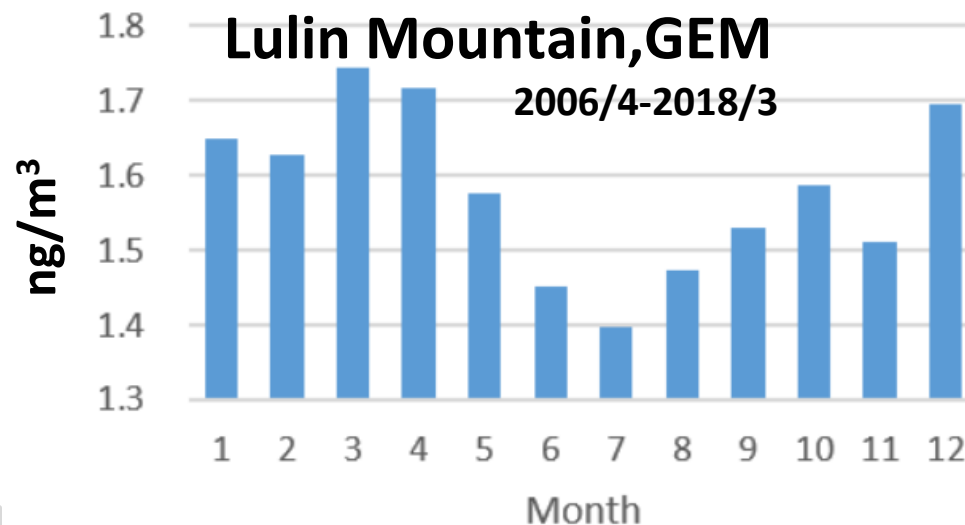


Mercury in Air

Monitor Gaseous Mercury since 2007

Data range : **0.43-7.4** ng/m³
Annual average : **2.11-3.94** ng/m³

(WHO Standard: 1,000 ng/m³)

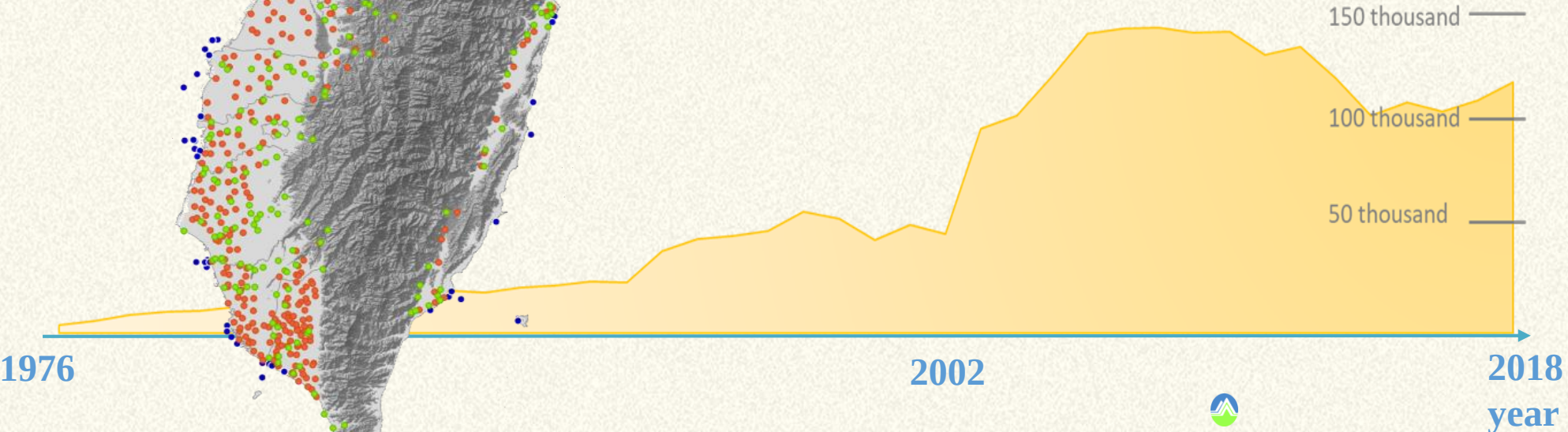
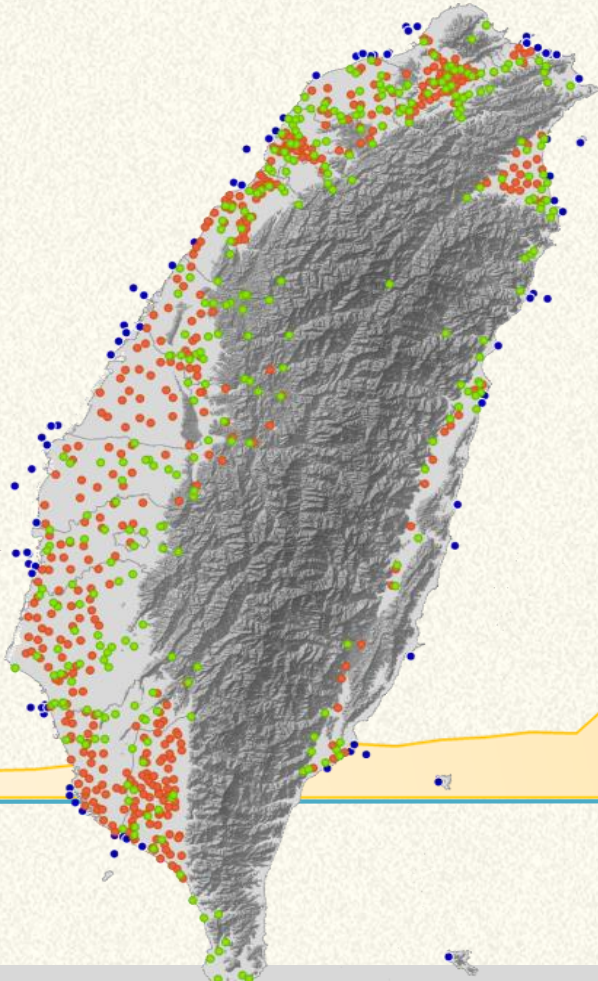


Mercury Monitoring of Environmental Medium



Mercury in Water Monitoring

Water Body	Monitoring Frequency
 River	303 stations / Month
 Sea water	105 stations / Season
 Groundwater	447 stations / Season



Mercury Monitoring of Environmental Medium



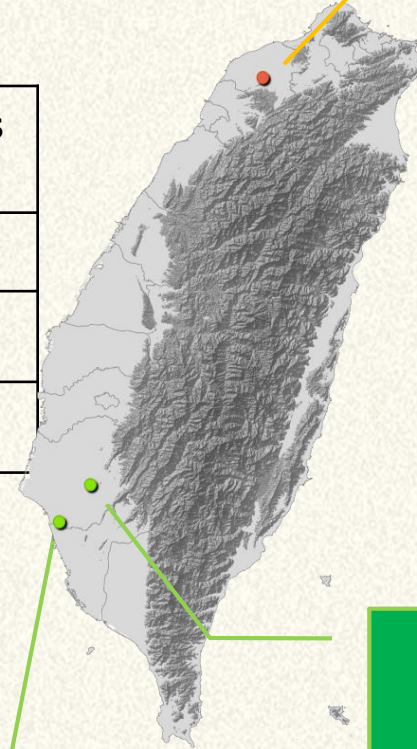
Mercury in Water Monitoring

Water Body	Measured range (mg/L)	Number of stations detected
 River	ND ~ 0.0007	2
 Sea water	ND	0
 Groundwater	ND ~ 0.0024	1

Detection Limit : 0.0003 mg/L
Regulatory standards:0.001mg/L



Erren River
0.0007 mg/L



Taoyuan City
0.0024 mg/L



Zengwun River
0.0006 mg/L

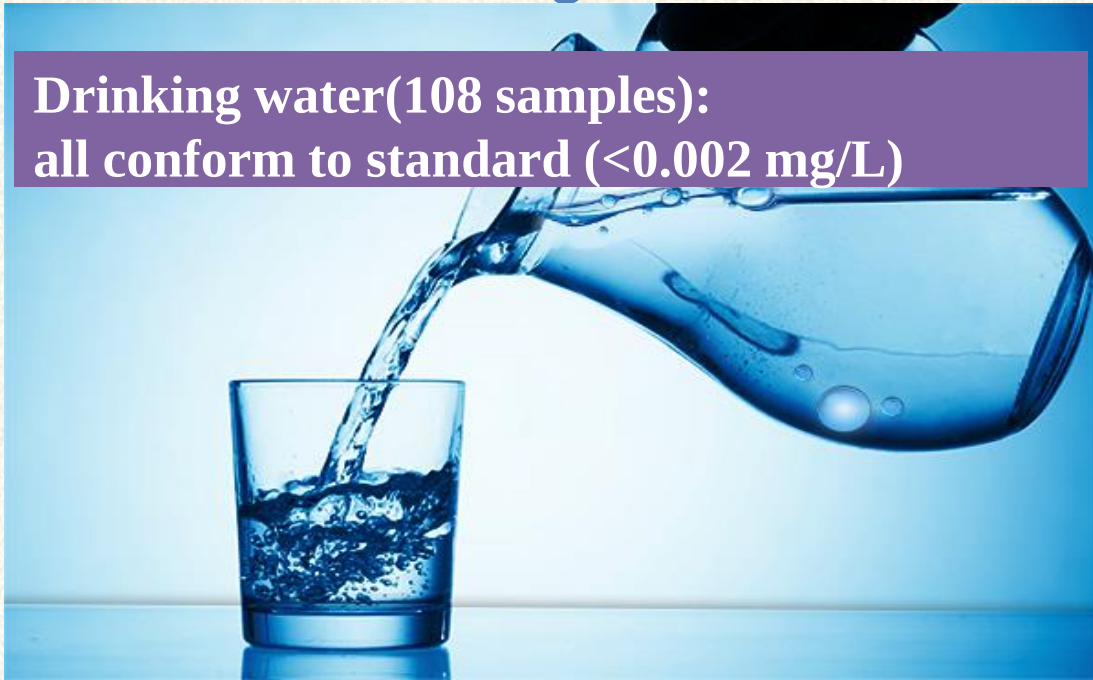


Mercury Monitoring of Environmental Medium



Mercury in Drinking Water & Organism Monitoring

Drinking water(108 samples):
all conform to standard (<0.002 mg/L)



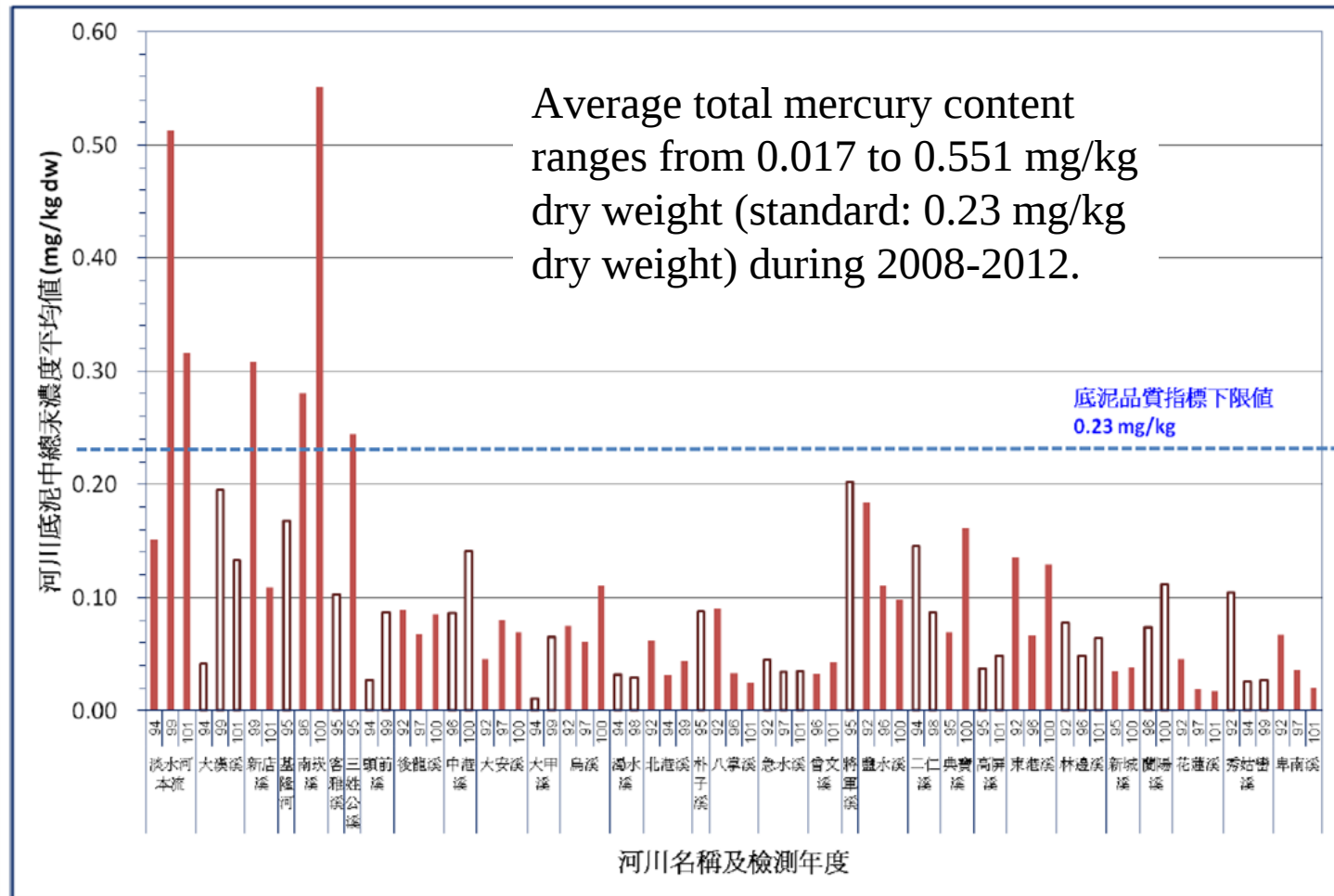
Mercury average of Organism in River (mg/kg)

2011 Wu River	0.043
2012 Xindian River	0.019



Mercury Monitoring of Environmental Medium

The distribution of total mercury content in the river sediments



The Recycling Experience of Mercury Lamps and Batteries

(5) Sellers and Collection Channels

A. Sellers

- Based on the Article 15 of Waste Disposal Act, Sellers shall bear the responsibility of collection.
- Sellers designated by TEPA shall install collection facilities and take back Regulated Recyclable Wastes.

B. Collection Channels

- Batteries** : Supermarkets, Wholesale Stores, Chain Convenient Stores, Village/Community Collection Stands, Municipal Collection Trucks, Telecommunications, Chain Pharmacies, Schools, Convenient Stores in Traffic Station and Collectors
- Lamps** : Lamp Sellers, Village/Community Collection Stands, Municipal Collection Trucks and



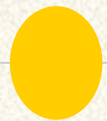
The Recycling Experience of Mercury Lamps and Batteries

(6) Municipal governments and grants

- A. Local governments have the responsibility of collecting RRW (including waste lamps and batteries) from the household.
- B. Recycling Fund Management Board (RFMB) provides grants for local governments to :
 - a. build or run collection, storage and sorting facilities.
 - b. procure collecting trucks and equipment.
 - c. implement educational and promotional programs.
- C. The local governments can reimburse part of the educational programs and equipment costs by selling or auctioning off the collected RRW.



educational and promotional activities



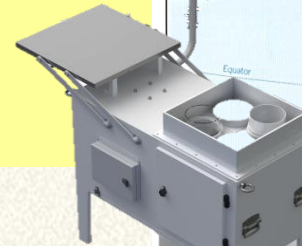
What's the next?

APMMN Promotion

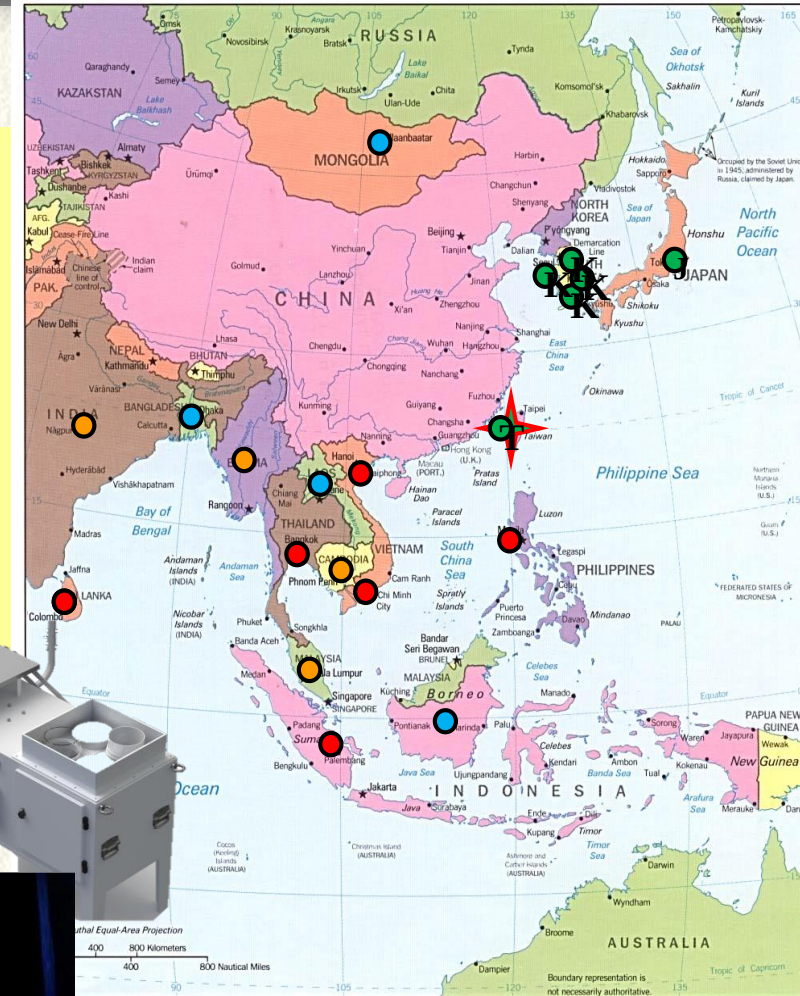


APMMN

- **Initiator** : Taiwan EPA, USEPA since 2012 to establish
- **Goal** : Systematically monitor wet deposition and atmospheric concentrations of mercury in a network of stations throughout the Asia-Pacific region
- **Samplers deployed from TEPA**: Vietnam, Thailand, Philippine and Sri Lanka so far
- **The 7th APMMN Annual meeting** :NOW
- **Center For Environmental Monitoring and Technology(2016)**



East Asia



- Operating
- Affiliated Network
- Phase II
- Phase III
- ★ Central Laboratory (NCU)



**THANK YOU FOR YOUR
ATTENTION !**

