

Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

「水俣条約推進に向けた国際水銀対策ワークショップ」

Proceedings



2018 International
Environmental Partnership



2018国立台北科技大学、
水俣環境アカデミア連携プログラム

Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

「水俣条約推進に向けた国際水銀対策ワークショップ」

Agenda

Tuesday, July 31			
Time	Topic	Speaker	Moderator
09:30-09:50	Registration		
09:50	Opening Ceremony		
09:50-10:10	Welcome Address (20 minutes): Director General, Yein-Rui Hsieh, Toxic and Chemical Substances Bureau, Environmental Protection Administration, Taiwan Mayor, Toshiharu Takaoka, Minamata City Hall, Japan		
10:10-10:20	Group photography (10 minutes)		
10:20-11:00	Section 1: Health impacts and exposure assessment of elemental and methylmercury (Award certificate of appreciation to speaker)	Executive Research Fellow, Mineshi Sakamoto, National Institute for Minamata Disease, Japan	Director General, Minoru Koga, Minamata Environmental Academia, Japan
11:00-11:20	Coffee break (20 minutes)		
11:20-12:00	Section 2: Sixty two years since Minamata Disease -Toward sustainable communities in Minamata (Award certificate of appreciation to speaker)	Director General, Minoru Koga, Minamata Environmental Academia, Japan	Prof. Tien-Chin Chang, National Taipei University of Technology, Taiwan
12:00-13:30	Lunch		
13:30-14:10	Section 3: Regulations on Mercury in Japan (Award certificate of appreciation to speaker)	Assistant Director, Mitsugu Saito, Mercury Countermeasure Promotion Office, Ministry of Environment, Japan	Director General, Minoru Koga, Minamata Environmental Academia, Japan
14:10-14:40	Section 4: Compliance with Minamata Convention on Mercury- The Strategies and Implementation Plan in Taiwan	Technical Specialist, Chi-Fu Lin, Toxic and Chemical Substances Bureau, Environmental Protection Administration, Taiwan	Prof. Li-Pang Wang, National Taipei University of Technology, Taiwan
14:40-14:50	Section 5: The Experience of Controlling Mercury in Aquatic Products	Director, Chien-Yu Chen, Fisheries Agency, Council of Agriculture, Taiwan	
14:50-15:10	Coffee break (20 minutes)		
15:10-15:20	Section 6: Management status of mercury in commodities in Taiwan	Senior Technical Specialist, Yu-Chen Rao, Bureau of Standards, Metrology & Inspection, Ministry of Economic Affairs, Taiwan	Technical Specialist, Chi-Fu Lin, Toxic and Chemical Substances Bureau, Environmental Protection Administration, Taiwan
15:20-15:30	Section 7: The Industry Promotion Status of the Replacement of Mercury-containing Lighting	Section Chief, Yi-Chi Wang, Industrial Development Bureau, Ministry of Economic Affairs, Taiwan	
15:30-15:40	Section 8: Research of blood mercury levels in Taiwanese and health education and propaganda	Section Chief, Po-Chang Tseng, Health Promotion Administration, Ministry of Health and Welfare, Taiwan	
15:40-16:30	Panel discussion/Group photography (50 minutes)		

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Minamata Convention on Mercury

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Agenda

Wednesday, August 1			
Time	Topic	Speaker	Moderator
09:10-09:30	Registration		
09:30-10:10	Section 1: 水銀汚染防止法による 製品規制と外為法による 貿易規制について (Award certificate of appreciation to speaker)	Senior Officer, Takuya Igarashi, Chemical Management Policy Division, Ministry of Economy, Trade and Industry, Japan	Director General, Minoru Koga, Minamata Environmental Academia, Japan
10:10-10:30	Coffee break (20 minutes)		
10:30-11:10	Section 2: Global Perspective of Mercury Management (Award certificate of appreciation to speaker)	Programme Officer, Shunichi Honda, International Environmental Technology Centre, United Nations Environment Programme, Japan	Director General, Minoru Koga, Minamata Environmental Academia, Japan
11:10-11:30	Panel discussion/Group photography (20 minutes)		

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Health impacts and exposure assessment of elemental and methylmercury

【Speaker: Executive Research Fellow,

Mineshi Sakamoto,

National Institute for Minamata Disease, Japan】

個人簡歷/Resume

姓名/Name	坂本 峰至 Sakamoto Mineshi	
服務單位/Department	Environment and Public Health	
職稱/Position	主席研究員 Executive Research Fellow	
<u>經歷/Experience</u>		
1987年 国立水俣病研究センター疫学研究部 研究員		
1995年 同 調査室長		
2005年 国際・総合研究部長（兼）疫学研究部長		
2016年 国際・総合研究部長 再任用		
2017年 環境・疫学研究部 主席研究員 再任用		
<u>學歷/Education</u>		
鹿児島大學医学博士		
<u>專長/Expertise</u>		
環境保健、中毒学		
Environmental Health, Toxicology		

Health impacts and exposure assessment of elemental and methylmercury

Welcome !

台湾行政院環境保護處訪問團の皆様

Mineshi Sakamoto




National Institute for Minamata Disease, Ministry of the Environment


Topics of Today


1. Hg use and health impacts
2. Kinetics and exposure assessment
3. Background of Minamata disease
4. Fetuses as a high risk group to MeHg
5. Risk and benefit of fish consumption
6. International contribution of NIMD as a WHOCC

History of Human Mercury Poisoning

- Mercury has been used by humans for a long time because of its physical and chemical usefulness.
However, mercury is toxic, and mercury poisoning has occurred repeatedly since the Middle Ages.
- **MeHg (methylmercury) poisoning in the mid 1950's Minamata Disease**
 - Kumamoto Prefecture (1956)
 - Kagoshima Prefecture
 - Niigata Prefecture (Agano River, 1965)


About 3,000 were recognized as patient


- MeHg poisoning by sterilized wheat in Iraq (1971)
6,530 poisoning victims
459 deaths
- Hg pollution by ASGM (1980s)




Examples of historical Hg poisonings

A huge statue of Buddha in Nara, in the 8 century



第8回
第7回
第6回
第5回
第4回

A character in "Alice in wonder land"



Mad as a HATTER?

Felt hat maker

Physical symptoms include trembling (known at the time as *hatter's shakes*), loss of co-ordination, loss of memory, depression, anxiety, and other personality changes. This was called *mad hatter syndrome* in 18 century

Three Chemical forms of Hg

- **Metallic : Hg^0** (known as elemental mercury)
- **Inorganic: mainly divalent (Hg^{++})** Mercuric sulfide (cinnabar ore), Mercuric chloride
- **Organic: CH_3Hg^+** is the most common form

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Elemental Hg-1

- **Global emission: Gold mine, Coal combustion, Volcanic activity**
- **Human exposure: Gold mine, Dental amalgam**
- **Hg vapor has no charge and easily absorbed by the lung (85%) and penetrates the brain and causes damages mainly to the brain. It also accumulates as Hg^{++} in the kidney and cause damages to kidney.**

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Elemental Hg-2

- **Oxidized to Hg^{++} by catalase in human body and accumulate in kidney.**
- **(High exposure \Rightarrow lung damage)**
- **BHT: approximately 60 days**
- **HBM: Hg concentration in urine or (plasma)**
- **Critical level: 50 $\mu g/g$ creatinine (IPCS)**

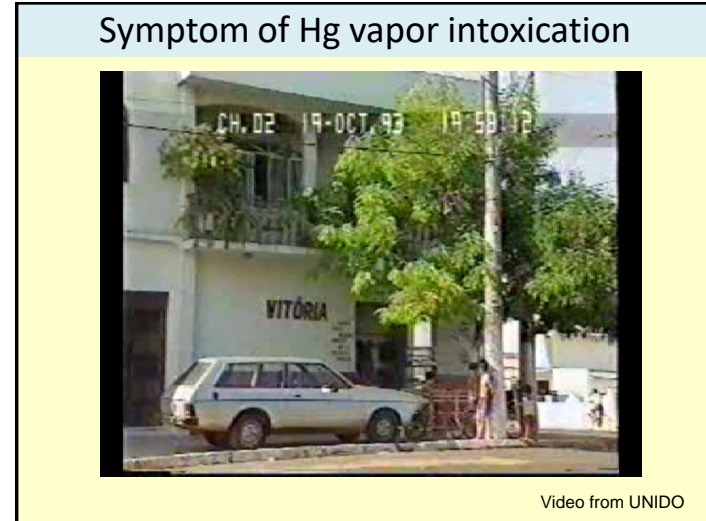
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Mercury use for gold collection in ASGM

Since 1980-

Burning
 Hg gold amalgam \rightarrow **Gold !**

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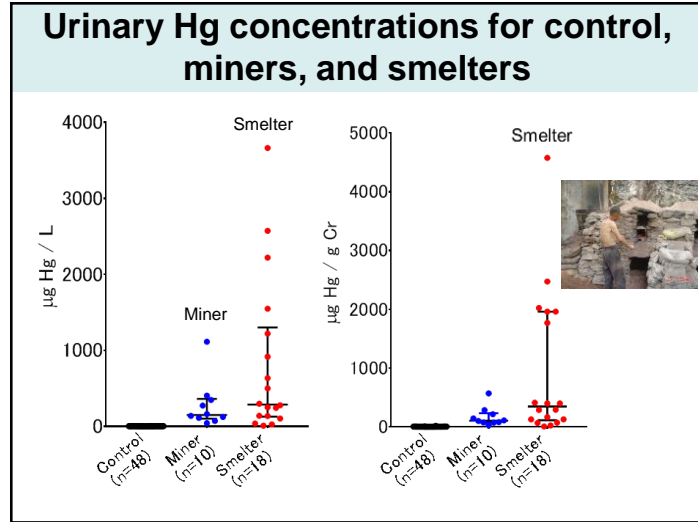
Geomean of THg in urine, T-Hg & MeHg in hair of smelters, miners and control

		Urine		Hair		
		µg Hg/l	µg Hg/g Cr	THg (µg/g)	MeHg (µg/g)	(MeHg %)
Exposed group	Smelter (16)	320**	338**	29.1**	1.78**	6.12**
	Miner (10)	182**	119**	11**	2.31**	21**
Unexposed group	Control (48)	2.08	2.48	0.71	0.6	84.8

** p<0.01, when compared to unexposed group

Sakamoto M et al. (2007)
Environ Health Prev Med 12(2):66-70

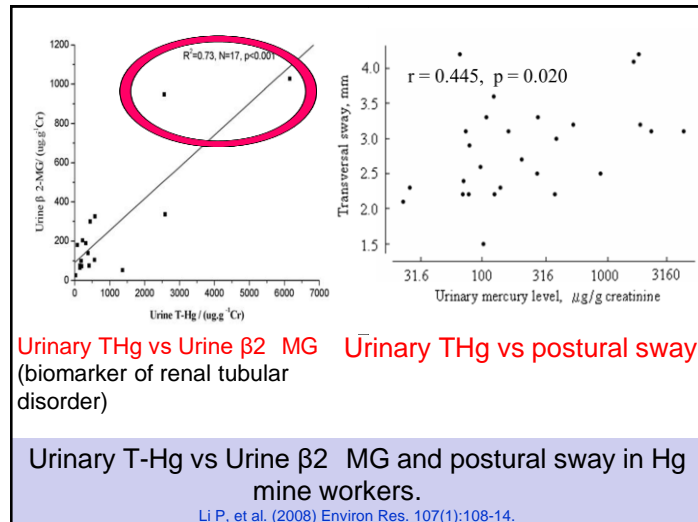
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Hand tremor intensity (mean ± SD) between Hg mine workers and controls

Frequency (Hz)	Exposed workers (n=27)	Control subjects (n=54)	P values
Dominant hand			
Total	0.234 ± 0.111	0.172 ± 0.077	0.006
1-6	0.090 ± 0.038	0.071 ± 0.019	0.004
6-10	0.160 ± 0.063	0.143 ± 0.063	0.258
10-14	0.112 ± 0.076	0.071 ± 0.051	0.007

Iwata T, Sakamoto M, et al. Int Arch Occup Environ Health 70 (5): 381-387 (2007)



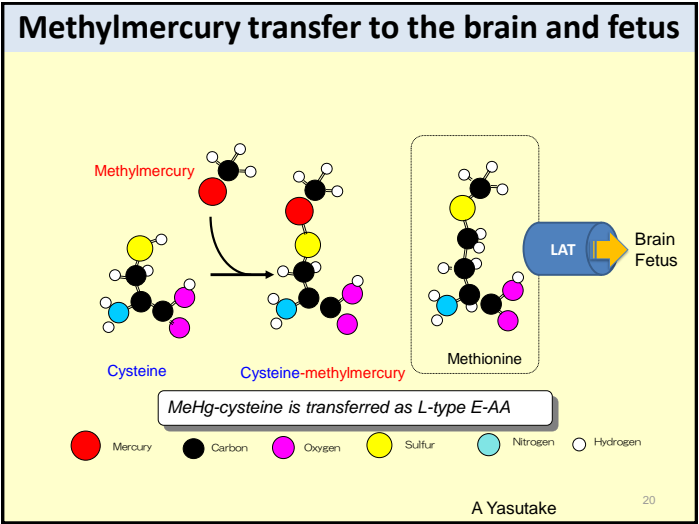
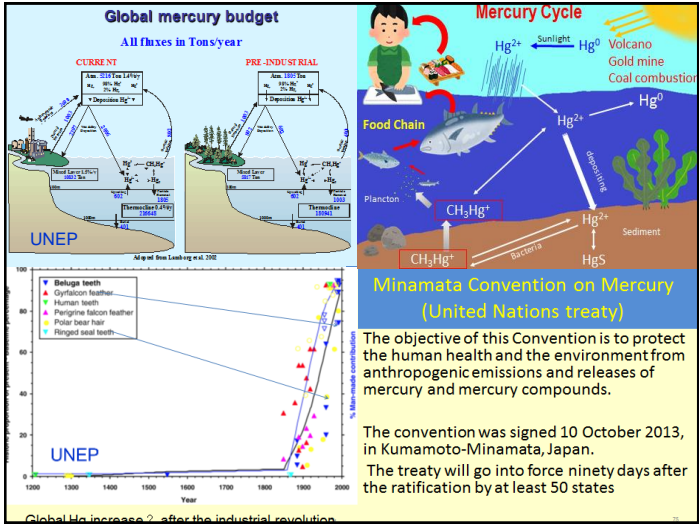
- ### Inorganic Hg
- **Human exposure: Food, Skin whitening cream, Accidental ingestion, Suicide purpose**
 - The absorption rate from the digestive tract is low (5-10%). Distribution to the CNS is low and kidney is the target organ
 - **BHT: approximately 60 days**
 - **Elemental mercury can be oxidized and change to inorganic mercury in the environment (by oxidation) and in human body (by catalase)**
 - **Human exposure assessment: Hg concentration in urine (and creatinine corrected) or plasma**

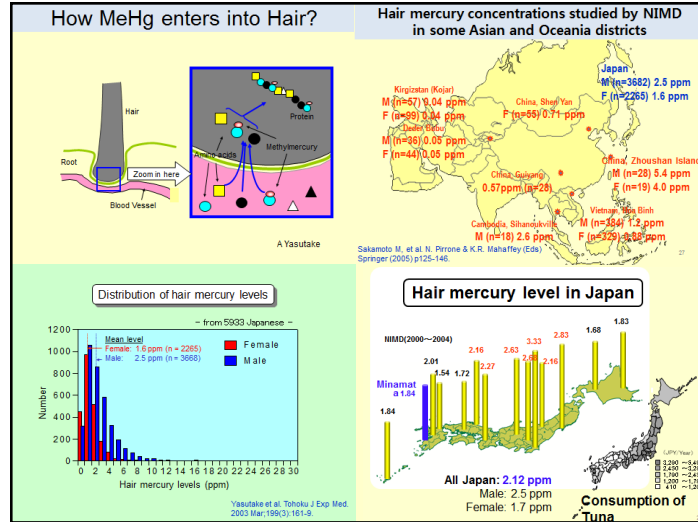
Methylmercury (MeHg)-1

- **Human MeHg exposure: Mainly from fish and shellfish consumption**
- **MeHg makes conjugate with cysteine and it is absorbed from the digestive tract (about 95%), then easily penetrate the brain / fetus according to their amino acids demand, causing disorders in the brain, especially in the fetal brain.**

Methylmercury (MeHg)-2

- **Fetus and neonate are high-risk groups**
- **HBM: (for adult and child) Hg in blood (RBCs) or hair**
For fetus ; cord blood, cord tissue, maternal hair/blood for fetus.
- **Critical level: (IPCS)**
Adult = 50–125 ppm hair Hg
Fetus = 10–12 ppm maternal hair Hg

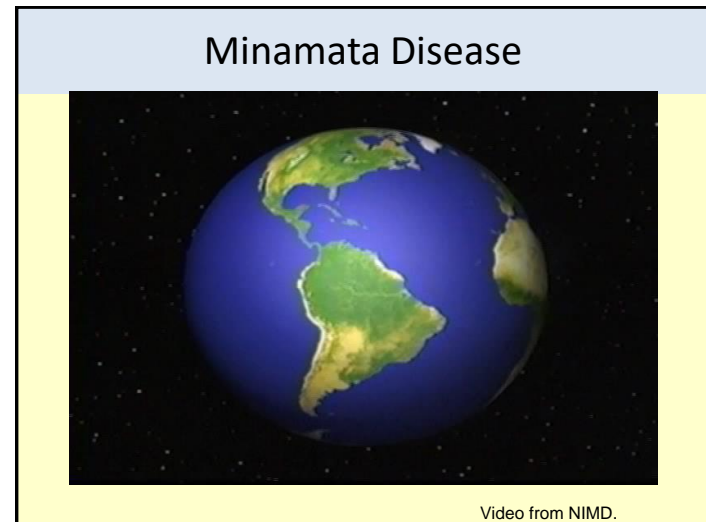




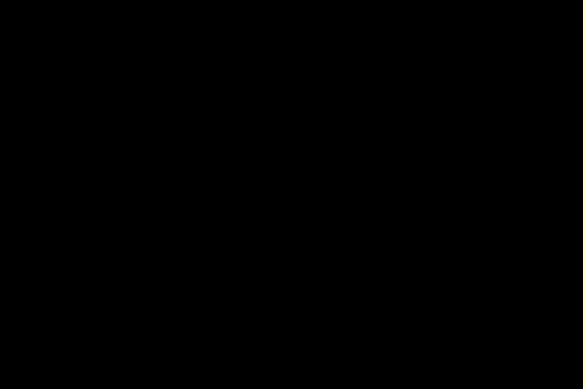
Characteristics of Minamata disease

- ① First outbreak of severe MeHg poisoning caused by manmade environmental pollution which gave first priority to economy but lack consideration to the environment
- ② Neurological disorders caused by MeHg which penetrates into the CNS through BBB
- ③ **Outbreak of fetal-type Minamata disease caused by maternal MeHg exposure**

By M Harada




MeHg Intoxication in Iraq




Video from Rochester University.

Severe Fetal-type MeHg Intoxications



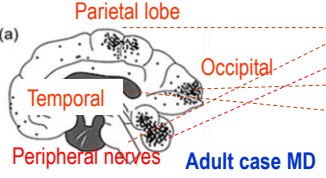
Minamata disease 1956, 1965
by Eugene Smith



by Bakie
Iraq MeHg intoxication 1971

Fetal-type patients


Distribution of lesions in the brain and symptoms




Adult case MD

Main symptoms

- Sensory disturbance
- Cerebellar ataxia
- Contraction of visual field
- Hearing impairment



Fetal type MD




Cerebral palsy

Children with Congenital Minamata Disease due to intrauterine methylmercury poisoning (Harada 1985).

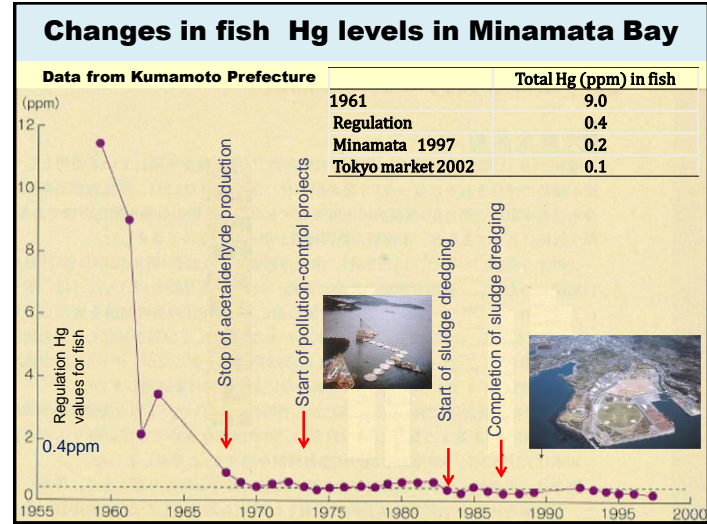
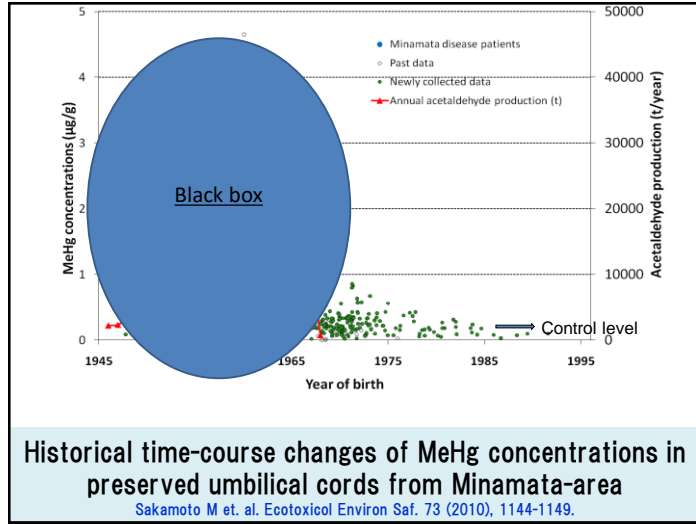
Retrospective study on temporal variations of MeHg concentrations in preserved umbilical cords collected from inhabitants of the Minamata area,

- First case (children) of Minamata disease (MD): in 1956
- Confirmation of the cause of MD by Japanese Government, Stop of acetaldehyde production: 1968



We did not have actual data on time-course and regional distribution of MeHg pollution in Minamata area, because it took long time to identify the cause of the disease.

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Plastic Recycling

Building Materials Recycling

Electronics Recycling

Bottle Reuse

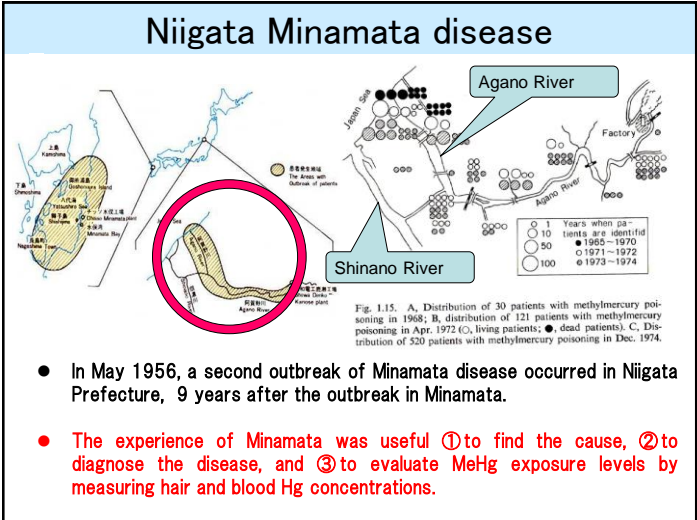
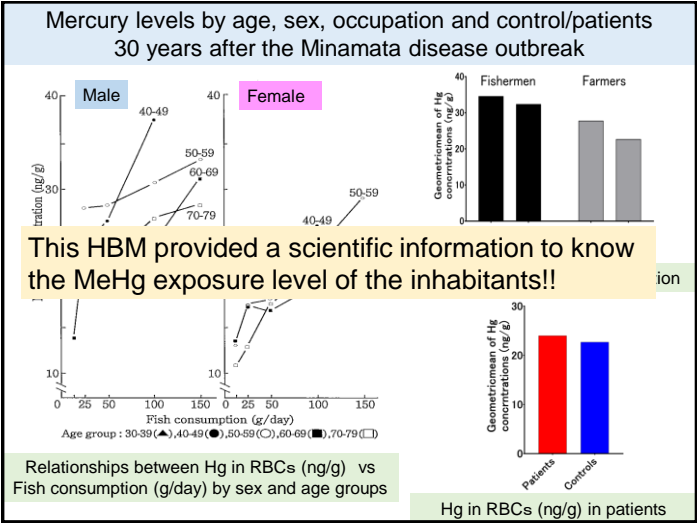
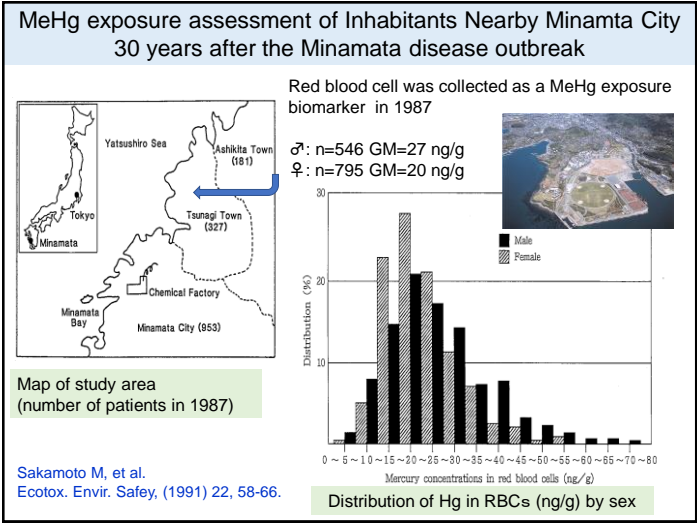
Organic Waste Recycling

Oil Recycling

Waste Reduction and recycling Programs

Tire Recycling

"Japan's most Eco-friendly City"



Total Hg levels of hair in Niigata cases

Case No.	Days after onset	Hair Hg (ppm)
1	37	570
4	43	230
6	-22 ~ -7	210
9	19~49	320
12	- 45 ~?	340
17	<43?	230
18	~5	280
19	1~15	210
29	1~30	320
30	1~30	52
31	1~20	150
39	(~ 60) ~29	280

Arithmetic mean: 266 ppm
Geometric mean: 235 ppm

No 30 patient showed the lowest level (52 ppm) of hair Hg with symptoms of sensory disorders, ataxia, and constriction of visual field. This result was applied to decide the critical dose for adults by WHO.

Critical level of MeHg exposure in adult

Table 4. Summary of concentrations of mercury in samples of blood and hair and the body burden of mercury associated with effects (usually paraesthesia) in the most sensitive group in the population*

Population	Total No. studied	Mercury concentration		Mercury in the body (mg/kg)	References
		Blood (µg/100 ml)	Hair (mg/kg)		
Niigata	17	20-40	52	—	Swedish Expert Group (1971)
Iraq	184	—	120	0.8	Shahristani et al. (1976)
Iraq	125	24-48	—	0.5-0.8	Bakir et al. (1973)
Iraq	427	—	—	0.7	Mufti et al. (1976)

* The numbers quoted in this table should not be considered independently of the accompanying test.

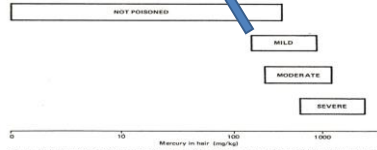


Fig. 6. This diagram is based on data reported by Shahristani et al. (1976) on an Iraqi population that consumed contaminated bread. Hair samples were divided into 1 cm segments and the concentrations of methylmercury in each segment for routine analysis. The response was similar to that reported in the literature. The length of each box is the range of maximum mercury concentrations in hair.

Main cohort studies on the effects of MeHg on child development

◆ Seychelles Study

- Rochester Univ. group
- 1989-90
- Fish
- Maternal hair
- 6.8 (Range:0.5-27) ppm by hair Hg
- No significant effects
- NOAEL (Non Observed Adverse Effect Level) : 12 ppm

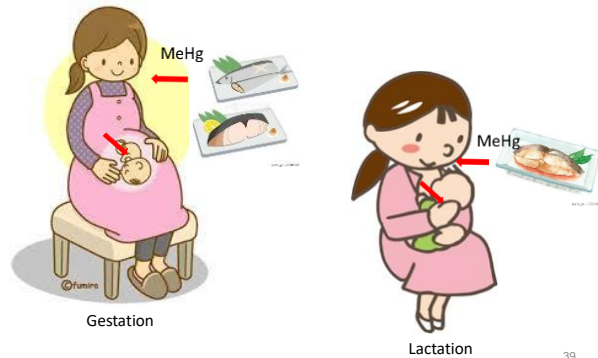
◆ Faroe islands study

- Odense Univ. group
- 1986-87
- Pilot whale
- Umbilical cord blood
- 4.3 (Range:0.2-39.1) ppm by hair Hg
- Effect to language, attention and memory.
- LOAEL (Lowest Observed Adverse Effect Level) : 10 ppm

The results were not consistent with each other.

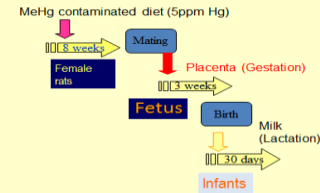
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MeHg exposure from mothers to infants during gestation and lactation

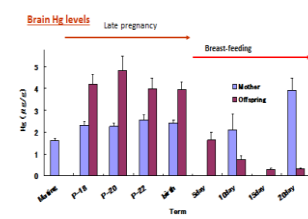
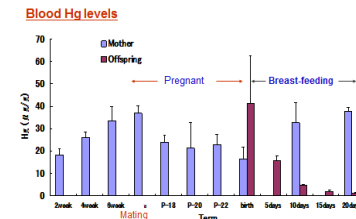


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Animal study protocol

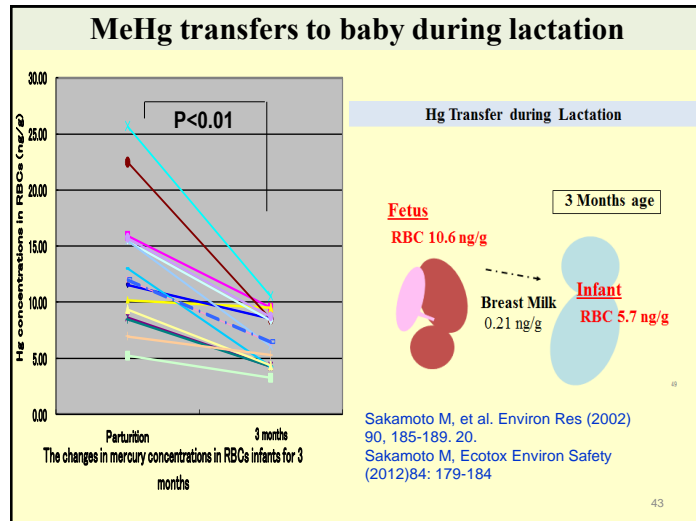
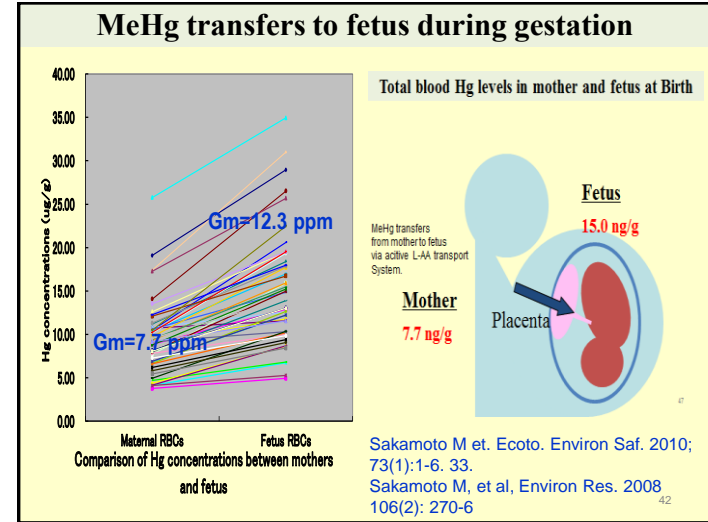
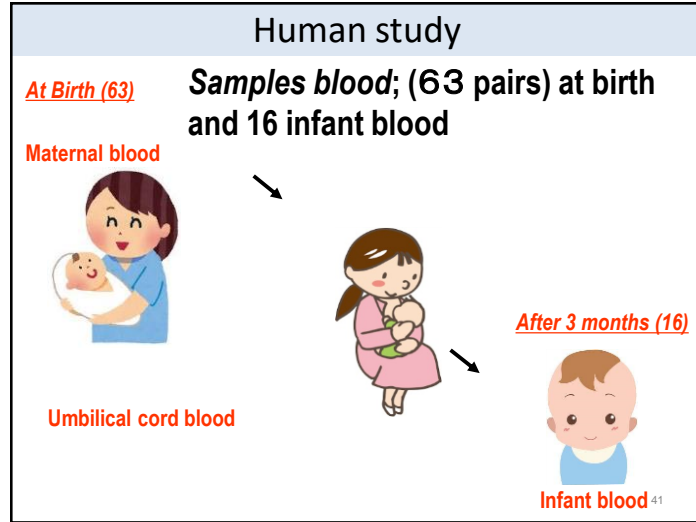


Sakamoto M, et al. Brain Res (2002) 949, 51-59



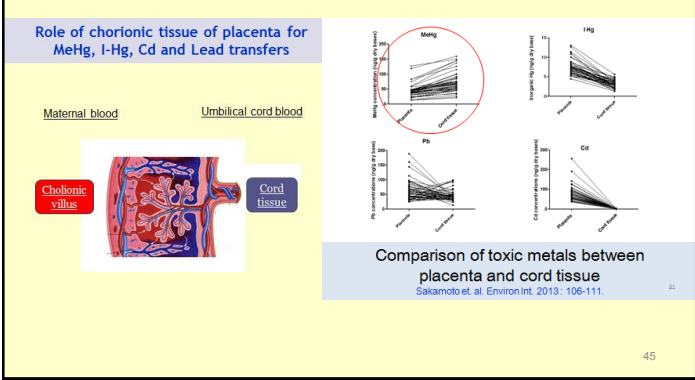
Time-course changes in Hg concentrations of maternal and infant rats during pregnancy and lactation

Time-course changes in Hg concentrations in the rat brain of mother and offspring during late pregnancy and after parturition



- ### Conclusion of MeHg transfers from mothers to infants
- Concerning to MeHg, the exposure risk of offspring is particularly high during gestation but may decrease during breast-feeding.
 - Intensive MeHg exposure assessment should be focused on the gestation rather than the lactation to avoid the adverse effects of MeHg to infants.
 - For the other environmental toxicants, exposure assessment should also be done separately during the periods.

Cd, I-Hg and Pb are well trapped within the placenta. However, placental does not work for trapping MeHg!



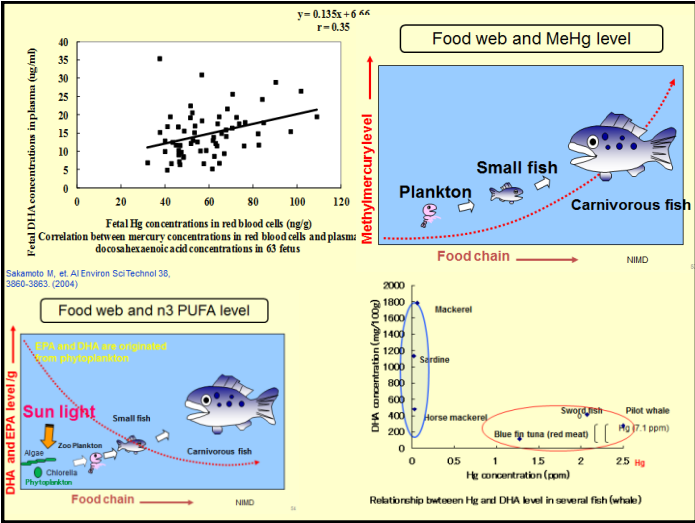
Summary of exposure source, pathway, target organs, and human biomarkers for three different chemical forms of mercury

	Hg ⁰	Hg ⁺⁺	MeHg
Exposure Source	ASGM, Dental amalgam, Mercury mine	Aerosol of mercuric chloride, Skin whitening cream	Fish and shellfish, Sea mammals, Rice in Hg contaminated area in China
Pathway	Lung → blood (blood-brain barrier) → brain, fetus	Lung, Skin, Gastrointestinal tract (5-10%)	Gastrointestinal tract (95%) → blood → (blood-brain & blood-placenta barriers) → brain, fetus
Target organs	Brain, Kidney	Kidney	Brain, fetus brain
HBM	Adult, infant: Urine (creatinine corrected), Serum Fetus: Breast milk	Urine (creatinine corrected), Serum	RBCs, Blood, Hair, nail Maternal RBCs, Blood, Hair, nail, breast milk Cord blood, cord tissue

Risk and benefit of fish consumption

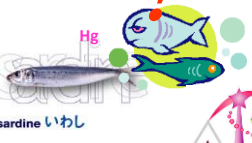
- Fish is a major source of harmful methylmercury (MeHg) and beneficial docosahexaenoic acid (DHA) in the developing brain.
- Therefore, eating fish can simultaneously expose humans to toxic MeHg and beneficial DHA.
- Public health worldwide is faced with the necessity of providing appropriate dietary advice on fish consumption that balances risks with benefits, especially during gestation.

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Pregnant women do not need to give up eating fish, they should continue to eat them in order to get the benefit from fish, but, must consume smaller fish in order to reduce the risk from large fish.

DHA, EPA



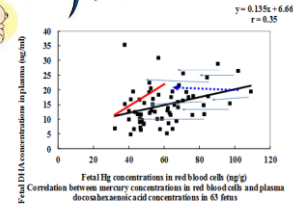
Hg

sardine いわし



Science News - June 10, 2006... Small fish for healthy babies

Japanese researchers have shown for the first time that pregnant women can increase their fetuses' exposure to harmful methyl mercury. As a result, the authors of research in the journal Environmental Health Perspectives recommended that mothers-to-be consume smaller fish while ensuring the diet contains enough omega-3 fatty acids that plays an important role in development.



Activities as a WHO Collaborating Centre



Kirgizstan '96



Indonesia '04



Mongolia '08



Cambodia '98

Thank you for your attention!



Sixty two years since Minamata
Disease -Toward sustainable
communities in Minamata

【Speaker: Director General, Minoru Koga,
Minamata Environmental Academia, Japan】

個人簡歷/Resume

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服務部門/Division	水俣環境アカデミア Minamata Environmental Academia	
職 稱/Position	所長 Director General	
<u>經歷/Experience</u>		
1972-1979 北九州市環境衛生研究所研究員		
1979-1990 産業医科大学医学部講師		
1987-1989 米国カルフォルニア大学ロサンゼルス校公衆衛生学部博士研究員		
1990-1997 産業医科大学共同利用研究センター副センター長、助教授		
1997-1999 熊本県立大学生活科学部助教授		
1999-2016 熊本県立大学環境共生学部教授、学生部長、副学長、学長		
2001-2002 英国プリマス大学客員教授		
2016-Present 水俣環境アカデミア所長、熊本県立大学名誉教授		
<u>學歷/Education</u>		
福岡教育大学教育学部卒、教育学士		
九州大学、理学博士		
<u>專長/Expertise</u>		
環境分析化学、水処理		

Sixty two years since Minamata Disease -Toward sustainable communities in Minamata-

Minoru Koga, Ph.D.

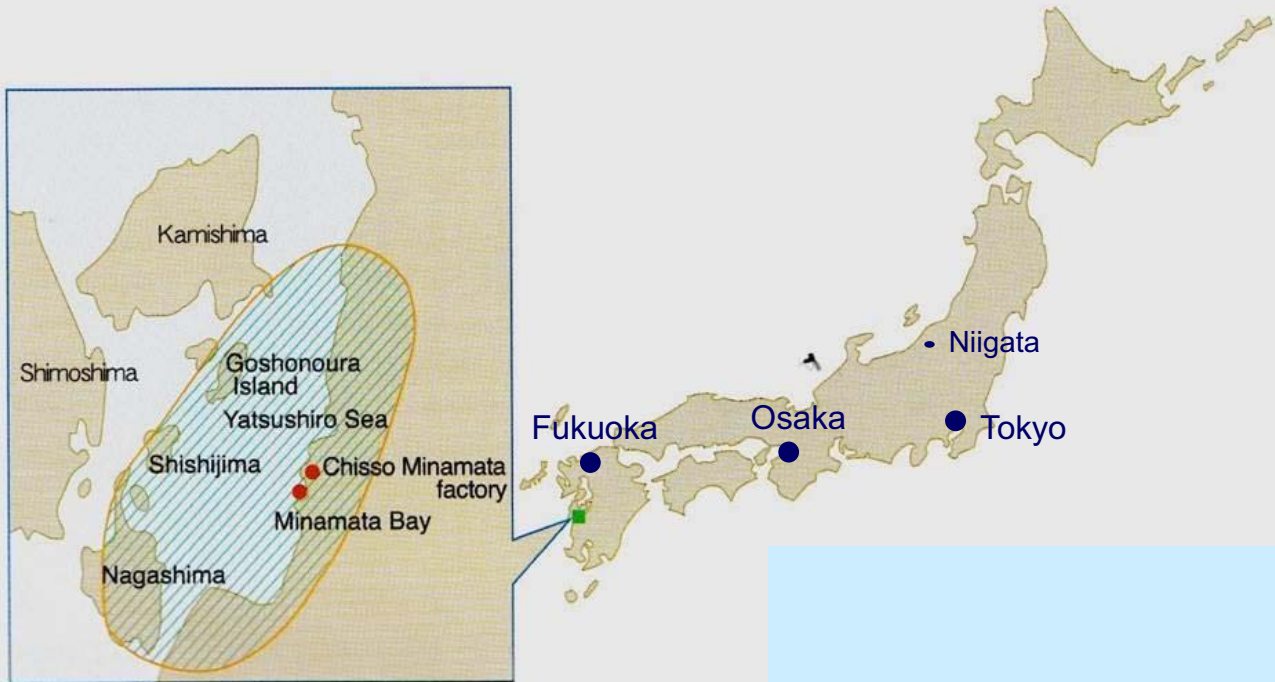
**Director General, Minamata Environmental Academia
Prof. Emeritus, Prefectural Univ. of Kumamoto**

2018.7.31. NTUT-MEA workshop

Minamata Disease

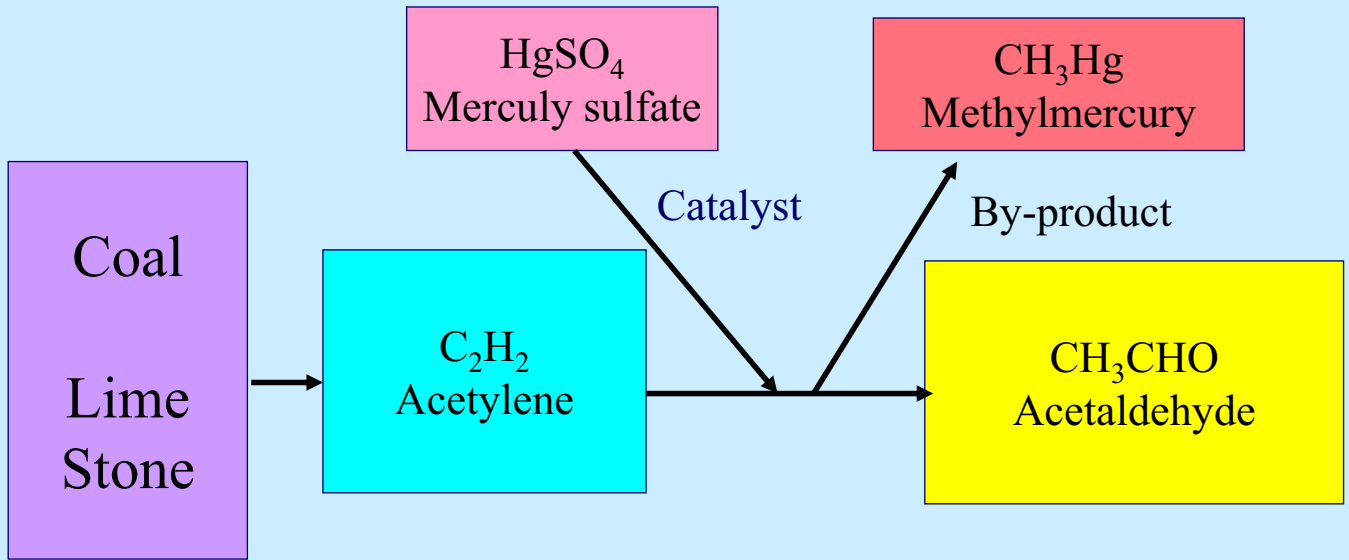
- 1909 Chisso, Minamata Div. established
- 1932 Acetaldehyde production plant started
- 1937 Methylmercury poisoning reported in UK
- 1945 Factory was damaged by US air raid
- 1955 Became a leading chemical company in Japan
- 1956.5 Minamata Diseases were reported.
- 1959.7 Kumamoto Univ. concluded the disease was caused by organo-mercury.
- 1962 Fetus poisoning (17 case)
- 1968.9 Government recognized organo-mercury poisoning.
- 1965 Niigata Minamata Disease

Outbreak area of Minamata disease patients



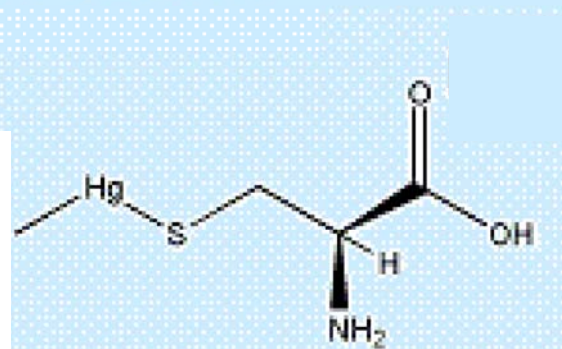
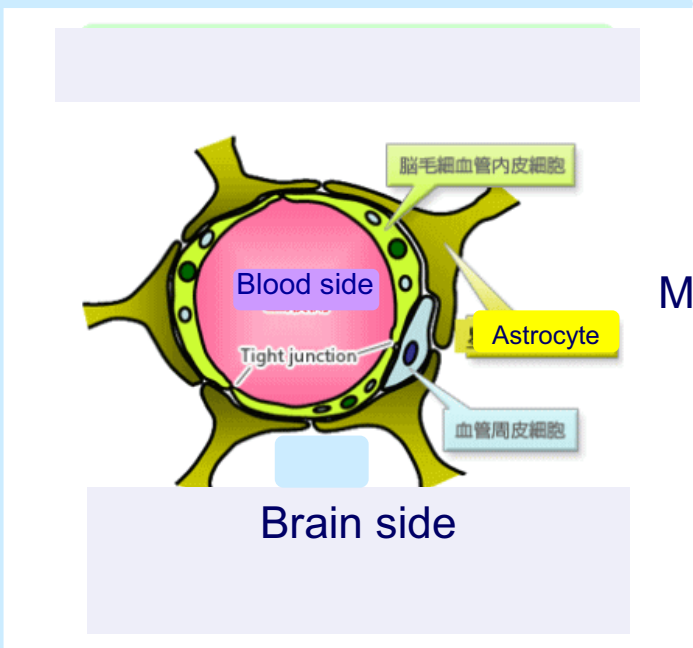
Typical symptoms of Minamata Disease (methyl-mercury poisoning)

- Sensory disorder of the four extremities
- Ataxia
- Concentric construction of the visual field
- Hearing impairment
- Disequilibrium
- Speech impediments
- Tremors
- Disorder of the ocular movement

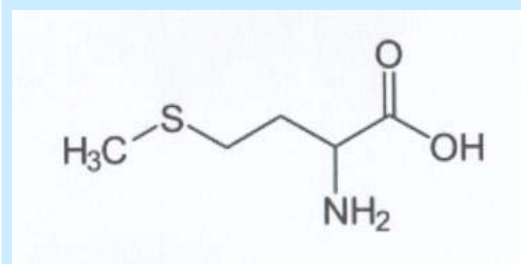


Methylmercury formation in the process

Blood-brain barrier

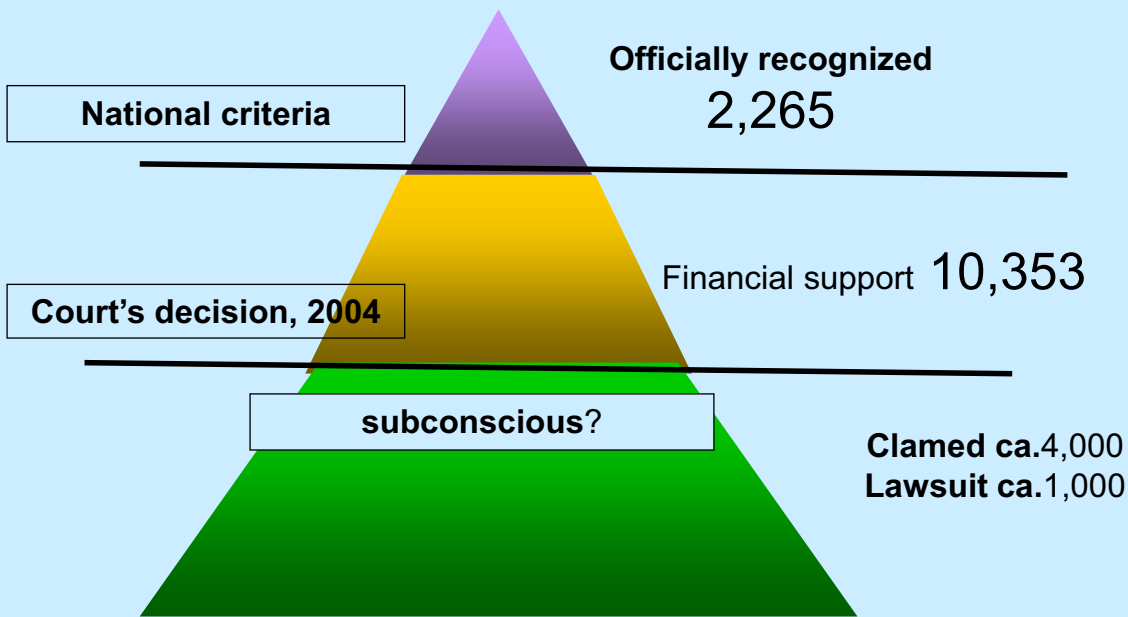


Methyl mercury-Cysteine conjugate

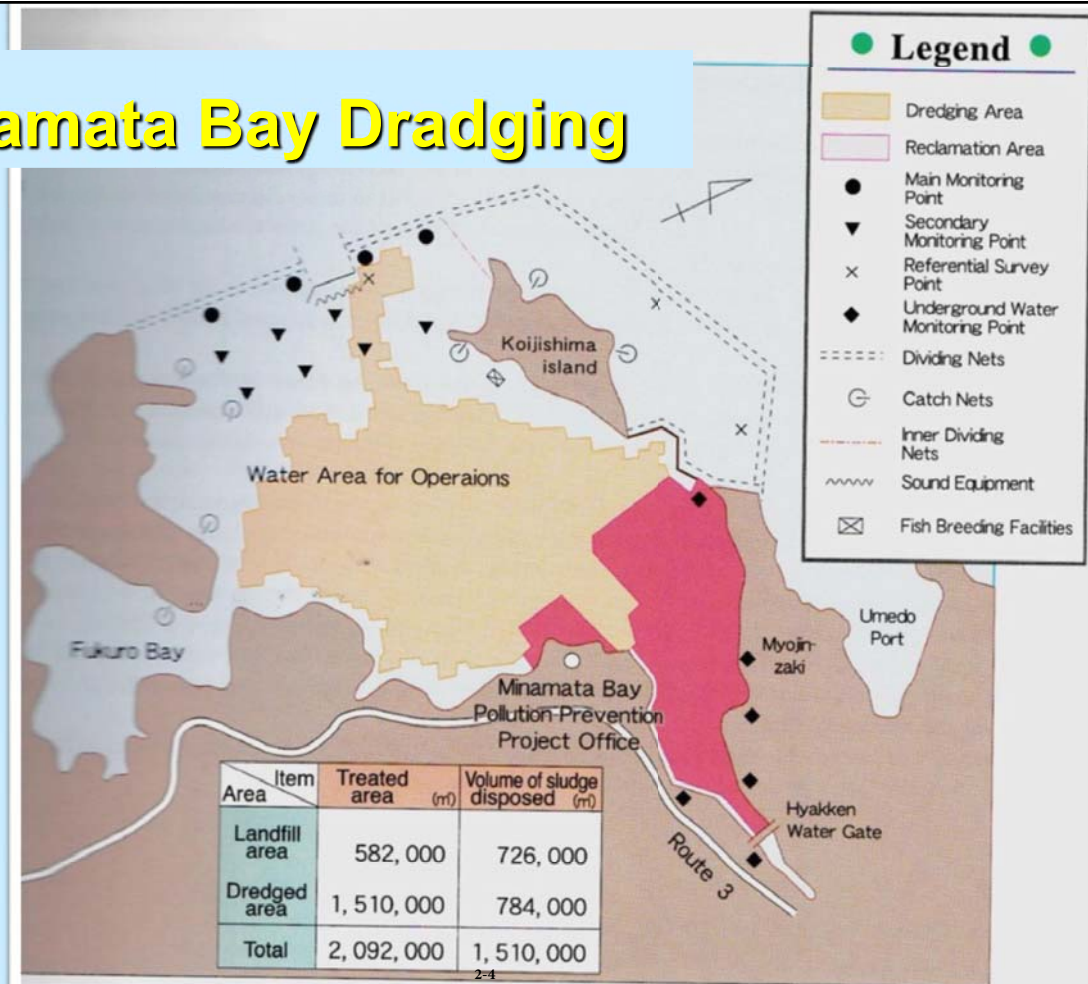


Methionine

Victims of Minamata Disease



Minamata Bay Dradging

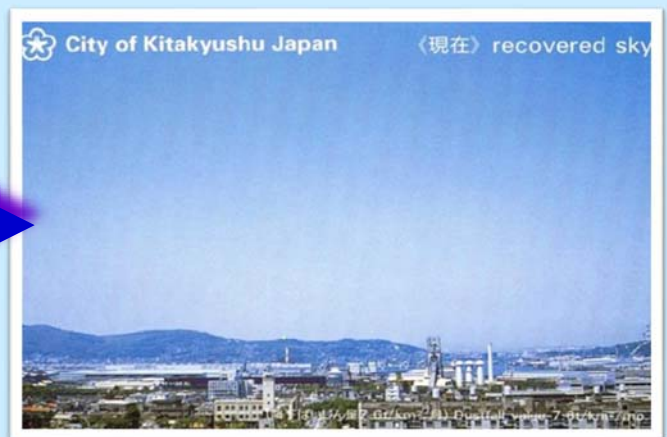


Compensation Sums of Minamata Disease

Sums of provided compensation
(million yen/year, as of 1991)

Health care :	7,671
Dredging :	4,271
Fishery :	689
Sum :	12,631

Estimated Treatment Cost : 123/year



Air and water pollution in Kitakyushu city, 1960–present.

Comprehensive Lessons from the Minamata Disease Affair

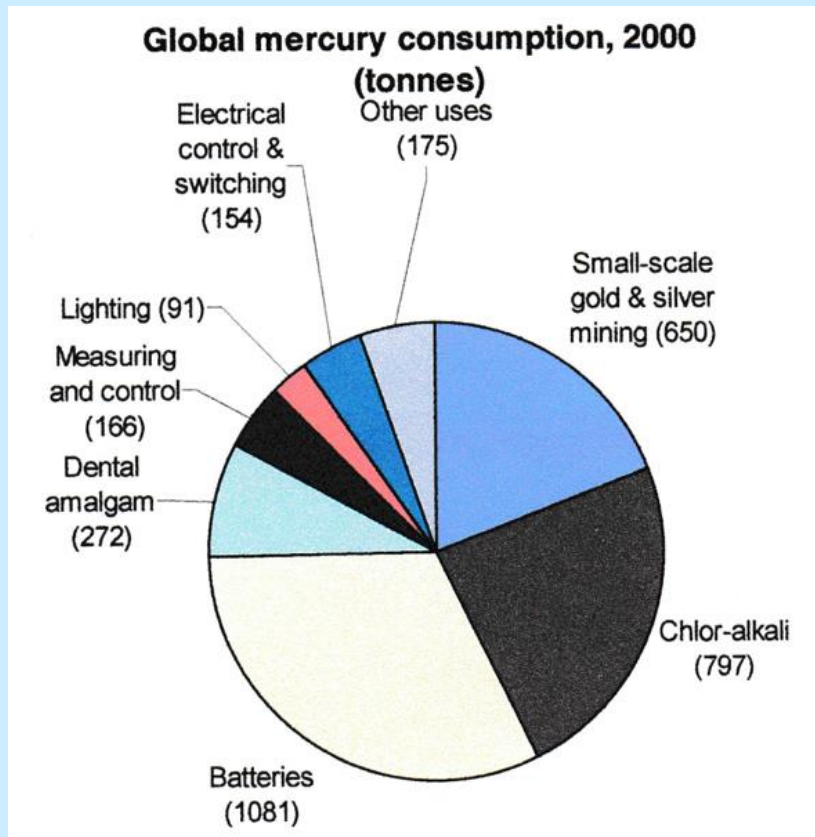
1. The actual setting must be directly observed, and the approach to the affair must be initiated from sincere hearing from the people.
2. Protection of health against damages must have priority over everything, and the administrative decision is required according to the certainty of the cause.
3. Collection and presentation of information in various scenes are necessary.
4. Companies have the social responsibility.

From: Report of the Social Scientific Study Group on Minamata Disease. NIMD, 2001.

Minamata's Regeneration (moyai-naoshi)

- 1992 The declaration on a City that values the Environment, Health and Welfare.
Declaration on the "Construction of a Model City for the Environment.
- 1993 The sorting and collection of household waste began (22 categories)
- 1994 Declaration of "Moyai-naoshi"
- 2001 Minamata Eco-town launched
The 6th International Conference on Mercury in Minamata.
- 2011 "Environmental capital" received.
- 2013 Minamata Convention in Kumamoto city and Minamata city.
92 countries signed.
- 2017 Minamata Convention on Mercury enacted.

Global mercury consumption, 2000



Citizens participation type garbage sorting and recycling collection.



Attractive nature and environment in Minamata area



A river source of Minamata



Rice paddy fields in Kugino area



Cherry blossoms along the Minamata river



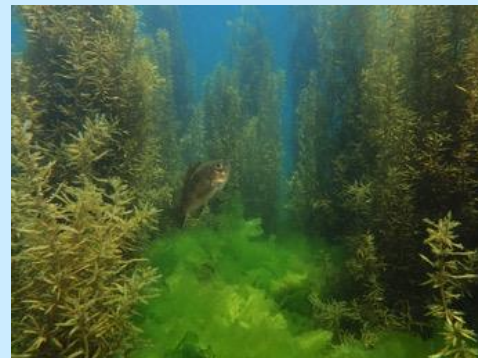
Tea plantation in Ishidobi area



Yunoturu hot springs



Koji Island from Eco-park



Seaweed forest in Minamata bay

Photo: M. Morishita



Photo: M. Morishita



Sea horse



Kitakyushu Natural History Museum

Key persons to develop the sustainability in Minamata



Mr. H. Amano, owner of tea plantation.



Mr. T. Sawahata, organizer of local activities.



Mr. K. Sasahara, patishie, sweetshop.

Minamata's original sweets
Monaka & Horaku manjyu



Mr. M. Morishita, diving instructor.

Education and Research Facilities, NPO and NGO in Minamata area



- Minamata Disease Municipal Museum
 - Environmental Center
 - NIMD Information Center



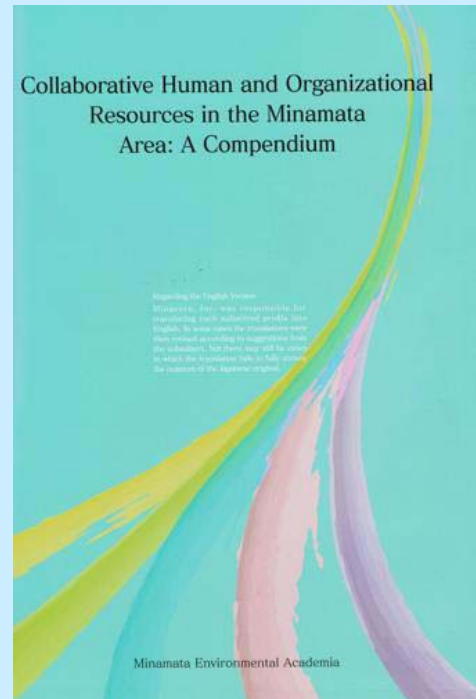
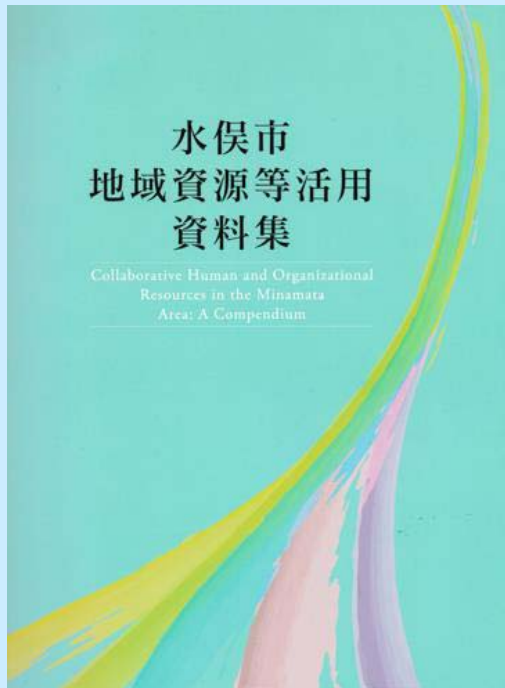
National Institute of Minamata Disease



Minamata Environmental Academia
Established in 2016.4

- Kumamoto Gakuenn Univ.
On-site Research Center for Minamata Studies
- Minamata Disease Center "Soshisha"

Collaborative human & organizational resources in Minamata area, issued by MEA, 2018.



Thank you for your attention.


References

- 1) Report of the Social Scientific Study on Minamata Disease, National Institute of Minamata Disease (2001),
- 2) Minamata Disease-Its History and Lessons-. Minamata City, 2007

Compliance with Minamata
Convention on Mercury- The
Strategies and Implementation Plan
in Taiwan

【Speaker: Technical Specialist, Chi-Fu Lin,
Toxic and Chemical Substances Bureau,
Environmental Protection Administration, Taiwan】

個人簡歷/Resume

姓名/Name	林繼富/ Chi-Fu Lin	
服務單位/Department	環境保護署毒物及化學物質局/ Toxic and Chemical Substances Bureau, Environmental Protection Administration, Taiwan	
職稱/Position	薦任技正/ Senior Specialist	
<u>經歷/Experience</u>		
1.環境保護署毒物及化學物質局薦任技正 (2017 年 5 月-迄今) 2.北市政府環境保護局空氣品質及噪音科 薦任技士(2012 年 1 月-2017 年 5 月)		
<u>學歷/Education</u>		
美國約翰霍普金斯大學 地理暨環境工程研究所 博士 Department of Geography and Environmental Engineering, The Johns Hopkins University, USA, Ph.D.		



2018 International
Environmental Partnership



2018国立台北科技大学、
水俣環境アカデミア連携プログラム

Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

「水俣条約推進に向けた国際水銀対策ワークショップ」



Compliance with Minamata Convention on Mercury- The Strategies and Implementation Plan in Taiwan

Chi-Fu Lin/Technical Specialist

Toxic and Chemical Substances Bureau,
Environmental Protection
Administration, Taiwan

2018.07.31

Content

1. Introduction

2. Implementation plan for Minamata Convention on Mercury

3. Promotion of mercury-free illumination sources and batteries with green mark

4. The recycling experience of mercury lamps and batteries

5. Mercury monitoring in environment

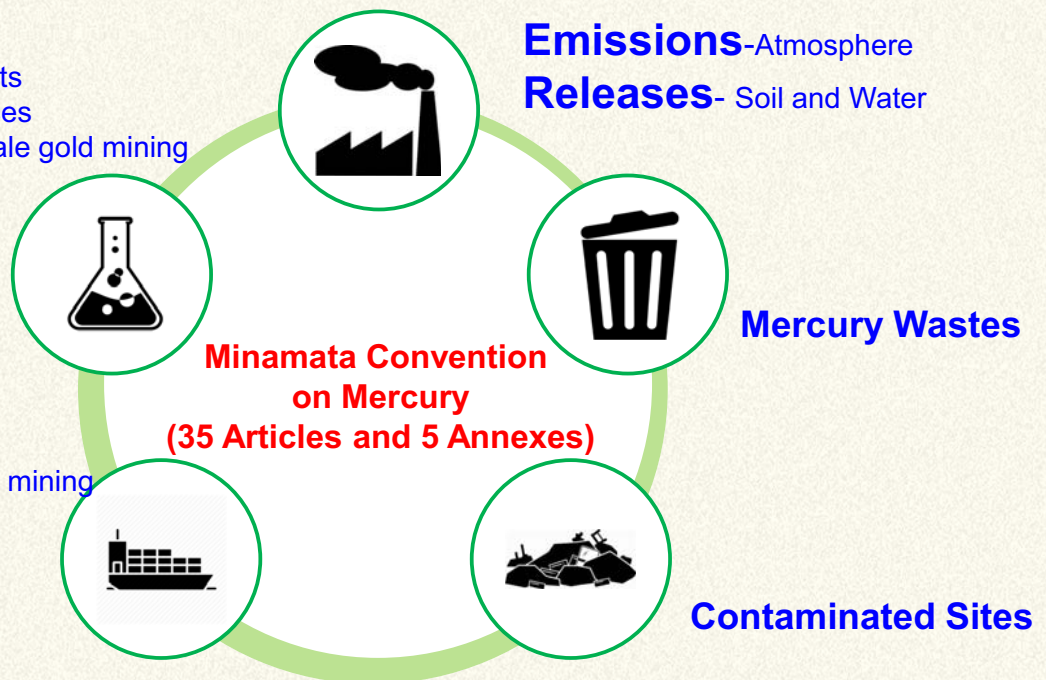
1. Introduction

Usage

- Mercury-added products
- Manufacturing processes
- Artisanal and small-scale gold mining

Supply sources and Trade

- Naturally occurring ore mining
- Storage
- Export and import



1. Introduction

Article 20 Implementation plans

1. Each Party may, following an initial assessment, develop and execute an implementation plan, taking into account its domestic circumstances, for meeting the obligations under this Convention.
2. Each Party may review and update its implementation plan, taking into account its domestic circumstances and referring to guidance from the Conference of the Parties and other relevant guidance.

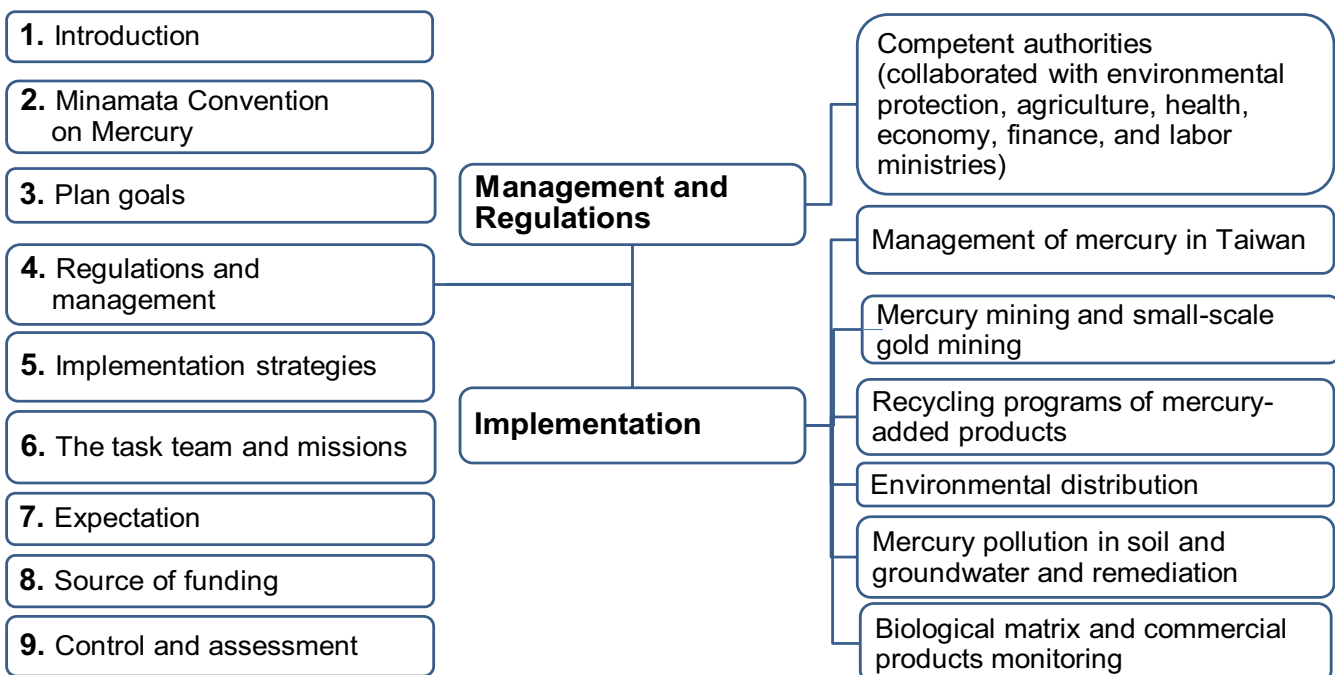
The cross-ministerial task team and implementation plan have been established and approved since June 27, 2016 in Taiwan, though Taiwan is still not a member or observer of Parties of Minamata Convention on Mercury.

2. Implementation Plan for Minamata Convention on Mercury in Taiwan



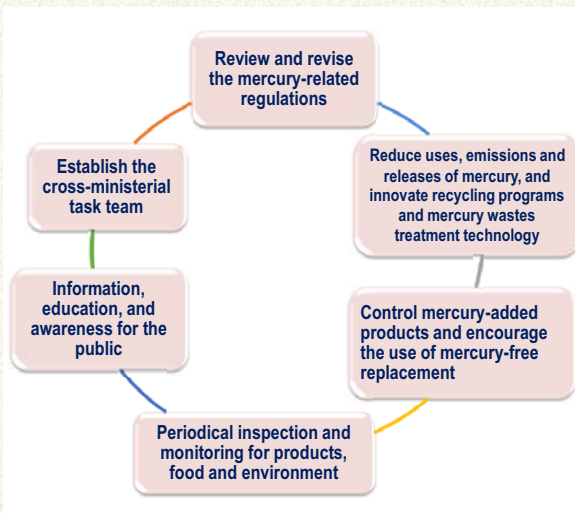
2. Implementation Plan for Minamata Convention on Mercury in Taiwan

The framework of Implementation Plan



2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Implementation Strategies



Agency	Task Team Members
Environmental Protection Administration (EPA)	Toxic and Chemical Substances Bureau Dept. of Environmental Sanitation & Toxic Substances Management Dept. of Air Quality Protection & Noise Control Dept. of Water Quality Protection Dept. of Waste Management Soil & Groundwater Remediation Fund Management Board Recycling Fund Management Board Department of Supervision Evaluation & Dispute Resolution, Department of Environmental Monitoring & Information Management, Environmental Analysis Laboratory, Bureau of Environmental Inspection
Ministry of Health and Welfare (MOHW)	Food and Drug Administration, Health Promotion Administration, Department of Chinese Medicine and Pharmacy, Department of Mental and Oral Health
Ministry of Economic Affairs (MOEA)	Industrial Development Bureau, Bureau of Foreign Trade, Bureau of Standards, Metrology and Inspection, Bureau of Mines
Council of Agriculture (COA)	Department of Animal Industry Agriculture and Food Agency, Fisheries Agency, Bureau of Animal and Plant Health Inspection and Quarantine, Agricultural Chemicals and Toxic Substances Research Institute
Ministry of Finance, Ministry of Labor	Customs Administration, Occupational Safety and Health Administration

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Missions:



Mercury-added products phase-out (2020):
The Convention Article 4 Annex A Part I



Dental amalgam phase-down:
The Convention Article 4 Annex A Part II



Mercury or mercury compounds are used in manufacturing processes:
The Convention Article 5 Annex B Part I & II



Reduction in emissions of mercury and mercury compounds to the atmosphere
The Convention Article 8 Annex D



Reduction in releases of "total mercury" to land and water
The Convention Article 9

Task Team members

EPA, MOWH, MOEA, and MOF

MOWH, EPA

EPA

EPA

EPA

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Missions:



Interim storage and mercury wastes
The Convention Article 10, 11



Contaminated sites
The Convention Article 12



Health aspects:
The Convention Article 16



Information exchange
The Convention Article 17



Public information, awareness and education
The Convention Article 18



Research, development, monitoring
The Convention Article 19

Task Team members

EPA, MOEA, and MOL

EPA

MOWH

EPA, MOWH, COA, MOEA, MOL,
MOF

EPA

EPA, MOWH, COA, MOEA, MOL,
MOF

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Regulations of Mercury in Taiwan

Mercury is promulgated as Class 1 and Class 3 toxic chemical substance (Toxic Chemical Substances Control Act)

Listed No.	Series No	Chinese Name	English Name	Chemical Formula	CAS. Number	control concentration standard w/w %	large-scale handling standard (kg)	Toxicity Classify (*)
22	01	汞	Mercury	Hg	7439-97-6	95	50	1, 3

* : 「1」 : Class 1 toxic chemical substance which is not prone to decompose in the environment or that pollute the environment or endanger human health due to bioaccumulation, bioconcentration or biotransformation.

「3」 : Class 3 toxic chemical substance which endangers human health or the lives of biological organisms immediately upon exposure.

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

■ Mercury regulation in uses

Prohibition of Mercury Activities in Uses

1. Manufacture of insecticide for crops
2. Manufacture of thermometers
3. Use as a catalyst in manufacturing processes

Allowance of Mercury Activities in Uses

1. Research, experiments, education
2. Metallurgy (as an extract reagent in manufacturing processes), manufacture of lens coatings
3. Manufacture of amalgam and its compounds, alloys
4. Manufacture of fluorescent lamps and lights
5. Manufacture of electric devices and mercury-added switches
6. Manufacture of barometer and hygrometers
7. Manufacture of reagents in experiments
8. Cleaning impurity of mercury

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

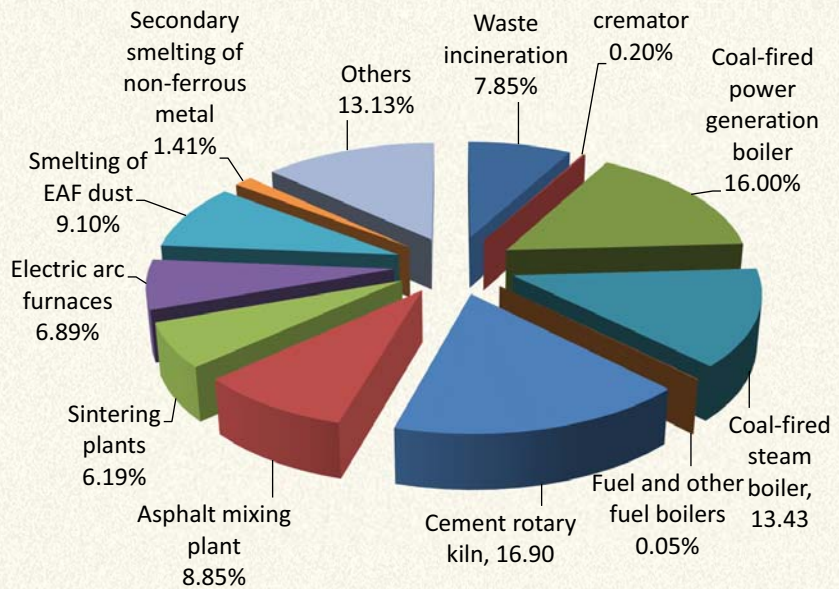
Summary of regulations for mercury in Taiwan

Regulations	Actions
Sources control	<ol style="list-style-type: none"> 1. List mercury as a chemical in Category I for limitation of the uses (currently is used in research, experiments, education, barometers, sphygmomanometers, etc.) of mercury in Toxic Chemical Substances Management Act in 1991. 2. No artisanal and small-scale gold mining and no new mercury mining permission as well as its extension.
Manufacture and Products	<ol style="list-style-type: none"> 1. Ban methylmercury pesticides manufacture, import, processing in 1971 and sale in 1972. 2. Ban mercury and its compounds used in cosmetics in 1983 and promulgated mercury content limitation in cosmetics (less 1 ppm). 3. Limit mercury content batteries manufacture, import, and sale including manganese zinc batteries, non-button alkali manganese batteries (less 5 ppm) (since 2006) 4. Ban mercury content thermometers in manufacture (since Jan 1, 2008) 5. Ban mercury thermometers import and sale for the public (since July 1, 2008) 6. Ban import and sale mercury thermometers for the public including medical facilities 7. Ban mercury as a catalyst in industries since July 31, 2009. 8. CNS15663 for mercury content limit for electronic and electric devices including switches and relays since July 30, 2013. 9. Promote LED lights to replace mercury content lights 10. Promote electronic sphygmomanometers in medical institutes and hospitals 11. Promote dental resin to replace dental amalgam
Wastes recycle	Recycle mercury-added products such as batteries, compact fluorescent lamps (CFLs), linear fluorescent lamps (LFLs), high pressure mercury vapor lamps (HPMV), etc.
Environmental Standards	Promulgated mercury emission standards or limitations for incinerators, power-plant, effluent, contaminated soil, groundwater, water bodies, water quality, drinking water, hazardous industrial wastes, etc.
Food, Aquatic products	Promulgated mercury content limitations for rice, aquatic products, ice, dietary oil, salts, Chinese herbal materials

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Mercury emissions inventory (2016)

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



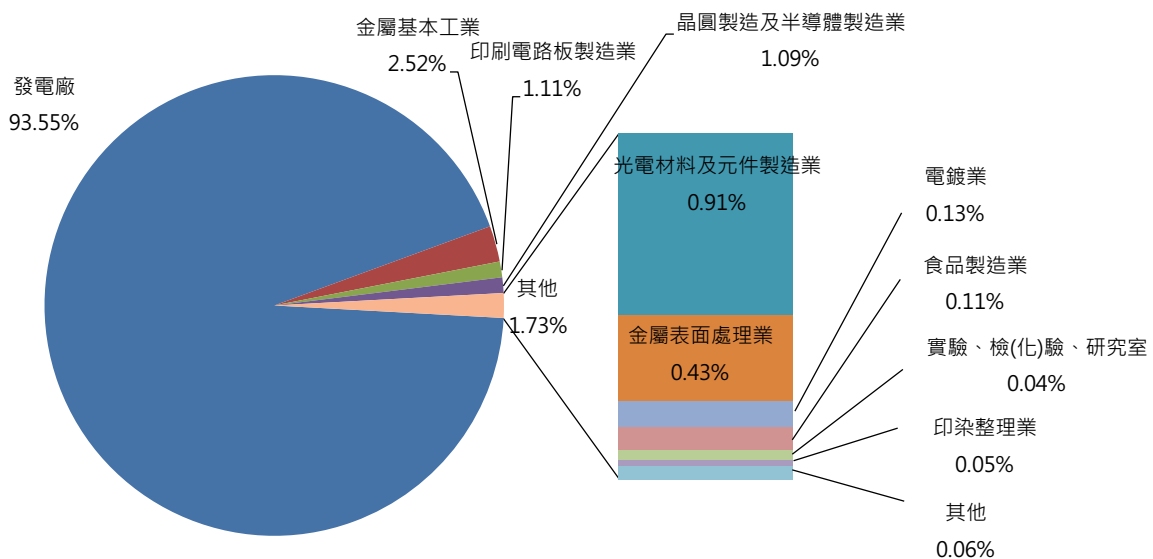
Major sources: cement rotary kiln, coal-fired steam boiler, coal-fired power generation boiler, and electric arc furnaces

2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Mercury releases inventory

Mercury releases from wastewater (estimated)

Major sources: power generation plants



2. Implementation Plan for Minamata Convention on Mercury in Taiwan

Health awareness and promotion for the vulnerable populations

Fish diet guidance for pregnant women, breast-feeding women, 1- 6 years-old children

制定食品汞含量標準，並執行抽測

Standards	Food items	Limit (ppm)
Standard for the Tolerance of Heavy Metals in Rice (Mercury)	Rice	0.05
Sanitation Standard for Aquatic Animal (Methyl mercury)	whale, shark, swordfish, tuna, oil-fish.	2
	grenadier, plain bonito, pandora, atlantic, catfish, a nglerfish, red seabream, megrim, mullet, rays, scab bard fish, red seabream, snack mackerel, butterfish , sturgeon, spotted butter fish, eel, pike.	1
	other fish	0.5
	shellfish	0.5
	Cephalopod (except organ)	0.5
	Crustaceans	0.5

3. Promotion of Hg-free illumination sources and batteries with Green Mark



Green Mark

- ISO 14024 Type I Eco label represents for "recyclable, low-polluting, and resource-saving"
- The Green Mark system was launched in 1992.
- Green Mark is awarded to products in the top 20%-30% of its category.
- 14 categories and 129 types of labeled products.
 - Resource recycling products
 - Home appliances products
 - Building materials
 - Services
 - Cleaning products
 - Energy saving products
 - Organic materials
 - Industry products
 - Daily commodities
 - Water-saving products
 - Degradable products
 - Using solar energy resources products
 - Office products
 - IT products
- Till July 9, 2018, the total number of green mark products are 15,084 items.
The valid products are 4,736 items.

Green Mark Products have the top priority in Taiwan GPP

3. Promotion of Hg-free illumination sources and batteries with Green Mark

- Measures taken for the Minamata Convention on Mercury

- Review the existing Green Mark criteria

Review all the mercury related criteria, including “Fluorescent Lamps”, “Energy Saving Fluorescent Lamps”, “Rechargeable Batteries”, “Mercury Free Batteries”, IT products and TV.

- Revision of “Fluorescent Lamps” and “Batteries” Green Mark criteria

Strengthen the mercury content limit of fluorescent lamps and combine “Rechargeable Batteries” and “Mercury Free Batteries” into “Batteries” and expand the product scope to cover more products.

- Initiation of Green Mark criteria for LED based illumination sources

Replace the fluorescent lamp based products with LED based products.

3. Promotion of Hg-free illumination sources and batteries with Green Mark

- Green Mark Criteria with Mercury Free Requirement

- Illumination sources related criteria (2 criteria for illumination sources & 4 criteria for products with CCFL)

Product Item	Mercury Content Limit	Last Revision
Fluorescent lamps	For linear fluorescent lamps with different types and diameters, the mercury content of the lamp shall be less than 3~5 mg.	June 23, 2016
Energy-saving fluorescent lamps	The mercury content of the product shall be less than 5 mg.	September 26, 2013
IT products (monitors, NBs, integrated desktop (AIO) computers) and TV	The lamps used in the product’s display unit shall not contain mercury.	November 25, 2015



3. Promotion of Hg Free Illumination sources and Batteries with Green Mark

- Green Mark Criteria with Mercury Free Requirement
 - Batteries related criteria (1 criterion for batteries & 6 criteria for products with built-in battery)

Product Item	Mercury Content Limit	Last Revision
Batteries (primary and secondary batteries)	The product shall not contain mercury (Regulatory limit : < 0.25 mg/kg).	December 14, 2016
IT products (Printers, Desktop Computers, Monitors, NBs)	The built-in battery shall not contain mercury (Regulatory limit : < 0.25 mg/kg) and the mercury content of the battery assembly for NB shall be less than 1 mg/kg.	November 25, 2015
TV	The built-in battery shall not contain mercury (Regulatory limit : < 5 mg/kg).	November 27, 2013



3. Promotion of Hg Free Illumination sources and Batteries with Green Mark

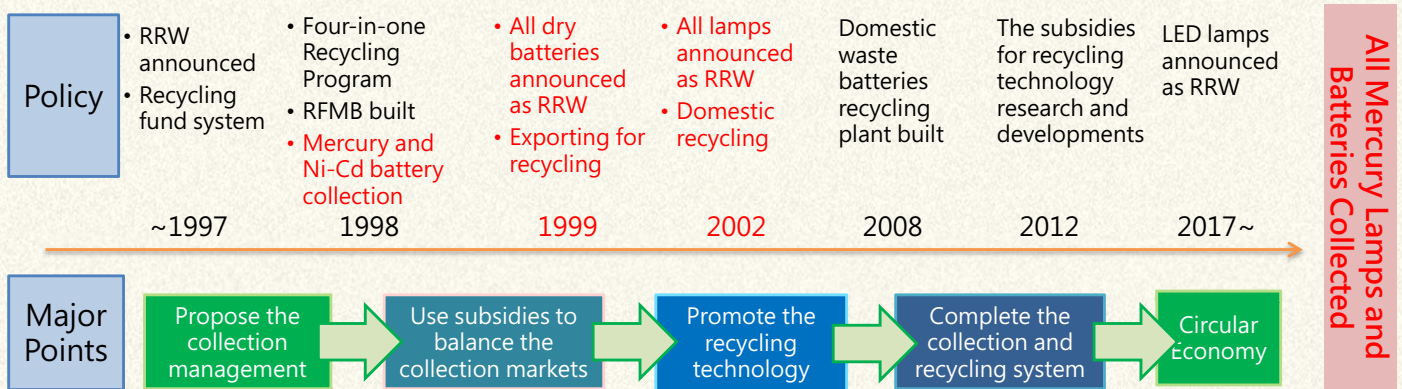
- Achievements
 - Reduction of Hg content in linear fluorescent lamps
 - For traditional fluorescent lamps, the Hg content reduced from 15 mg to 5 mg. (averagely)
 - For LCD panels , replace CCFL with LED, reduce 3mg Hg per LCD panel. (minimum)
 - Reduction of Hg content in batteries
 - For cylinder batteries, Hg content reduced from 5 ppm to Hg free (Regulatory limit : < 0.25 mg/kg).
 - For button cells, not regulated before. Now all the button cells used by Green Mark IT products shall be Hg free (Regulatory limit : < 0.25 mg/kg).
 - Publication of three Green Mark criteria for LED related products to replace fluorescent Lamps

“LED Lamps”, “Fixtures of Roadway Lighting with LED Lamps”, and “LED Display Panels”.

4. The Recycling Experience of Mercury Lamps and Batteries

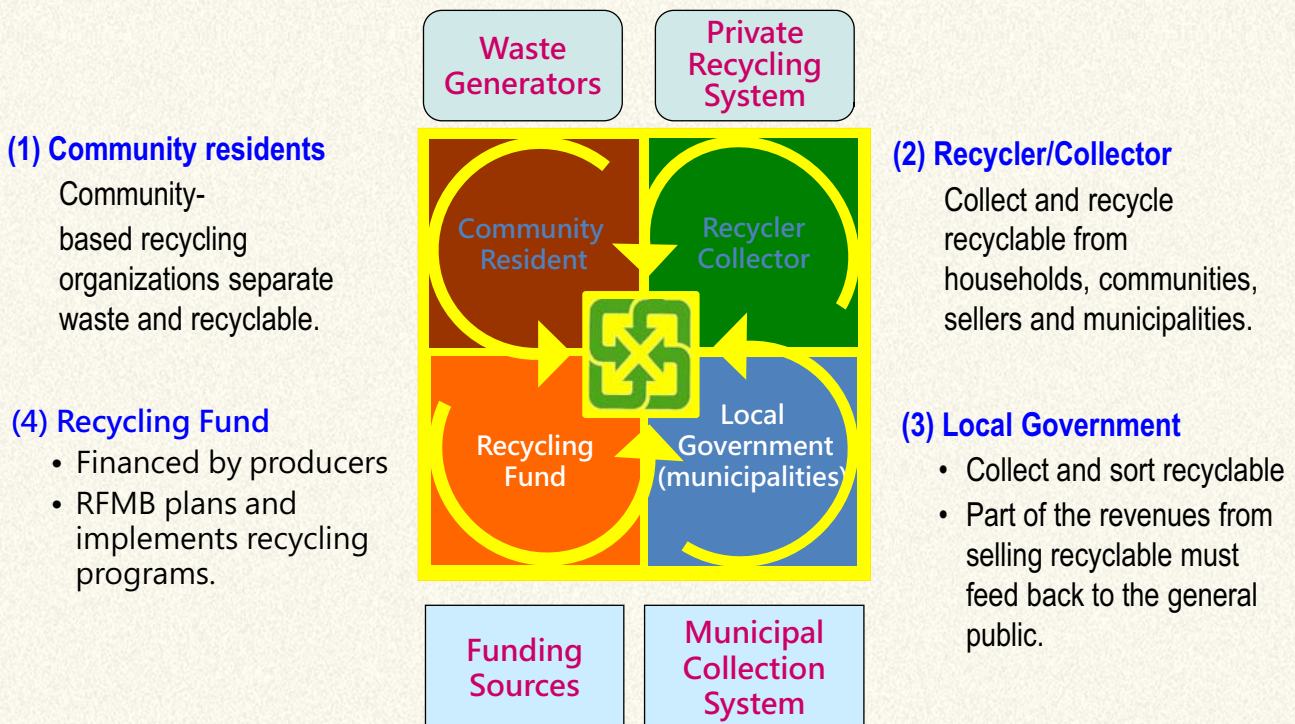
(1) Promoting History

- A. Taiwan EPA (TEPA) announced mercury-added batteries as Regulated Recyclable Wastes (RRW) in Jun 1997, then expanded the scope to all types of dry batteries in September 1999, including Mn-Zn, Alkaline batteries and button cells.
- B. TEPA announced Linear fluorescent lamps as RRW in Jan 2002. Then added Circular fluorescent lamps, Ballast build-in fluorescent lamps and Compact fluorescent lamps in Jul 2007. Afterwards, expanded the scope to High-intensity discharge lamps (HID) in Jul 2008. Finally, added Cold cathode fluorescent lamps (CCFL), Inductive fluorescent lamps and other mercury lamps in Mar 2014.



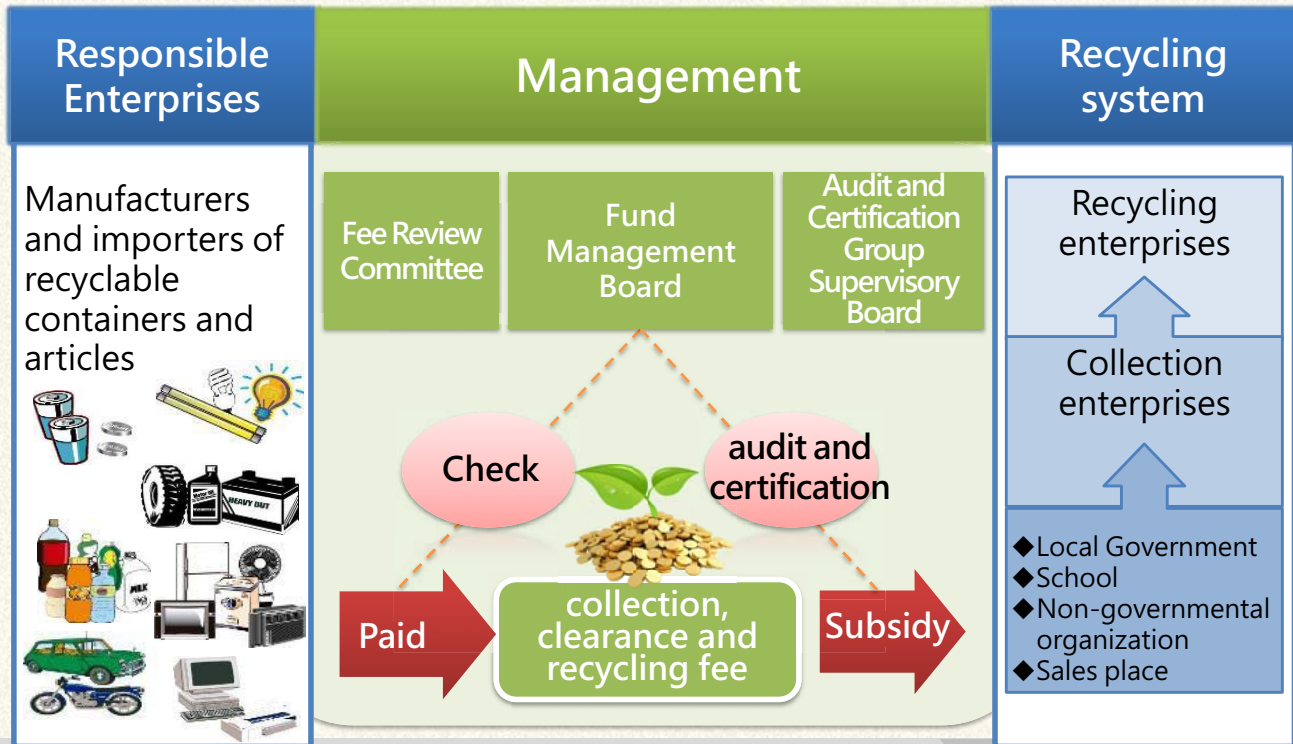
4. The Recycling Experience of Mercury Lamps and Batteries

(2) Four-in-one Recycling Program



4. The Recycling Experience of Mercury Lamps and Batteries

(3) Operation of Recycling Fund



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4. The Recycling Experience of Mercury Lamps and Batteries

(4) Responsible Producers (EPR Laws)



A. Article 15 of Waste Disposal Act

Manufacture or importer of the articles and the packaging and containers thereof, or the manufacturer or importers of the raw materials thereof **shall bear responsibility for collection and recycling**.

B. Article 16 of Waste Disposal Act

Responsible producers should register with TEPA and **pay recycling fees based on the quantities sold/imported to the national market**, and the fee rates decided by TEPA. Recycling fees are deposited into recycling funds in banks.

C. Article 17 of Waste Disposal Act

Recycling funds shall be used for the following purposes :

1. **The payment of collection and recycling subsidies**
2. **The provision of grants and awards for collection and recycling systems**
3. The covering of expenses for municipalities performing collection and recycling on behalf of responsible producers
4. The covering of auditing and certification expenses
5. Other uses related to general waste resource recycling



D. Article 19 of Waste Disposal Act

Producers designated by TEPA shall **mark articles or the packaging and containers thereof with recycling marks**.



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4. The Recycling Experience of Mercury Lamps and Batteries

(5) Sellers and Collection Channels



A. Sellers

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



B. Collection Channels

- a. **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
- b. **Lamps** : Lamp Sellers, Village/Community Collection Stands, Municipal Collection Trucks and



4. 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.

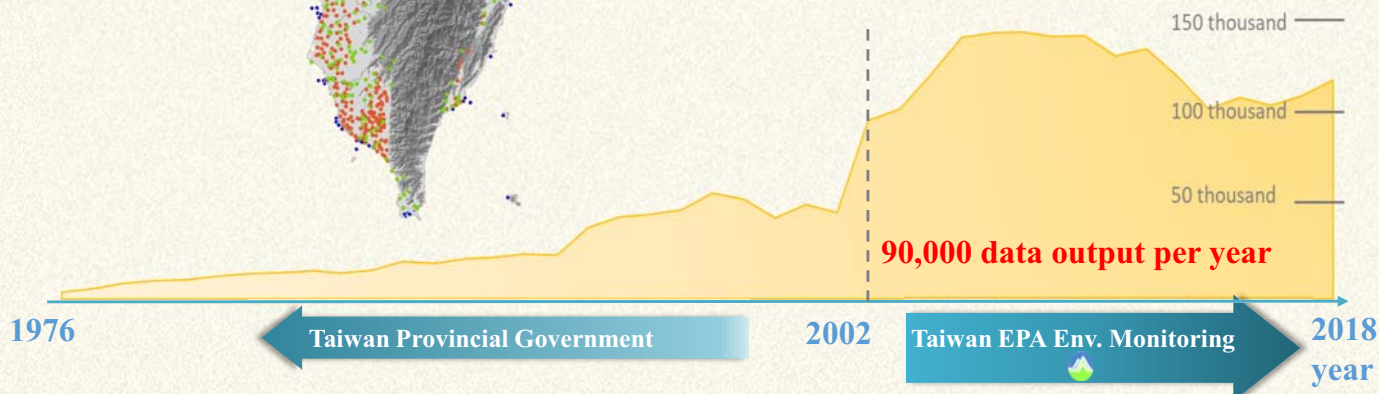
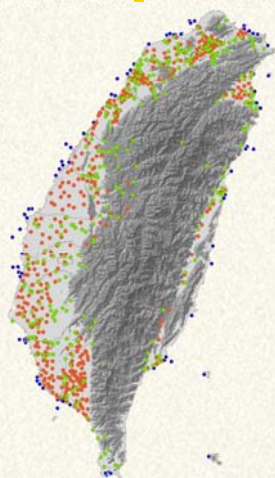


educational and promotional activities

5. 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



5. Monitoring of Environmental Medium

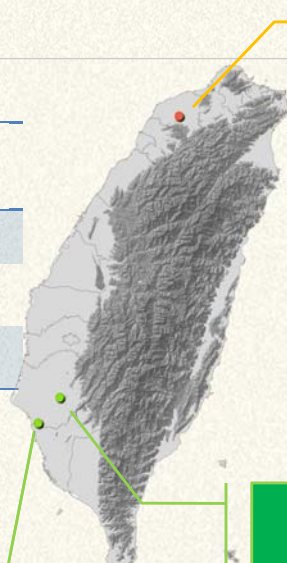
Mercury in Water Monitoring

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

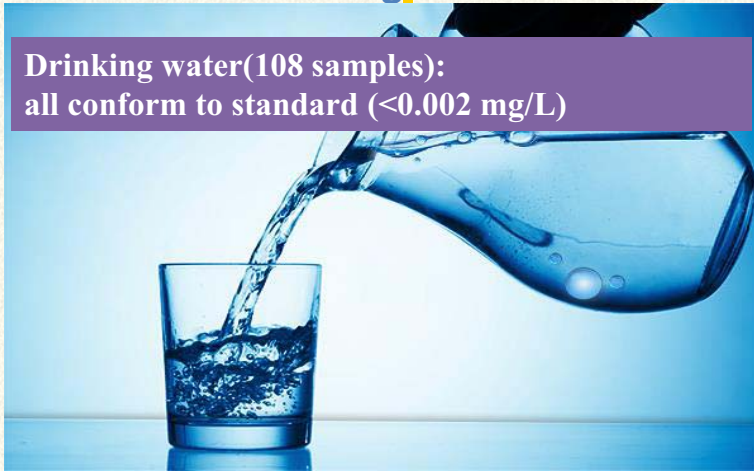


5. Monitoring of Environmental Medium



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



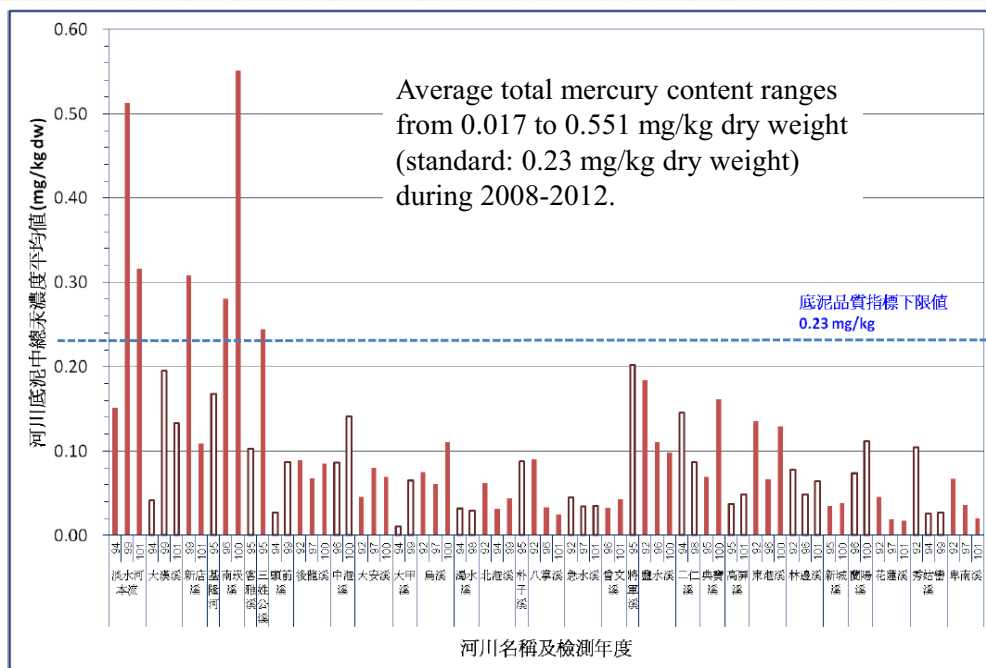
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5. Monitoring of Environmental Medium



The distribution of total mercury content in the river sediments



Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

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5. Monitoring of Environmental Medium



Mercury in Air

Monitor Gaseous Mercury since 2007

Date range : **0.94-7.44** ng/m³

Annual average : **2.11-3.92** ng/m³

(WHO Standard: 1,000 ng/m³)

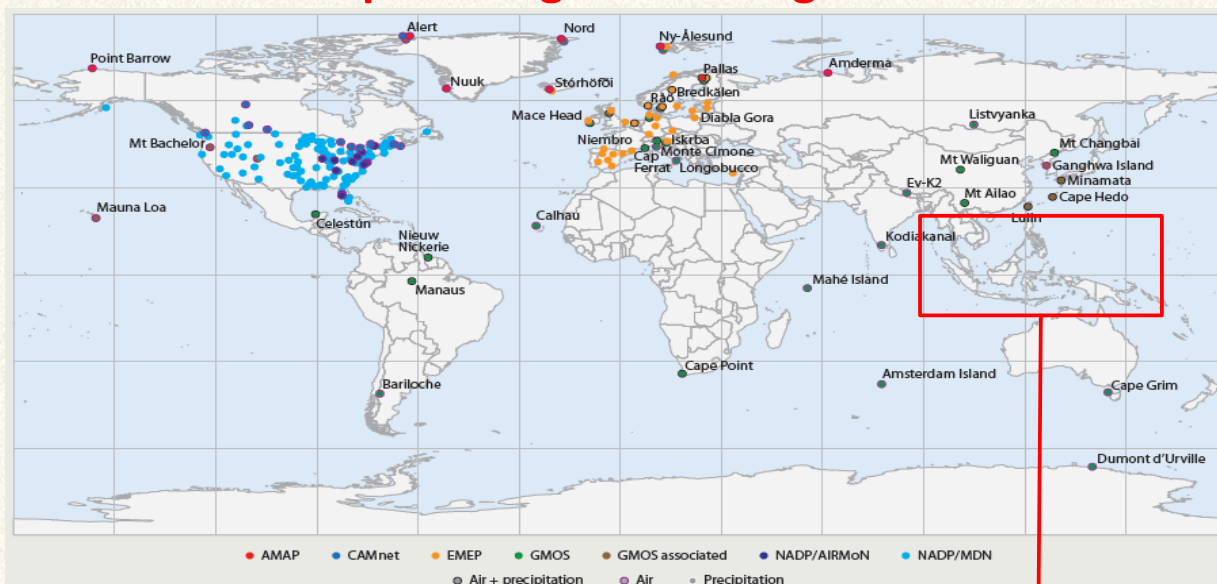
Lulin Mountain Background Station(2862m)

Gaseous elemental mercury : **1.58** ng/m³

(The average concentration of north Earth is 1.5-1.7ng/m³)

5. Monitoring of Environmental Medium

Atmospheric Hg Monitoring Worldwide



Currently, long-term or background atmospheric Hg monitoring activities in SE and S Asia are lacking.

5. Monitoring of Environmental Medium



APMMN



Asia Pacific Mercury Monitoring Network

- **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
- **Partner** : Vietnam, Indonesia, Thailand, Philippine and Sri Lanka so far
- **The 7th APMMN Annual meeting** : 2018.9.4~7 Philippine Manila



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

Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

Summary

1. As a member of the Global Village, Taiwan, with a great determination and ambition, has performed progressively achievements in prevention mercury pollution, ban mercury content pesticides, recycling wastes of mercury content products, and monitoring mercury transport in air, water, and land, etc.
2. With devotion and compassion, Taiwan would like to share successful experience on mercury issues with friends from the world.
3. On the other hand, Taiwan also would like to learn the excellence of mercury issues from friends in the other countries. Let's work together with an inescapable responsibility, no one is left behind.



THANK YOU FOR YOUR ATTENTION !



Toxic and Chemical Substances Bureau,
Environmental Protection Administration,
Taiwan

The Experience of Controlling Mercury in Aquatic Products

【 Speaker: Director, Chien-Yu Chen,
Fisheries Agency, Council of Agriculture, Taiwan 】

個人簡歷/Resume

姓名/Name	陳建佑/ Chien-Yu Chen	
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職稱/Position	組長/ Director	
<u>經歷/Experience</u>		
1.農委會漁業署養殖漁業組組長 2.農委會漁業署漁政組副組長 3.財團法人養殖漁業發展基金會執行長		
<u>學歷/Education</u>		
國立臺灣海洋大學生命與資源科學院應用經濟研究所 Master's Degree of Institute of Applied Economics, National Taiwan Ocean University		



2018 International
Environmental Partnership



2018国立台北科技大学、
水俣環境アカデミア連携プログラム

Implementation Strategies and Measures Workshop for Minamata Convention on Mercury 「水俣条約推進に向けた国際水銀対策ワークショップ」



The Experience of Controlling Mercury in Aquatic Products

Chien-Yu Chen/Director

Fisheries Agency, Council of Agriculture,
Taiwan

2018.07.31

Outline

1.Introduction

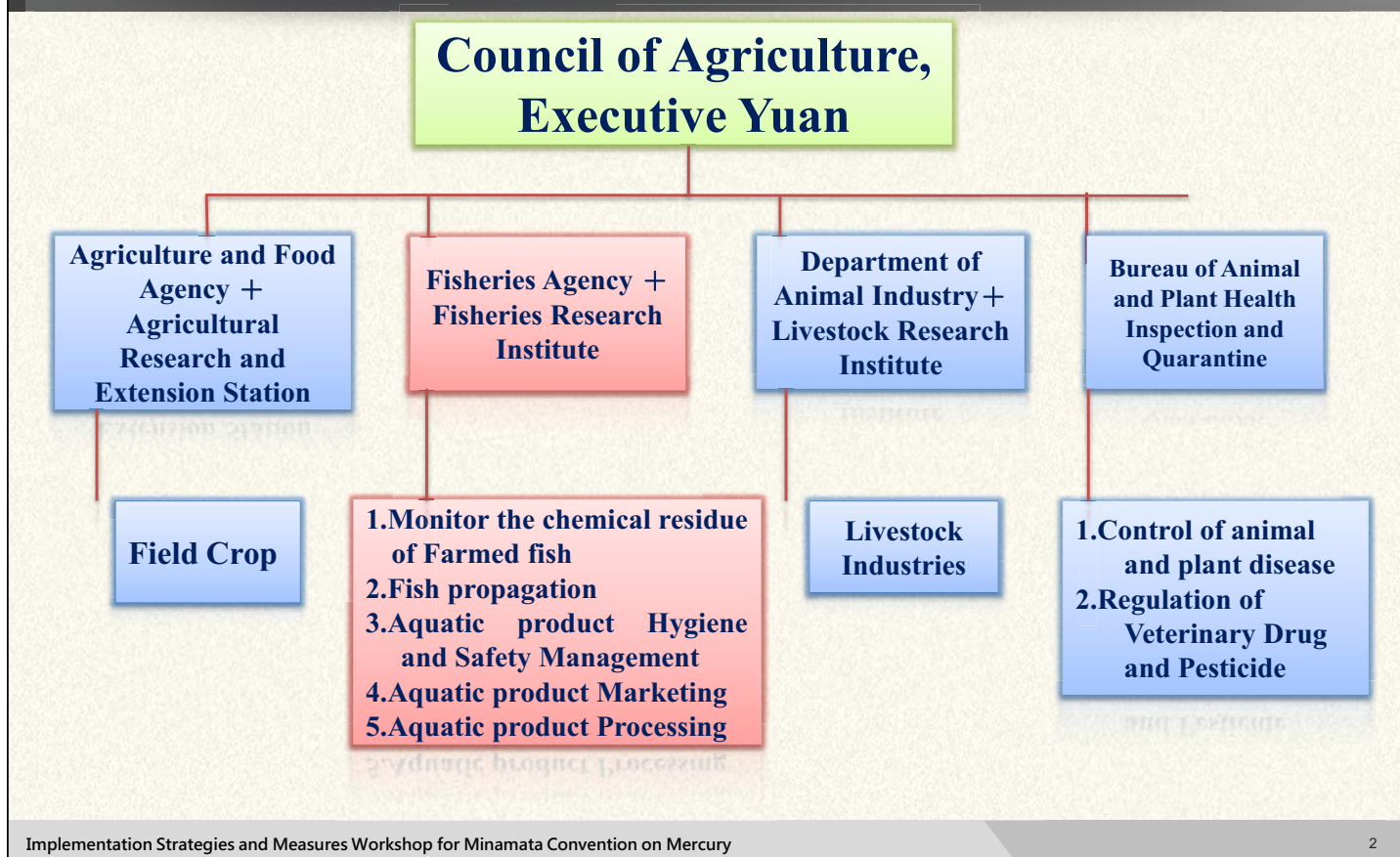
2.Action Plan of Minamata Convention on Mercury

3.Response Measures to the Pollution Incidence

4.Case Study and Monitoring Methods

5.Conclusion

1. Introduction-CoA's Structure and Function



2. Action Plan of Minamata Convention on Mercury (1)

- * The purpose of this action plan is to establish a national regulation of controlling mercury through inter-ministerial cooperation to reduce the mercury pollution in environment and food and to ensure public health.
- * The duty of fisheries agency is to sample and inspect the residues of heavy metals (e.g. lead, cadmium and mercury) in aquatic products including farmed products, captured products and oyster.

2. Action Plan of Minamata Convention on Mercury(2)

Test Results of Methylmercury in Aquatic Products

Category Years	Farmed Products		Captured Products		Oyster	
	Number of Samples	Number of Unqualified	Number of Samples	Number of Unqualified	Number of Samples	Number of Unqualified
2015	129	0	40	0	849	0
2016	100	0	61	2	870	0
2017	239	0	59	1	876	0

Test Results of Methylmercury in Large Migratory Fish

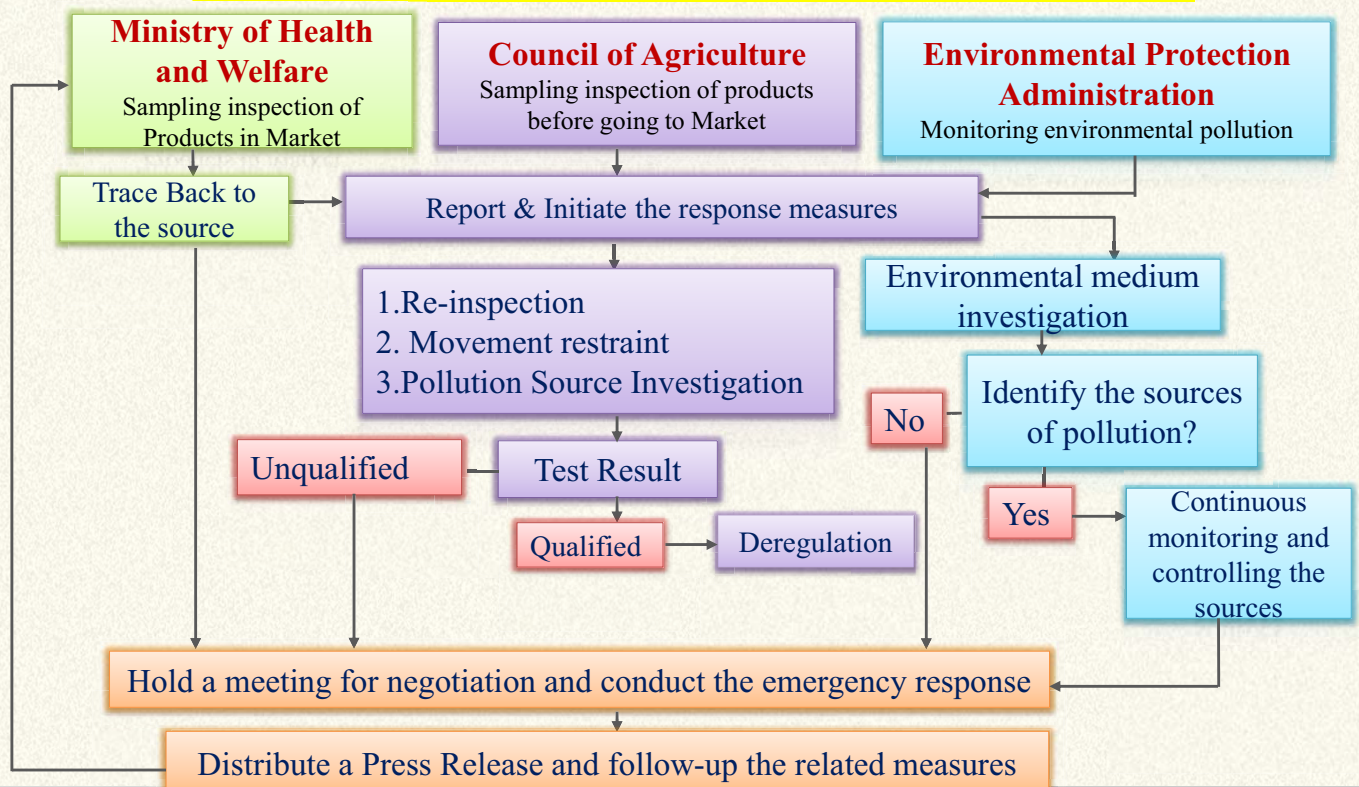
Category Years	Sharks		Marlin		Tunas	
	Number of Samples	Number of Unqualified	Number of Samples	Number of Unqualified	Number of Samples	Number of Unqualified
2015	17	0	15	0	8	0
2016	15	0	16	1	30	1
2017	15	1	41	0	3	0

Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

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3. Response Measures to Pollution Incidence

Trace Back to the Source through Inter-ministerial Cooperation



Implementation Strategies and Measures Workshop for Minamata Convention on Mercury 4-3

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4. Case Study and Monitoring Methods (1)

* If any aquatic product be inspected unqualified, the local authority will be informed immediately to trace back to the source. The relevant products will be reclaimed to prevent from releasing to the markets.

* The local authority will also be instructed to increase sampling frequency at the source of unqualified product to confirm whether it is a individual case or pollution. If it is pollution, the stricter measures will be conducted to ensure the source management.



Distribution of Monitoring the Heavy Metal in Large Migratory Fish

4. Case Study and Monitoring Methods (2)

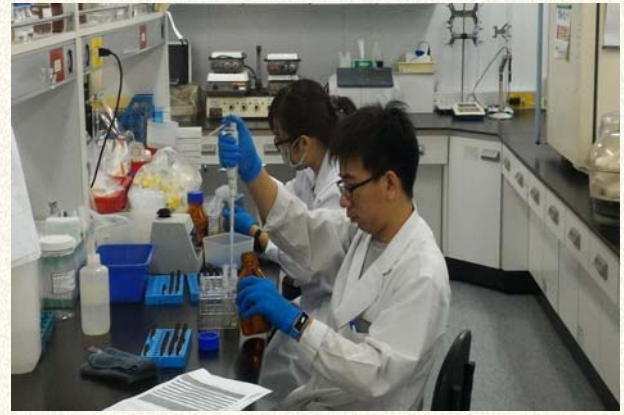
1. Fisheries Agency will enhance the sampling inspection of aquatic products at pollution potential areas according to EPA's Environmental Water Quality Information. (Available at <https://wq.epa.gov.tw/Code/?Languages=tw>)

2. In 2017 the sampling number was including 239 piece of farmed fish and 876 piece of oyster. The test results of all samples are qualified in accordance with our national standard of food safety.



5. Conclusion

- * Fisheries agency conducts the sampling inspection in accordance with risk management and enhances the source management through cooperation with Ministry of Health and Welfare and Environmental Protection Administration in order to ensure food safety.



Implementation Strategies and Measures Workshop for Minamata Convention on Mercury

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THANK YOU FOR YOUR ATTENTION !



Fisheries Agency, Council of Agriculture,
Taiwan

4-5

Management status of mercury in commodities in Taiwan

【Speaker: Senior Technical Specialist, Yu-Chen Rao,
Bureau of Standards, Metrology & Inspection, Ministry
of Economic Affairs, Taiwan】

個人簡歷/Resume

姓名/Name	饒玉珍/ Yu-Chen Rao	
服務單位/Department	經濟部標準檢驗局/ Bureau of Standards, Metrology & Inspection, Ministry of Economic Affairs, Taiwan	
職稱/Position	簡任技正/ Senior Technical Specialist	
<u>經歷/Experience</u>		
1.標準檢驗局科長 2.標準檢驗局簡任技正		
<u>學歷/Education</u>		
臺灣大學森林學研究所碩士 National Taiwan University Institute of Forest Research		



Implementation Strategies and Measures Workshop for Minamata Convention on Mercury 「水俣条約推進に向けた国際水銀対策ワークショップ」



Management status of mercury in commodities in Taiwan

Yu-Chen Rao/ Senior Technical Specialist

Bureau of Standards, Metrology and
Inspection, Ministry of Economic Affairs,
Taiwan

2018.07.31

Outline

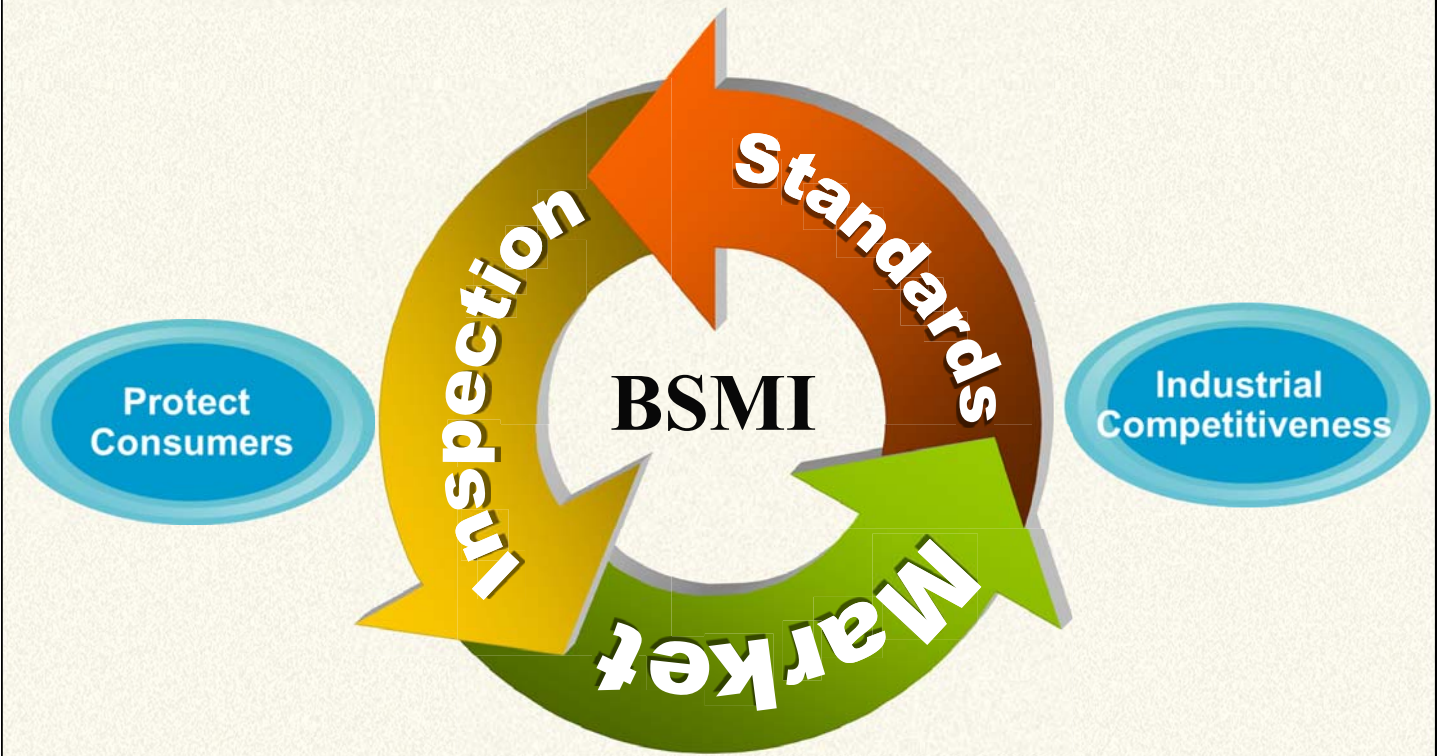
1.About the BSMI

2.Product safety regulatory system

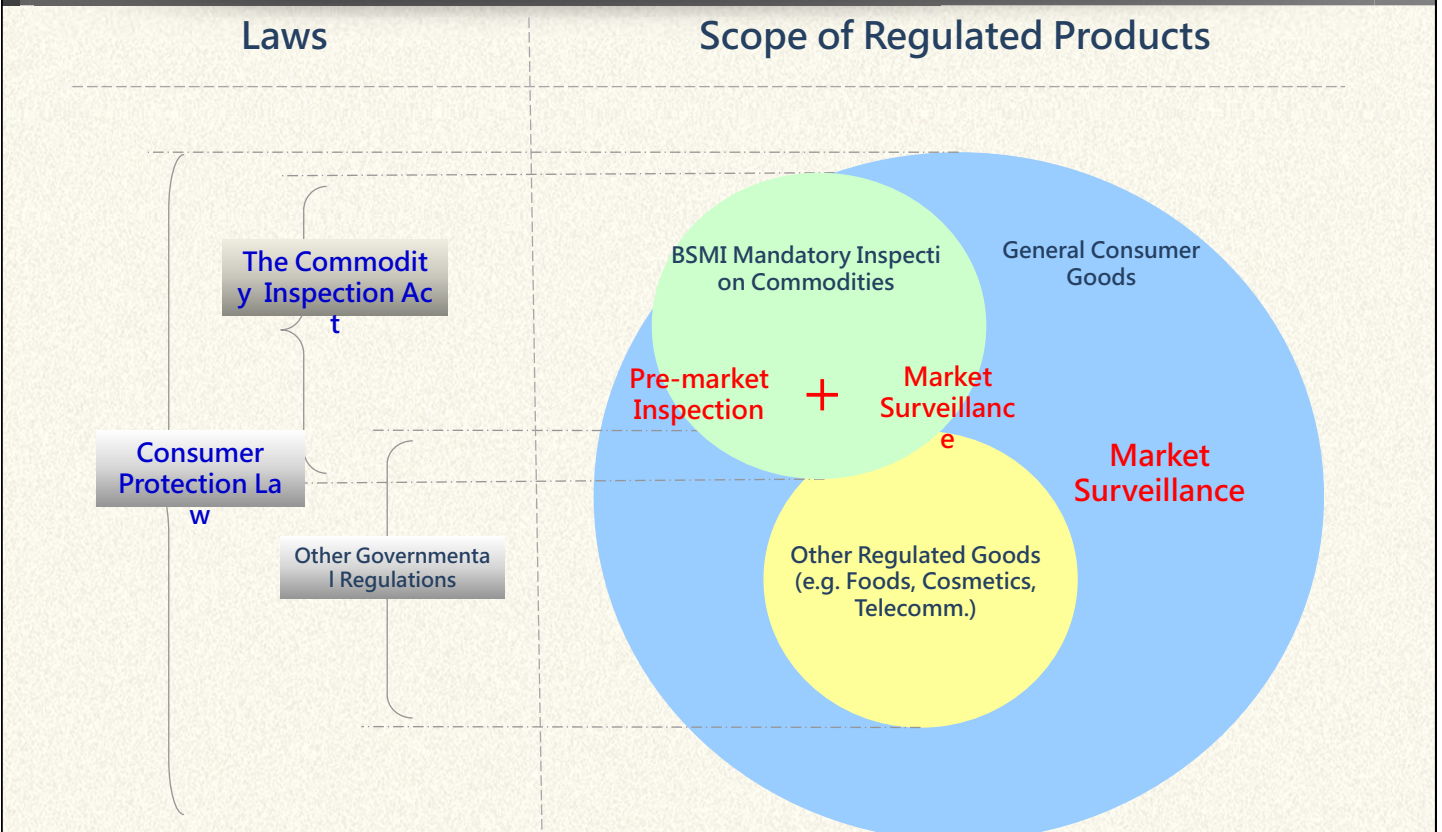
3.Management status of mercury in
commodities

4.Future plan

About BSMI - activities

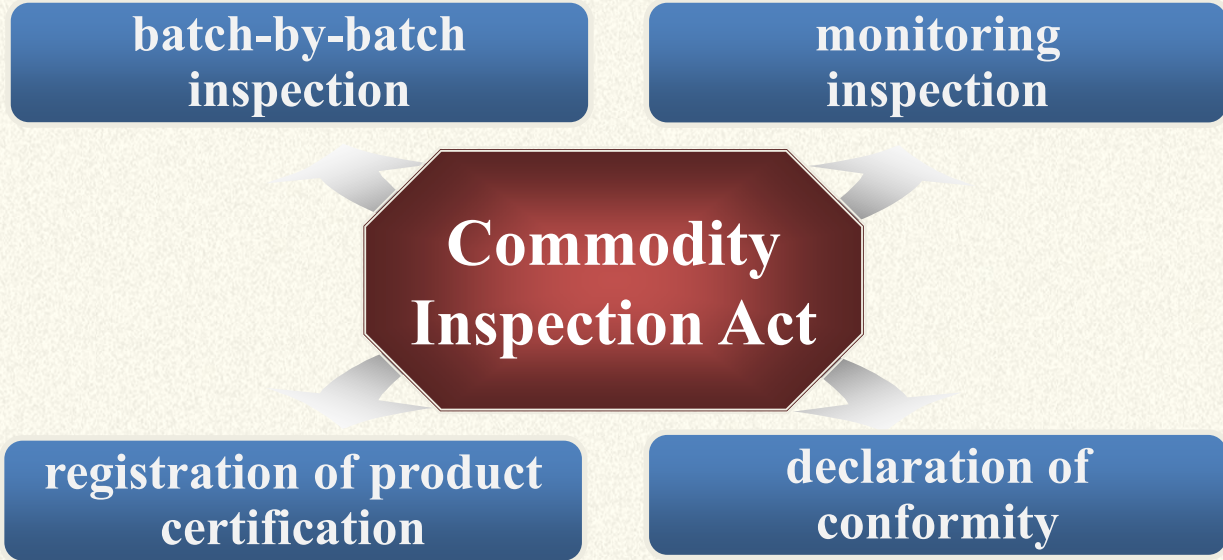


Product safety regulatory system

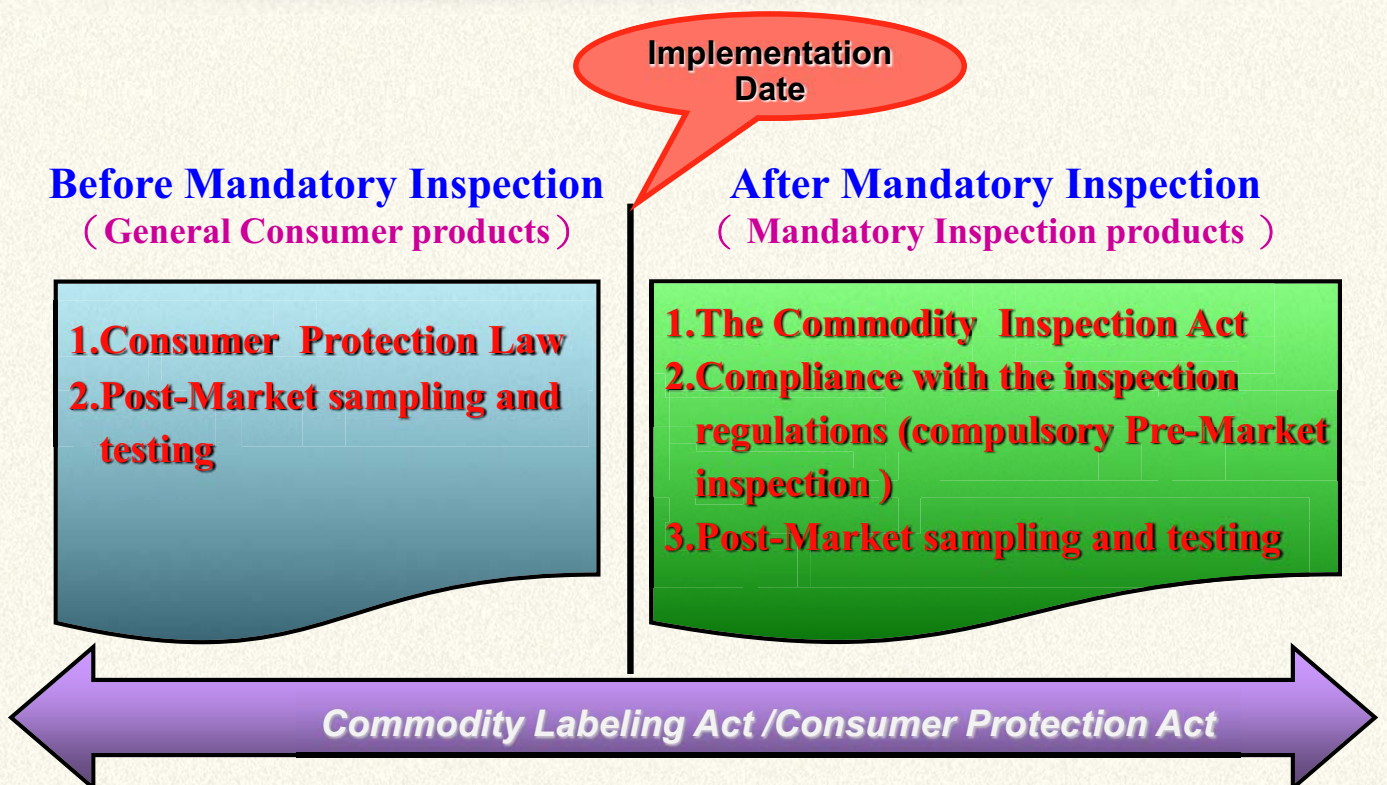


Product safety regulatory system

The BSMI conducts regulatory inspection based on the *Commodity Inspection Act*



Product safety- Pre-Market inspection



Product safety- Post-Market Surveillance

Market Surveillance

mercury content test of the sample

2016s	2017s	2018s (up to now)
<u>126件</u>	<u>169件</u>	<u>91件</u>
toy balls, dolls, Toy scooters, soft plastic desk mat, children's raincoats, etc.	toy balls, dolls, children's backpack, soft plastic desk mat, children's high chair, emulsion paint, joss sticks, etc.	erasers, dolls, crayons, pencils, colored pencils, children's footwear, etc.



Management status of mercury

◆ Setting relevant national standards

Setting limit values

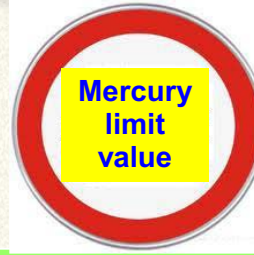
◆ Inspection and monitoring of products

The evaluation of high-risk of hazard products that may affect consumers' health and safety is listed as a priority announcement for compulsory inspection, and stipulate monitoring plan for the products being placed on the market

◆ Communicating with the media and the public in a timely manner

Management status of mercury

47 CNS Standards



0.1 wt %

Shaped clay \\
Finger painting :
25 mg/kg
other :
60 mg/kg

Toys intended for use by children of less than 14 years

Electrical and electronic equipment

60 mg/kg

Children's products (High chairs \\
Raincoat \\
Bed-guards ...)

Fluorescent lamps (for general lighting services)

< 30 W : 2.5 mg
30W ~ 50W : 3.5 mg
50W ~ 150W : 5 mg
> 150W : 15 mg

60 mg/kg

Articles for daily use (Bags \\
Joss sticks \\
Mat \\
Paint...)

Stationery (Erasers...)

Contact with skin :
25 mg/kg
Not in contact with the skin : 60 mg/kg

Management status of mercury

Mandatory Inspection ~2018.7.1



10 commodities of consumer goods are subject to mandatory inspection such as Toys, Children's high chairs, Children's Raincoats, Bed-guards, Suitcase, etc.

8 kinds of heavy metals:

Hg, Sb, As, Ba, Cd, Cr, Pb, Se

Total of 233 legal inspection of electrical and electronic products must mark "the presence conditions of the restricted substances"

2017.7.1 ~

restricted chemical substances:

Hg, Pb, Cd, Cr⁺⁺, PBB, PBDE

Management status of mercury

- ◆ **Switches and relays 、 fluorescent lamps**
 - **CNS 15663 Guidance to reduction of the restricted chemical substances in electrical and electronic equipment**
 - **Marking for the presence condition of Hg**
- ◆ **fluorescent lamps (for general lighting services)**
 - **CNS 14125 Self-ballasted fluorescent lamps (for general lighting services)**
 - **Mean measured value of Hg**
 - **Power < 30 W, Hg content shall not exceed 2.5 mg**
 - **Power \geq 30W and < 50W, Hg content shall not exceed 3.5 mg**
 - **Power \geq 50W and < 150W, Hg content shall not exceed 5 mg**
 - **Power \geq 150W, Hg content shall not exceed 15 mg**

Future plan

- ◆ **Continuously reviewed measures**
 - **Update the relevant regulations of BSMI timely**
 - **Setting limit value**
 - **Evaluate mandatory inspection**
- ◆ **Exchange of experience**
- ◆ **Regulatory enforcement**
 - **Policy advocacy**
 - **Market supervision**
 - **Provide information on product safety**

THANK YOU FOR YOUR ATTENTION !




Bureau of Standards, Metrology and
Inspection, Ministry of Economic Affairs,
Taiwan

The Industry Promotion Status of the Replacement of Mercury-containing Lighting

【 Speaker: Section Chief, Yi-Chi Wang,
Industrial Development Bureau,
Ministry of Economic Affairs, Taiwan 】

個人簡歷/Resume

姓名/Name	王義基/ Yi-Chi Wang	
服務單位/Department	經濟部工業局/ Industrial Development Bureau, Ministry of Economic Affairs, Taiwan	
職稱/Position	科長/ Section Chief	
<u>經歷/Experience</u>		
<p>1.原任永續發展組永續發展規劃科科長至 105 年 1 月改任該組工安環保輔導科科長至今</p> <p>2.亞洲生產力組織(APO)舉辦之綠色能源專家技術諮詢服務會議、菲律賓、103/11/10-103/11/14</p> <p>3.亞洲生產力組織(APO)舉辦之綠色生產力網絡發展委員會、日本東京、104/11/25-104/11/28</p> <p>4.參加環境保護署 106 年於新加坡舉辦「環境事故現場高階應變人員專案訓練」訓練合格</p>		
<u>學歷/Education</u>		
大同工學院化工所 Tatung Institute of Technology Chemical Enineer master		



Implementation Strategies and Measures Workshop for Minamata Convention on Mercury 「水俣条約推進に向けた国際水銀対策ワークショップ」



The Industry Promotion Status of the Replacement of Mercury- containing Lighting

Yi-Chi Wang/Section Chief

Industrial Development Bureau,
Ministry of Economic Affairs,
Taiwan

2018.07.31

Outline

1. Introduction

2. Current Situation of Lighting in Taiwan

3. The Conduct of Government Counseling and
Advocacy

4. Technology R&D and Innovation for
Alternatives to Mercury-containing Lighting

5. Conclusion

1. Introduction

- 1) The United Nations Environment Program (UNEP) has established the Minamata Convention on Mercury on August 16, 2017. The first part of Annex A of Article 4 of the United Nations Mercury Water Margin Convention contains mercury products and the deadline for the elimination phase is before December 31, 2020.
- 2) In order to gradually comply with the control of the Convention, Taiwan has completed the “Implementation of the United Nations Mercury Minamata Convention Promotion Plan” (Approved by the Executive Yuan on June 27, 2016) as a basis for promoting mercury management.
- 3) **LED Lighting is an important industrial promotion focus in response to the replacement of mercury-containing lighting.**

2. Current Situation of Lighting in Taiwan

(1) Compact Fluorescent Lamps , CFLs<30W



- Convention specifications:
Compact Fluorescent Lamps (CFLs) for general lighting applications up to 30 Watts and a single mercury content of more than 5 mg

There are no manufacturing for the four eliminated lamps in Taiwan now.

(2) Straight tube type fluorescent lamp (General lighting)



- Convention specifications:
Straight tube type fluorescent lamp for general lighting purposes
- (a) A three-wavelength fluorescent powder (three primary color fluorescent powder) straight tube fluorescent lamp for general illumination with a power <math>< 60\text{ W}</math> and a mercury content exceeding 5 mg;
- (b) Ordinary lighting halogen powder (Halo phosphate phosphor powder) with a power of $\leq 40\text{ W}$ and a mercury content of more than 10 mg. Straight tube type fluorescent lamp.

2. Current Situation of Lighting in Taiwan

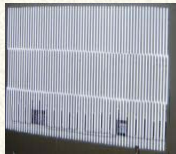
(3). High pressure mercury vapor lamp (General lighting)



- Convention specifications:
High pressure mercury vapor lamp for general lighting purposes

There are no manufacturing for the four eliminated lamps in Taiwan now.

(4). CCFL & EEFL for electronic display



- Convention specifications:
Cold cathode fluorescent tube (CCFL) and no (external) fluorescent tube (EEFL) for electronic display:

- (a) ≤ 500 mm in length and more than 3.5 mg in mercury;
- (b) between 500-1500 mm in length and more than 5 mg in mercury;
- (c) Length > 1500 mm, mercury content exceeding 13 mg.

3. The Conduct of Government Counseling and Advocacy

(1) The Green Policy- Nuclear-Free Taiwan by 2025

A. 「2025 Nuclear-Free Taiwan」 is a plan not to rely on nuclear power generation in 2025. The developing contents of green industry including four areas of energy saving, developing, storing, system integrating.

B. **LED Lighting accounts for about 19% of total power consumption. It is an important focus on energy saving and eco-friendly at the same time.** Developing smart city with implement of intelligent management and control system is expect to improve a significant energy-saving effect.



3. The Conduct of Government Counseling and Advocacy

(2) Coordinating industrial platform to improve industrialization of LED lighting industry in Taiwan

- A. IDB establishes an industrial platform which coordinates R&D leading institute, industrial associations, and counseling with government projects to improve industrialization of LED lighting industry.
- B. Taiwan LED industrial structure is constructed completely from upstream to downstream. Export-oriented(70%).
- C. **World no. 2 production of LED chip, world no. 4 revenue of LED package.**
- D. **Domestic LED lighting accounts for more than 50% of the total lighting revenue.**



3. The Conduct of Government Counseling and Advocacy

(3) Public Works of LED Traffic Lights and Street Lights in Taiwan

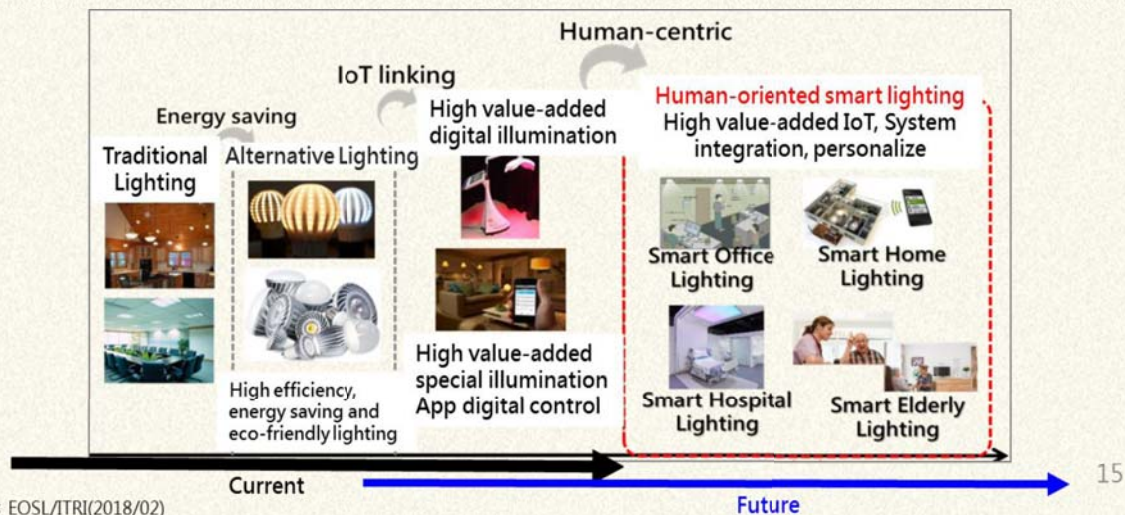
- A. Taiwan government pulled all-out effort to implement the LED street lights from year 2012.
- B. Totally about 692,000 units of LED streetlights implemented. Penetration rate will raise to 56.4%. Save power consumption 640M kWh/year, accounting for 1.8% of all nuclear power generation.
- C. **Taiwan becomes the country which has world's highest Installation density of LED streetlights now.**



4. Technology R&D and Innovation for Alternatives to Mercury-containing Lighting

(1) Taiwan is enabling LED new era lighting to the future which is driven with system innovation

A. LED smart lighting is more than 20% energy saving efficient than traditional LED lighting, which will further improve domestic electricity power consumption.



5. Conclusion

- 1) Taiwan Implements and promotes LED lighting industry to conserve energy and replace mercury-containing lighting for more than 15 years. Mercury-free LED lighting accounts for more than 50% revenue of the total lighting. There are no manufacturing for the four eliminated lamps in Taiwan now.
- 2) LED smart lighting is more than 20% energy saving efficient than traditional LED lighting, which will further improve domestic electricity power saving, and is the key trend for future development.

THANK YOU FOR YOUR ATTENTION !



Industrial Development Bureau
Ministry of Economic Affairs, Taiwan

Research of blood mercury levels in Taiwanese and health education and propaganda

【 Speaker: Section Chief, Po-Chang Tseng,
Health Promotion Administration,
Ministry of Health and Welfare, Taiwan 】

個人簡歷/Resume

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<u>經歷/Experience</u>		
1. 衛福部國民健康署社區組 3 科科長 2. 宜蘭縣政府環保局設檢科科長 3. 宜蘭縣政府環保局空噪科科長		
<u>學歷/Education</u>		
中國醫藥大學 環境醫學研究所 Institute of Environmental Health, China Medical University		



Implementation Strategies and Measures Workshop for Minamata Convention on Mercury 「水俣条約推進に向けた国際水銀対策ワークショップ」



Research of blood mercury levels in Taiwanese and health education and propaganda

Po-Chang Tseng/Section Chief

Health Promotion Administration,
Ministry of Health and
Welfare, Taiwan

2018.07.31

Outline

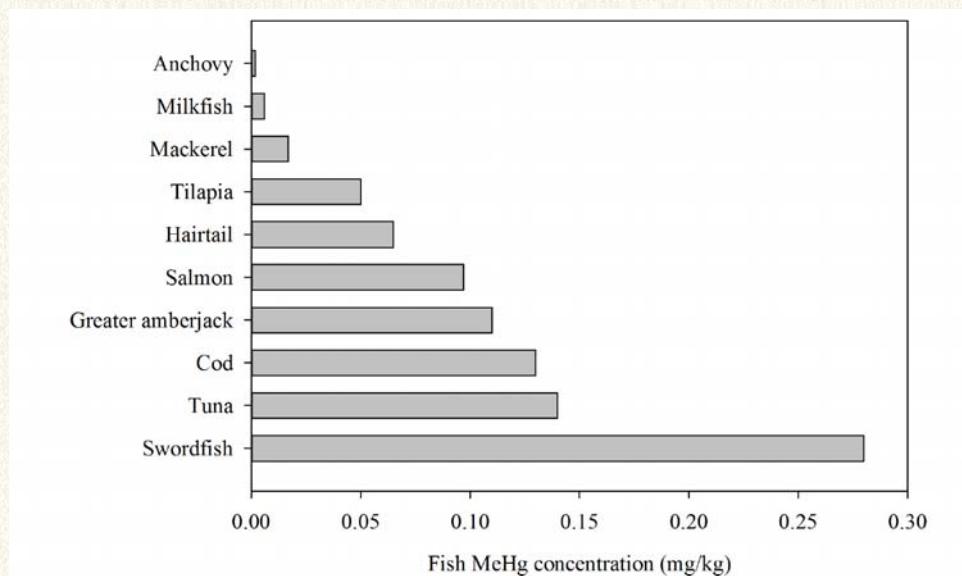
- Introduction
- Health Education and Nutrition Promotion for Susceptible Group
- Research of Blood Mercury Levels in Preschool Children in Taiwan
- Conclusion

Introduction

- 1. Propaganda:** To conduct health education and nutrition promotion to susceptible group
- 2. Evidence-based Research:** To conduct the research and survey of blood lead and mercury levels in preschool children through implementing physical examination, collecting personal information and exposure pathways

Health Education and Nutrition Promotion for Susceptible Group

- Mercury concentration and 10 kinds of fish consumption in Taiwanese pregnant women



(Hsi et al, 2016)

Health Education and Nutrition Promotion for Susceptible Group

The recommendation of fish consumption for pregnant women and women of childbearing age

- To ingest at least 7-9 servings (245-315g) of fish per week.
- To avoid ingesting large predatory fish, such as swordfish, tuna and oilfish .
- To avoid ingesting more than 2 servings (70g) of large fish per week.

魚類有優良蛋白質、多元不飽和脂肪酸及多種營養素，為孕婦及兒童應建議攝取之食品之一。但是，部分大型掠食性魚類有蓄積較高濃度甲基汞之情形，對於胎兒及幼童之神經發育可能造成危害，所以應該依本建議適量攝食。

孕婦、育齡婦女及1-6歲兒童魚類攝食指南

孕婦及育齡婦女魚類攝食量建議

- 每週至少均應攝食7-9份(245-315公克)之各種魚類。
- 避免攝食鯊魚、旗魚、鰵魚及油魚、鰵魚、每週以攝食不超過2份(70公克)之旗魚、鰵魚及油魚，或每週攝食不超過1份(35公克)之鰵魚為宜。

1-6歲兒童魚類攝食量建議

- 1-3歲兒童，每週至少均應攝食2份(70公克)之各種魚類；4-6歲兒童，每週至少均應攝食3份(105公克)之各種魚類。
- 避免攝食鯊魚、旗魚、鰵魚、油魚、鰵魚，每個月以攝食不超過1份(35公克)為宜。

份量估計
1份魚肉≈35公克(可食生重)
■ 以成人三指併攏後之大小及厚度

註：針對無毒建議之攝食限制，應選以具無毒限制之白肉魚類建議，其他無毒建議之攝食限制，比照其他各種魚類。

FDA 食品藥物管理署

(Source: Food and Drug Administration, Ministry of Health)

Health Education and Nutrition Promotion for Susceptible Group

The recommendation of fish consumption for children aged 1-6 years

- To ingest at least 2 servings (70g) of fish per week for children aged 1-3 years.
- To ingest at least 3 servings (105g) of fish per week for children aged 4-6 years.
- To avoid ingesting more than 1 serving (35g) of large fish, such as swordfish, tuna and oilfish per month.

魚類有優良蛋白質、多元不飽和脂肪酸及多種營養素，為孕婦及兒童應建議攝取之食品之一。但是，部分大型掠食性魚類有蓄積較高濃度甲基汞之情形，對於胎兒及幼童之神經發育可能造成危害，所以應該依本建議適量攝食。

孕婦、育齡婦女及1-6歲兒童魚類攝食指南

孕婦及育齡婦女魚類攝食量建議

- 每週至少均應攝食7-9份(245-315公克)之各種魚類。
- 避免攝食鯊魚、旗魚、鰵魚及油魚、鰵魚，每週以攝食不超過2份(70公克)之旗魚、鰵魚及油魚，或每週攝食不超過1份(35公克)之鰵魚為宜。

1-6歲兒童魚類攝食量建議

- 1-3歲兒童，每週至少均應攝食2份(70公克)之各種魚類；4-6歲兒童，每週至少均應攝食3份(105公克)之各種魚類。
- 避免攝食鯊魚、旗魚、鰵魚、油魚、鰵魚，每個月以攝食不超過1份(35公克)為宜。

份量估計
1份魚肉≈35公克(可食生重)
■ 以成人三指併攏後之大小及厚度

註：針對無毒建議之攝食限制，應選以具無毒限制之白肉魚類建議，其他無毒建議之攝食限制，比照其他各種魚類。

FDA 食品藥物管理署

(Source: Food and Drug Administration, Ministry of Health)

Health Education and Nutrition Promotion for Susceptible Group

(母子健康手帳)

- Infants, pregnant and breastfeeding women may be sensitive to the potential health risks of heavy metals (such as methylmercury) in food.
- It's recommended to reduce bioaccumulation of heavy metals in large fish intake.
- It's recommended to ingest small sized fish to get the health benefits of fish and to spread the risk instead.



(Source: Health Promotion Administration)

Health Education and Nutrition Promotion for Susceptible Group

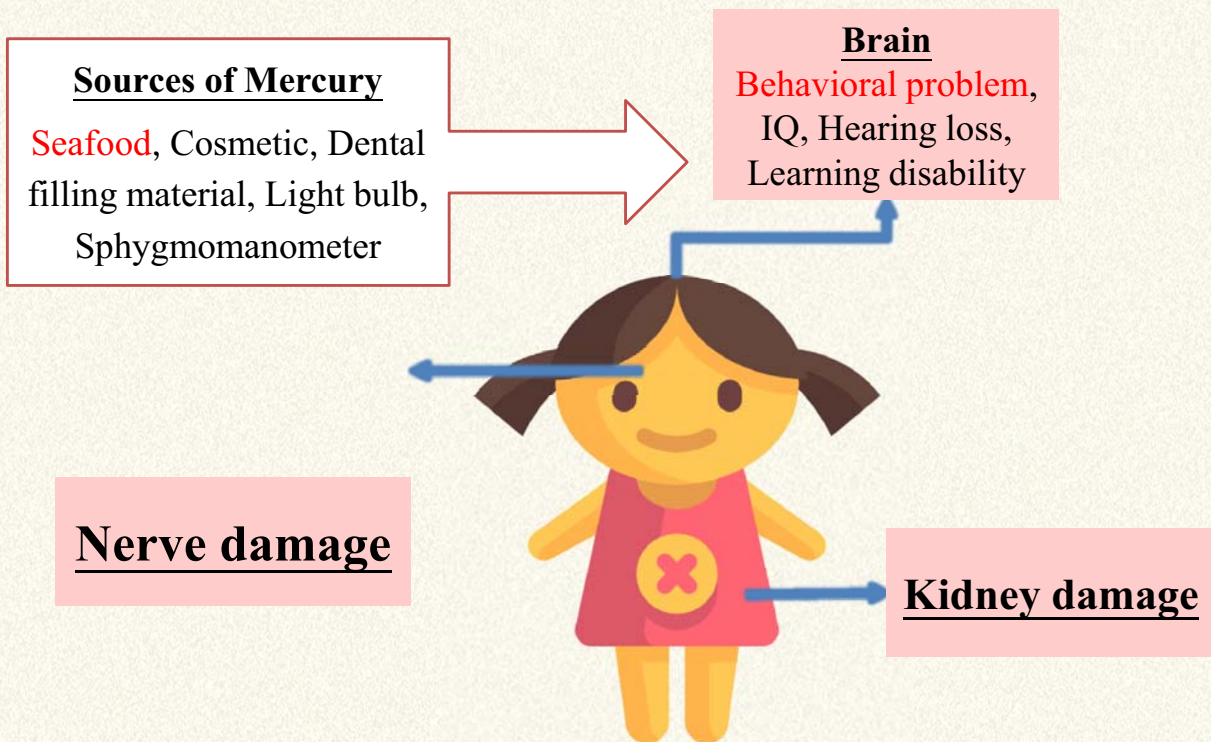
(母子健康手帳)

- The maternal and child health handbook is for pregnant women by local health centers and medical institutions.
- In June 2017, the file of the handbook was uploaded on the official website for public to download.

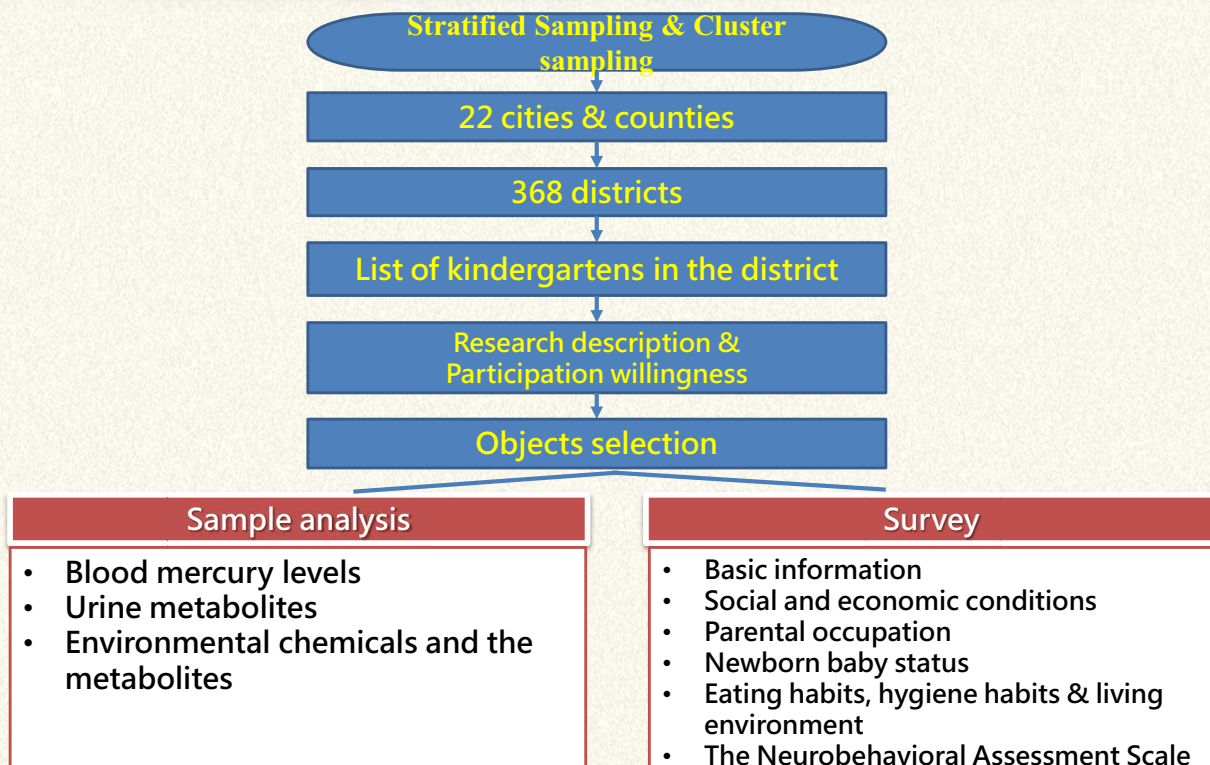


(Source: Health Promotion Administration)

Research of Blood Mercury Levels in Preschool Children in Taiwan



Research of Blood Mercury Levels in Preschool Children in Taiwan



Conclusion

- HPA continues to conduct health education and nutrition promotion to susceptible group for protecting people's health.
- “Research of Blood Mercury Levels in Preschool Children in Taiwan” will be accomplished by the end of 2018, and the result would be the reference for making policies.

THANK YOU FOR YOUR ATTENTION !

健康好幫手! --守護國民 促進健康!



促進健康 **Promotion.**
預防疾病 **Prevention.**
安全防護 **Protection.**
共同參與 **Participation.**
夥伴合作 **Partnership!**

Health Promotion Administration,
Ministry of Health and Welfare, Taiwan

Global Perspective of Mercury Management

【Speaker: Programme Officer, Shunichi Honda,
International Environmental Technology Centre,
United Nations Environment Programme, Japan】

個人簡歷/Resume

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<u>專長/Expertise</u>		
<p>Waste Management (mercury waste, E-waste, plastic waste, waste and climate change, etc.), Multilateral Environmental Agreements, Socioeconomic Development in Waste Management Sector, Poverty and Development in Waste Management Sector</p>		

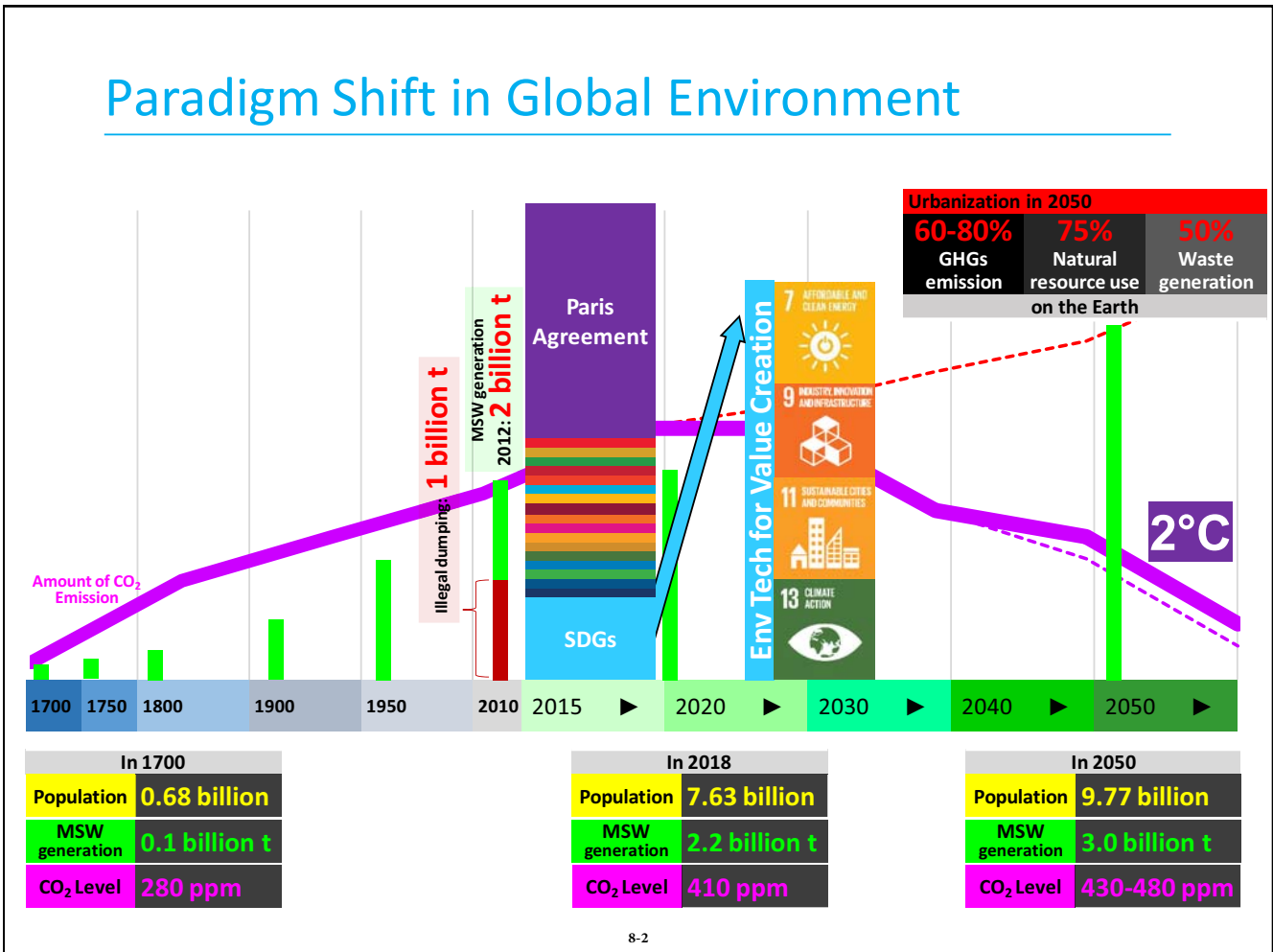
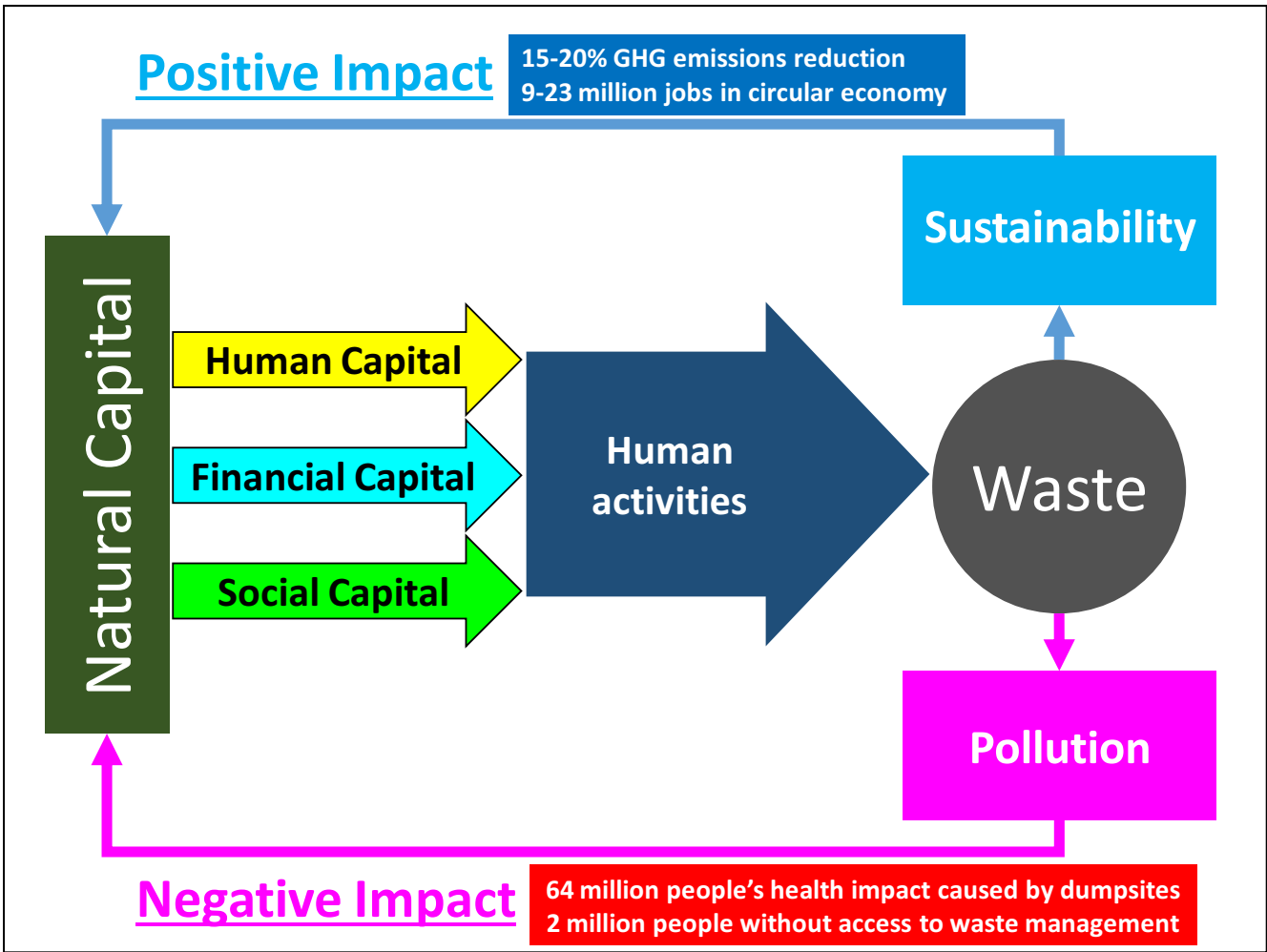
Global Perspective of Mercury Management

United Nations Environment Programme

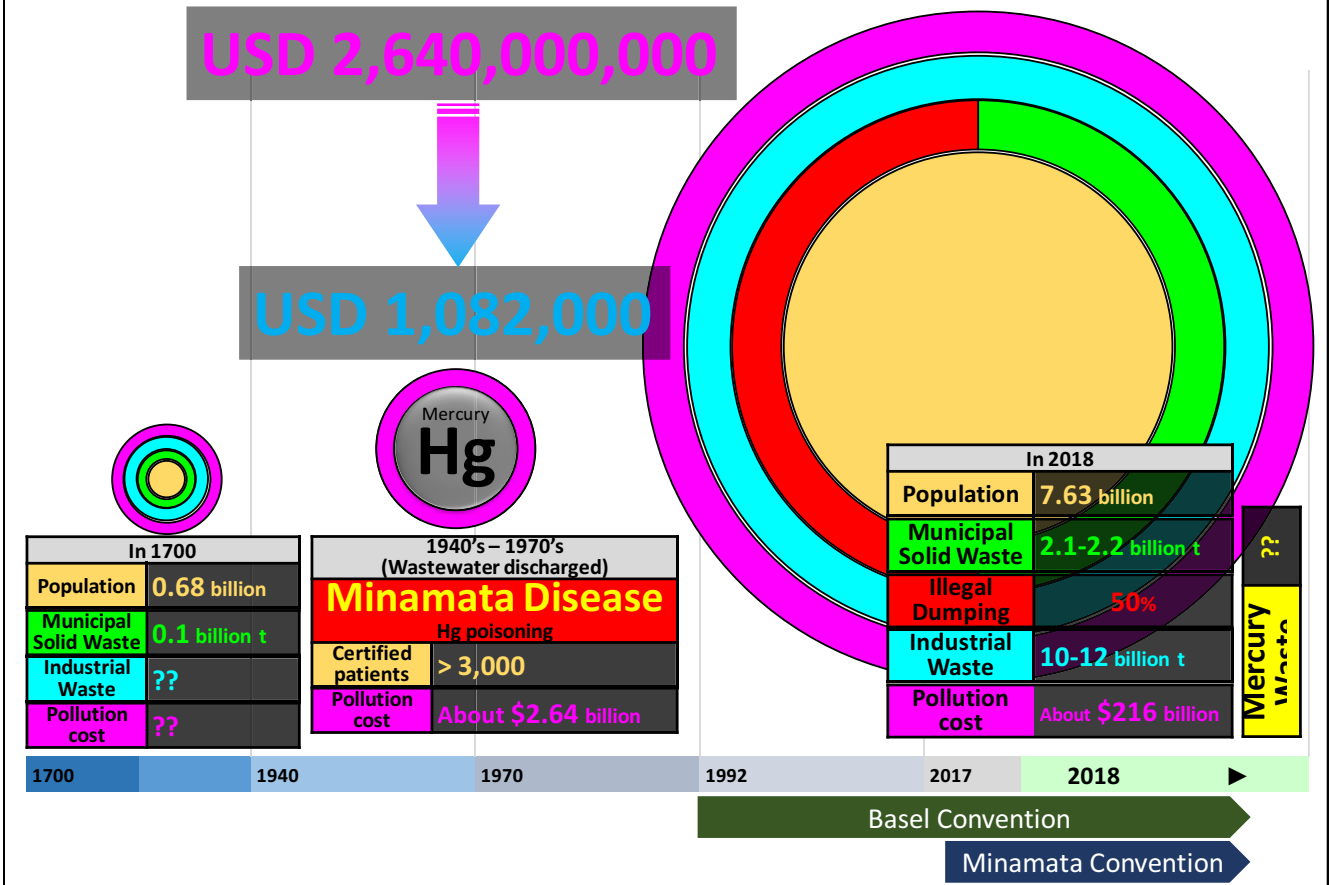
Shunichi Honda (PhD), International Environmental Technology Centre, Economy Division

International Environmental Partnership - Minamata Academia, 1 August 2018

1. Global Waste Management
2. Mercury Waste Management
3. Way Forward

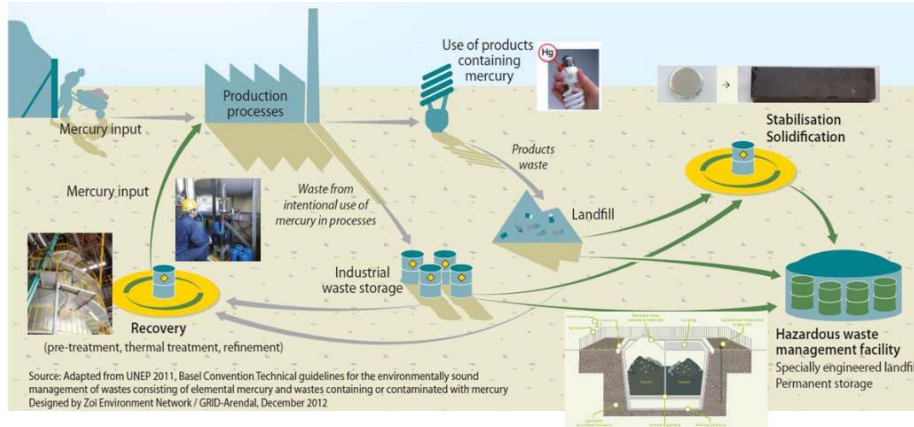


Waste Management – Negative Impact



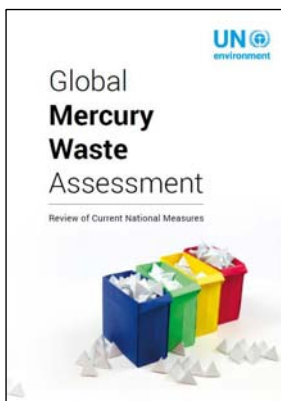
1. Global Waste Management
2. Mercury Waste Management
3. Way Forward

Mercury Waste Management



Handling	Separate from others, uses of appropriate boxes or containers	Do not mix it with others
Separation		Source segregation from others
Collection		Collection in appropriate containers by designated collectors
Packaging		Use of appropriate packaging based on national/intl standards
Labelling		Use of clear labelling based on national/intl standards
Transportation		By licensed transporters
Treatment		

Global Mercury Waste Assessment



What are current practices?

Investigations in 35 countries

- Mercury waste issue = general waste issue
- Increase of elemental mercury waste
- Trace Hg in product waste
- Site contaminated with Hg

Needs: Development of Waste Management System and Technology based on current situation

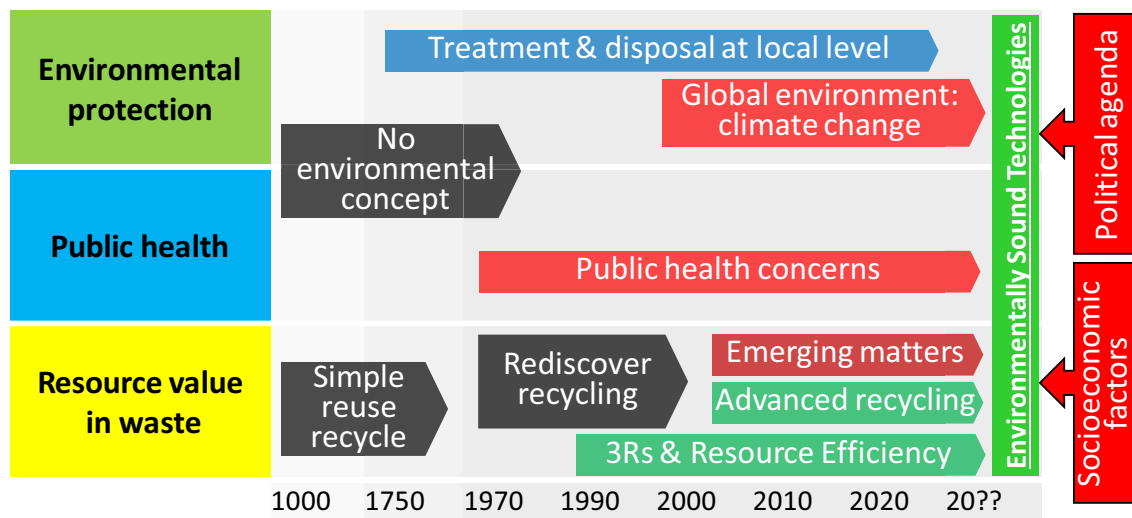


Mercury Emissions from Dumping Sites



1. Global Waste Management
2. Mercury Waste Management
3. Way Forward

Waste Management: Where to go?



In 1700	
Population	0.68 billion
MSW generation	0.1 billion t
CO ₂ Level	280 ppm

In 2018	
Population	7.63 billion
MSW generation	2.2 billion t
CO ₂ Level	410 ppm

In 2050	
Population	9.77 billion
MSW generation	3.0 billion t
CO ₂ Level	430-480 ppm

Thank you



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