



**June 13, 2011**

## **Business Meeting of Working Group of East and Southeastern Asian Countries on Soil and Groundwater Pollution and Remediation**



**Taipei, Taiwan**

R401 & R405,  
4F, EPA Building  
ROC (Taiwan)



## **Handbook**

- Environmental Protection Administration, ROC
- United States Environmental Protection Agency
- Taiwan Association of Soil and Groundwater Environmental Protection
- Working Group of East and Southeastern Asian Countries on Soil and Groundwater Pollution and Remediation





## Preface

2010 is the 10<sup>th</sup> anniversary of the Soil and Groundwater Pollution Remediation Act enforced in Taiwan. To celebrate the 10 years achievement and to continuously improve our technologies on investigation, remediation and management on soil and groundwater contaminated sites in Taiwan, Environmental Protection Administration of Taiwan (Taiwan EPA) organized an international Conference on the investigation, remediation and management of soil and groundwater contaminated sites at Taipei on October 27, 2010. More than 50 distinguished experts were invited from more than 20 countries to share their knowledge and experience in this conference.

The goals of Taiwan EPA future work are to clean up the contaminated land with green remediation strategies, protecting our resources by rigorously carrying out the regulations, provide training courses of advance technologies for our professionals, and share our experiences with other countries, especially for Asian countries. Therefore, a special meeting program was also organized for East and South-Eastern Asian countries in the afternoon of October 27, 2010. This specially meeting was very successful in bringing together for scientists and government officers, including Japan, Korea, Philippines, Indonesia, Malaysia, Thailand and Taiwan, to realize and concur on the urgent need to establish a technical working group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG) in the closing remarks on October 27, 2010 at Taipei.

The primary objectives of this working group would be to provide a technical-based network for Asian countries that is capable of exchange and cooperate of remediation techniques in Asia and to serve the remediation techniques for the changing and challenging social demands and to function as a rational platform for decision and policy makers to make informed decisions for risk-based assessment of the contamination sites in the future. In the closing remarks of this special meeting program, all the participants of scientists and government officers from Asian countries agreed that Taiwan was approved as the Chairman, Japan is the Vice Chairman, and Korea is the Secretary General of this working group to serve in the first term (January 2011 to December 2012). I was appointed as the Chairman of the working group of the first term.

On behalf of ReSGPAC WG, I began to discuss with Taiwan EPA officers in early 2011 and to organize some programs for the first term, including (1) business meeting to be held on June, 2011 and June, 2012; (2) workshop on health risk assessment to be held on June 14, 2011; (3) workshop on the remediation and risk-based assessment of sediments contaminated sites to be held on June 15-16, 2011; (4) workshop on the management strategies and developing the regulation of pollutants to be held on November, 2011; (5) workshop and training courses to be organized by the Committees of Working Group to be held in June in 2012; (6) 2012 International Conference on the investigation, remediation and management of soil and groundwater contaminated sites to be held in October, 2012 at Taipei; and (7) two field study tours on the oil and heavy metals contaminated sites in Taiwan to be held on June 17 and November in 2011 in Taiwan.

Chairman of the Working Group

Zueng-Sang Chen, Ph.D., signed on June 7, 2011



Distinguished Professor and Associate Dean  
Department of Agricultural Chemistry  
National Taiwan University, Taipei 10617, TAIWAN  
Email: [soilchen@ntu.edu.tw](mailto:soilchen@ntu.edu.tw)



## Conference Introduction

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The goals of this conference is to provide a technical-based network for Asian countries, including Japan, Korea, Philippines, Indonesia, Malaysia, Thailand and Taiwan, is capable of exchange and cooperate of remediation techniques in Asia and to serve the remediation techniques for the changing and challenging social demands and to function as a rational platform for decision and policy makers to make informed decisions for risk-based assessment of the contamination sites in the future.

The main conference agenda include:

- ◆ Achievement, Development and Experience of Remediation Technologies Applied to Soil and Groundwater Contaminated Sites of Taiwan.
- ◆ Case studies and experience from Japan and Korea
- ◆ Rationale to develop the working group of the soil and groundwater remediation in East and Southeastern Asian countries
- ◆ Discussion on the generals rules







**Business Meeting of**  
**Working Group of**  
**East and Southeastern Asian Countries on**  
**Soil and Groundwater Pollution and Remediation**

**June 13, 2011**



R401 & R405, 4F, EPA Building, Taipei, ROC (Taiwan)

## Agenda

Time	Topic	Speaker
0830-0855	Registration	
0855-0905	Opening Address	Dr. Zueng-Sang Chen (Taiwan)
0905-0915	Welcome Speech	Mr. Hung-Teh Tsai (Taiwan)
0915-0935	Achievement, Development and Experience of Remediation Technologies Applied to Soil and Groundwater Contaminated Sites of Taiwan	Dr. Zueng-Sang Chen (Taiwan)
0935-0955	Japan's Policies and Legislative Measures for Soil Contamination Countermeasures	Mr. Masanori Kobayashi
0955-1015	Policy and Legal Framework on Soil Contamination Management	Ms. Jin Won Yi
1015-1045	Break	
1045-1200	Taiwan EPA and USEPA Meetings on the Soil and Groundwater Remediation and Meeting of USEPA Assistant Secretary and All the Representative Government Officers of the working Group from the Asian Countries	Dr. Shu-Hung Shen Minister, EPA (Taiwan)
1200-1330	Lunch	
1330-1340	Rationale to Develop the Working Group of the Soil and Groundwater Remediation in East and Southeastern Asian Countries	Mr. Hung-Teh Tsai (Taiwan)
1340-1530	Discussion on the General Rules of the Working Group –(1)	Dr. Zueng-Sang Chen (Taiwan)
1530-1600	Break	
1600-1700	Discussion on the General Rules of the Working Group –(2)	Dr. Zueng-Sang Chen (Taiwan)
1700-1730	Summary and Closing Remarks	Dr. Zueng-Sang Chen (Taiwan)



ROC (Taiwan)  
Environmental Protection  
Administration



United States  
Environmental Protection  
Agency



Taiwan Association of  
Soil and Groundwater  
Environmental Protection

Working Group of  
East and Southeastern Asian Countries on  
Soil and Groundwater  
Pollution and Remediation





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63-74	Rationale to Establish a Technical Working Group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG)
75-94	Discussions on the General Rules of the Working Group
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97-104	Discover Taiwan





**Business Meeting of  
Working Group of East and Southeastern Asian  
Countries on Soil and Groundwater  
Pollution and Remediation**

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**June 13  
2011**

**Invited Speakers and Facilitators**





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## Honored Guest

Shu-Hung Shen  
Taiwan



Dr. Shu-hung Shen received his Ph.D. degree from Department of Chemical Engineering, National Taiwan University (NTU). He is the Minister of Environmental Protection Administration (EPA), Executive Yuan, R.O.C. (Taiwan). He has obtained Best Civil Servant Award of Executive Yuan, ROC (Taiwan); Engineering Award, Engineering Business Category, Chinese Institute of Environmental Engineering; Outstanding Contribution Award, Chinese Environmental Analytical Society in 1987, 2003, and 2005, respectively.

## Committee Chair

Zueng-Sang Chen  
Taiwan



Dr. Zueng-Sang Chen received his Ph.D. degree from Department of Agriculture Chemistry, NTU, Taiwan. He is the Distinguished Professor of Department of Agriculture Chemistry and Associate Dean of College of Bioresources and Agriculture, NTU. His specialties are pedology, soil classification and taxonomy, forest ecology, and soil pollution remediation. He has many experiences on planning, design, construction, and operation of soil remediation work.



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## Speakers and Representative Government Officers

*(in alphabetical order)*

Atty. Ernesto D. Adobo, Jr.

Philippines

Dr. Atty. Ernesto D. Adobo, Jr. is the undersecretary of Field Operations, Department of Environment and Natural Resources (DENR), Republic of the Philippines.

Azimuddin Bahari

Malaysia



Dr. Azimuddin Bahari is the Undersecretary of Minerals & Geoscience Division, Ministry of Natural Resources and Environment, Malaysia.

Chia-Shyun Chen

Taiwan



Dr. Chia-Shyun Chen received his Ph.D. degree from Texas A&M University. He is the Professor of Graduate Institute of Applied Geology, National Central University. He has many research and practical experiences in Ground Water Science.



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## Edwin C. Concepcion

Philippines

Mr. Edwin C. Concepcion is the Environmental Management Specialist II of Environmental Management Bureau, Department of Environment and Natural Resources (DENR), Republic of the Philippines.

## Stephen J. Ells

USA

Mr. Stephen J. Ells received his B.S degree in biology from Villanova University, Villanova, PA. and M.S degree in Fisheries Biology from University of Connecticut, Storrs, Connecticut. He has many experiences about environmental toxicology, and used to be a scientist in Office of Toxic Substances. Now he is the senior environmental scientist, Science Policy Branch, Assessment and Remediation Division, Office of Superfund Remediation and Technology Innovation. He is the team leader for the superfund sediment team.

## Marc S. Greenberg

USA



Dr. Marc S. Greenberg received a M.S. degree in Aquatic Toxicology from Miami University, Oxford, Ohio, and a Ph.D degree in Biomedical Sciences from Wright State University, Dayton, Ohio, USA in 2002. His technical experience includes research in both human health and aquatic ecological toxicology. He is an Environmental Scientist and Toxicologist on the U.S. EPA's Environmental Response Team where he supports various clean-up, emergency, and other response actions within the Superfund program.



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## Pham Thi Thuy Hanh

Vietnam



Ms. Pham Thi Thuy Hanh is the official of Department of International Cooperation and Science - Technology, General Department of Land Administration, Ministry of Natural Resources and Environment, Vietnam.

## Rashid Hasan

India



Dr. Rashid Hasan received his Ph.D degree from Aligarh Muslim University (AMU). He had 10 years researching experience about toxicology, and he has worked in government service for 18 years. He has many experiences about pollution control, environmental policy, planning, and law, ecodevelopment, and so on. Now he is the Director of CP Division, Government of India Ministry of Environment and Forests, Republic of India.

## Jeng-Ren Ho

Taiwan

Mr. Jeng-Ren Ho is the Division Chief of Technical Review Division, Soil and Groundwater Remediation Fund Management Board (SGRFMB), EPA, R.O.C. (Taiwan).



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## Dong-Jin Kim

Korea



Dr. Dong-Jin Kim received his Ph.D degree from Department of Environmental Science, Kangwon National University. Now he works on Soil & Groundwater Management Division, Water Environment Management Bureau, Ministry of Environment, Republic of Korea. He has many experiences on legislation of environmental protection.

## Masanori Kobayashi

Japan



Mr. Masanori Kobayashi earned his Magister in Public Administration/International Law, ICU, Japan and LL.M in International Economic Law, UGA, USA. He is the senior coordinator and principal researcher in Programme Management Office, Institute for Global Environmental Strategies (IGES). His specialties are policy analysis on environmental management and sustainable development, interdisciplinary analysis on policy implementation and development for environmental management and sustainable development.

## Le Thi Hai LE

Vietnam



Dr. Le Thi Hai Le is the head of Department of Science – Technology, Ministry of Natural Resources and Environment, Vietnam.





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## Tomoyuki Makino

Japan



Dr. Tomoyuki Makino received his Ph.D degree from University of Tohoku. Now he is the senior researcher in Soil Environmental Division, National Institute for Agro-Environmental Sciences (NIAES). His major is soil science and remediation technology of heavy metal contamination.

## Marc A. Mills

USA



Dr. Marc A. Mills is an Environmental Engineer at the National Risk Management Research Laboratory within the Office of Research and Development at U.S. EPA. He is responsible for a research program focused on evaluating the effectiveness of remediation of contaminated sediments in support of U.S. EPA's Superfund program and the Great Lake National Program Office.

## Dedi Nursyamsi

Indonesia



Dr. Dedi Nursyamsi received his Ph.D degree from Bogor Agricultural University, Indonesia. He is the Head of Indonesian Agricultural Environment Research Institute (IAERI). His specialties is soil science and soil management.



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## Shih-Cheng Pan

Taiwan

Dr. Shih-Cheng Pan received his Ph.D. degree in Environmental Engineering from National Central University. He is currently the Technical Manager of Environmental Engineering Department (I), Sinotech Engineering Consultants Ltd., and the General Manager of Pin-Pro Corporation. Dr. Pan is also the Secretary in General of Taiwan Association of Soil and Groundwater Environmental Protection (TASGEP). Dr. Pan owned many years of field experience in the investigation and remediation of soil and groundwater contaminated sites related to chlorinated solvent and petroleum contamination. He also conducted several projects for Taiwan EPA including regional groundwater monitoring, and the investigation of military and aviation sites.

## Nur Sharliza binti Mohd Rapi'Ain

Malaysia



Dr. Nur Sharliza binti Mohd Rapi'Ain is the principal assistant secretary, Minerals & Geosciences Division, Ministry Of Natural Resources And Environment, Malaysia.



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## Aroonkit Sitthichai

Thailand



Mr. Aroonkit Sitthichai is the environmentalist professional level in Industrial Wastewater Division, Water Quality Management Bureau, Pollution Control Department, Ministry of Natural Resources and Environment, Kingdom of Thailand.

## Ridwan D. Tamin

Indonesia

Mr. Ridwan Tamin is the Assistance of Deputy Minister, State Ministry for Environment, Indonesia.

## Hung-Teh Tsai

Taiwan



Mr. Hung-Teh Tsai received his Master degree from National Taiwan University. He is the Technical Superintendant and Executive Secretary of Soil and Groundwater Remediation Fund Management Board (SGRFMB), EPA, R.O.C. (Taiwan). He has many experiences in administration, site supervision, and management.



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## Chayawee Wangcharoenrung

Thailand



Dr. Chayawee Wangcharoenrung is the environmentalist professional level in Industrial Wastewater Division, Water Quality Management Bureau, Pollution Control Department, Ministry of Natural Resources and Environment, Kingdom of Thailand.

## Jae Eui Yang

Korea



Dr. Jae E. Yang received his Ph.D degree from Montana State University. He is the President of International Union of Soil Science (IUSS), and he is also the professor of Soil Environmental Chemistry Department of Biological Environment, Kangwon National University. He has many experiences in environmental site assessment, remediation planning construction, and operation of soil remediation work.

## Jin Won Yi

Korea



Ms. Jin Won Yi is the Deputy Director of Soil & Groundwater Management Division, Water Environment Management Bureau, Ministry of Environment, Republic of Korea.



# **Achievement, Development and Experience of Remediation Technologies Applied to Soil and Groundwater Contaminated Sites of Taiwan**

**Zueng-Sang Chen, Ph.D.**

Associate Dean, College of Bioresources and Agriculture, National Taiwan University  
Distinguished Professor of pedology and soil and environmental quality,  
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## ***Contents***

- Legislature of Soil and Groundwater Pollution Remediation Act (SGWPR Act) in 2000
- Achievements of Taiwan SGWPR Act
- Development of remediation techniques in Taiwan
- Taiwan Association of Soil and Groundwater Environmental Protection (TASGEP)
- Experience, strategies and policies of Taiwan SGWPR Act in the future

## **1. Introduction**

- Industrial and agricultural activities generate waste materials, and their amounts tend to increase as the demand for quality of life increases.
- Increasing population, changing consumption patterns, economic development, urbanization, and industrialization result in increased generation of solid waste and wastewater.
- Over 90 industrial parks are currently operated in western Taiwan, and approximate one-fifth of them clearly produce hazardous wastewater.
- Taiwan's government has obtained detailed information regarding solid waste disposal from 18,000 of industrial plants.
- About 50% of industrial parks offer a centralized system for wastewater collection and treatment.
- Illegal discharge of swine wastewater caused to the accumulation of N, P, soluble salts, and heavy metals (Cu and Zn) in the nearby water bodies.
- Paddy fields were consequently contaminated by the above mentioned wastewater around the irrigation canal systems.

## **2. The legislature of Soil and Groundwater Pollution Remediation Act (SGWPR Act) in 2000**



- The Legislature confirmed that the SGWPR Act will fully address in February, 2000.
- The regulation of pollutants, guidelines of control and remediation projects and other items were announced by Taiwan EPA (<http://sgw.epa.gov.tw/public/En/index.htm>).
- When levels of soil contaminants exceed the soil control standard (SCS) at site, this site will be announced as a "control site".
- The control site assessed to be clear risk by a tiered approach will be further announced as a "remediation site".
- Most of remediation sites are gas stations and petroleum storage tanks in Taiwan.
- About 90% of total number of control sites was rural soil that has been almost contaminated by heavy metals in paddy fields and most of them were cleaned up by soil turnover and dilution method in last few years.
- Petroleum products leaked from gas station and large oil storage tank is an additional and clear contamination type of soil.

### **3. Development of background concentration of pollutants**

- During 1985-1997, the upper levels of background concentration of surface soil (0-15cm) were determined by the database of heavy metal content in the rural soils (n=9155) of Taiwan were developed.
- The upper levels of background total concentration of heavy metals in surface soil (0-15cm) were also developed.

### **4. Development of the regulation of organic and inorganic pollutants in soil and groundwater**

- The soil control standards of heavy metals in the SGWPR Act are listed as follows (mg/kg): As 60, Cd 5.0, Cr 250, Cu 200, Hg 5, Ni 200, Pb 500, and Zn 600, based on aqua regia and total digestion methods.
- The regulation of organic pollutants in soils and groundwater are also announced in the website of Taiwan EPA (<http://sgw.epa.gov.tw/public/En/index.htm>).

### **5. Remediation techniques used in Taiwan**

- Phytostabilization and phytoremediation: field scale
- Attenuation: field scale
- Soil amendments: pilot scale
- Soil washing: pilot scale
- Soil vapor extraction (SVE): field scale on oil station



- Thermal desorption: field scale for organic pollutants
- Permeable reactive barriers (PRB): field scale
- Solidification: pilot
- Chemical Oxidation: pilot and field scales
- Electrokinetics Separation: pilot
- Bioremediation: field scale

#### **6. Remediation techniques used in Taiwan**

- Phytostabilization and phytoremediation: field scale
- Attenuation: field scale
- Soil amendments: pilot scale
- Soil washing: pilot scale
- Soil vapor extraction (SVE): field scale on oil station
- Thermal desorption: field scale for organic pollutants
- Permeable reactive barriers (PRB): field scale
- Solidification: pilot
- Chemical Oxidation: pilot and field scales
- Electrokinetics Separation: pilot
- Bioremediation: field scale

#### **7. Remediation techniques applied for metals-contaminated soils**

- Soil turnover and dilution, in situ stabilization by chemical amendments, and phytoremediation were used in the field scale.
- Soil amendment methods are also developed for reduced the solubility of heavy metals in the contaminated soils and to reduce the uptake of metals in brown rice and other upland crops for food safety in Taiwan.
- To develop the regulation of bioavailable concentration of metals in soil by different simulation models or approaches are future direction.

#### **8. Well-performed regression Models to predict Cd in root and grain of rice varieties**

- Based on database collected from the field studies of Cd-contaminated soils in regression equation in Taiwan
- A well-performed was developed to predict Cd-root levels by soil available Cd and Zn concentrations.

#### **9. Remediation techniques for oil and DNAPL-contaminated sites**



- Regular, traditional and cost-effective remediation techniques were well successfully applied in the oil and DNAPL-contaminated sites of Taiwan in last decade.
- Many remediation techniques including soil vapour extraction (SVE), air stripping, bioremediation, land farming, chemical oxidation, permeable reactive barriers by oxygen release compounds or iron powder were applied in sites of Taiwan.

#### **10. The survey and assessment of sediments are included in Act in 2010**

- Taiwan EPA has included the survey, monitoring and making risk assessment into the SGWPR Act in February, 2010.
- To promote more activities on the development of remediation techniques and risk-based assessment by research, monitoring and assessment in this Act.

#### **11. Taiwan Association of Soil and Groundwater Environmental Protection (TASGEP)**

- The association (TASGEP) was established for 10 years in Taiwan since 2000
- To promote and extend the techniques and knowledge between the governmental officials (Taiwan EPA and EPB), industrial companies, environmental consultant companies, colleges, and universities in Taiwan <http://www.tasgep.org.tw/>
- TASGEP is composed of > 600 members and 40 company members to share their knowledge and techniques to clean up the contaminated sites in Taiwan.

#### **12. Experience, strategies and policies of Taiwan SGWPR Act in the future**

- Risk-based assessment to be as a new approach direction to setup the regulation and to cleanup the contaminated sites: We need to save budget and time to clean up the contaminated sites by risk-based approach techniques, not one target value-based approached to be followed in the future.
- Need more communication and education between the community, scientists and EPA: Taiwan EPA wants to promote and organize more communication workshops and communication education to compromise the remediation target of the contaminated sites in the future.
- To make a detail survey on waste plants by x-ray fluorescence fast screening and clean up the sites based on the risk-based assessment.
- To develop the new strategies and management systems of remediation projects to be cost-effective.
- To make sure the persons or the companies of responsibility to clean up the pollution sites in Taiwan.





- Brownfield program or land revitalization program to be reusing by Policy:  
Taiwan EPA wants to propose a more attractive program to clean up the slightly contaminated sites for reusing the natural resources.
- To develop a new concept on the remediation train and life cycling for different pollution locations and levels.
- To develop the new management strategies and new materials and techniques.





# Achievement, Development and Experience of Remediation Technologies Applied to the Soil and Groundwater Contaminated Sites of Taiwan

**Zueng-Sang Chen**

Professor and Associate Dean

College of Bioresources and Agriculture

National Taiwan University

Taiwan.

## Contents

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- Experience, strategies and policies of Taiwan SGWPR Act in the future



## Introduction -1

- Industrial and agricultural activities generate waste materials, and their amounts tend to increase as the demand for quality of life increases.
- Increasing population, changing consumption patterns, economic development, urbanization, and industrialization result in increased generation of solid waste and wastewater.
- Over **90 industrial parks** are currently operated in western Taiwan, and approximate one-fifth of them clearly produce hazardous wastewater.
- Taiwan's government has obtained detailed information regarding solid waste disposal from **18,000 of industrial plants**.

## Introduction -2

- About 50% of industrial parks offer a centralized system for wastewater collection and treatment.
- Illegal discharge of swine wastewater caused to the accumulation of N, P, soluble salts, and heavy metals (Cu and Zn) in the nearby water bodies.
- Paddy fields were consequently contaminated by the above mentioned wastewater around the irrigation canal systems.



## The legislature of Soil and Groundwater Pollution Remediation Act (SGWPR Act) in 2000 (1)

- The Legislature confirmed that the SGWPR Act will fully address in February, 2000.
- The regulation of pollutants, guidelines of control and remediation projects and other items were announced by Taiwan EPA (<http://sgw.epa.gov.tw/public/En/index.htm>).
- When levels of soil contaminants exceed the soil control standard (SCS) at site, this site will be announced as a "**control site**".
- The control site assessed to be clear risk by a tiered approach will be further announced as a "**remediation site**".

## The legislature of Soil and Groundwater Pollution Remediation Act (SGWPR Act) in 2000 (2)

- Most of remediation sites are gas stations and petroleum storage tanks in Taiwan.
- About 90% of total number of control sites was **rural soil that has been almost contaminated** by heavy metals in paddy fields and most of them were cleaned up by soil turnover and dilution method in last few years.
- Petroleum products leaked from **gas station and large oil storage tank** is an additional and clear contamination type of soil.

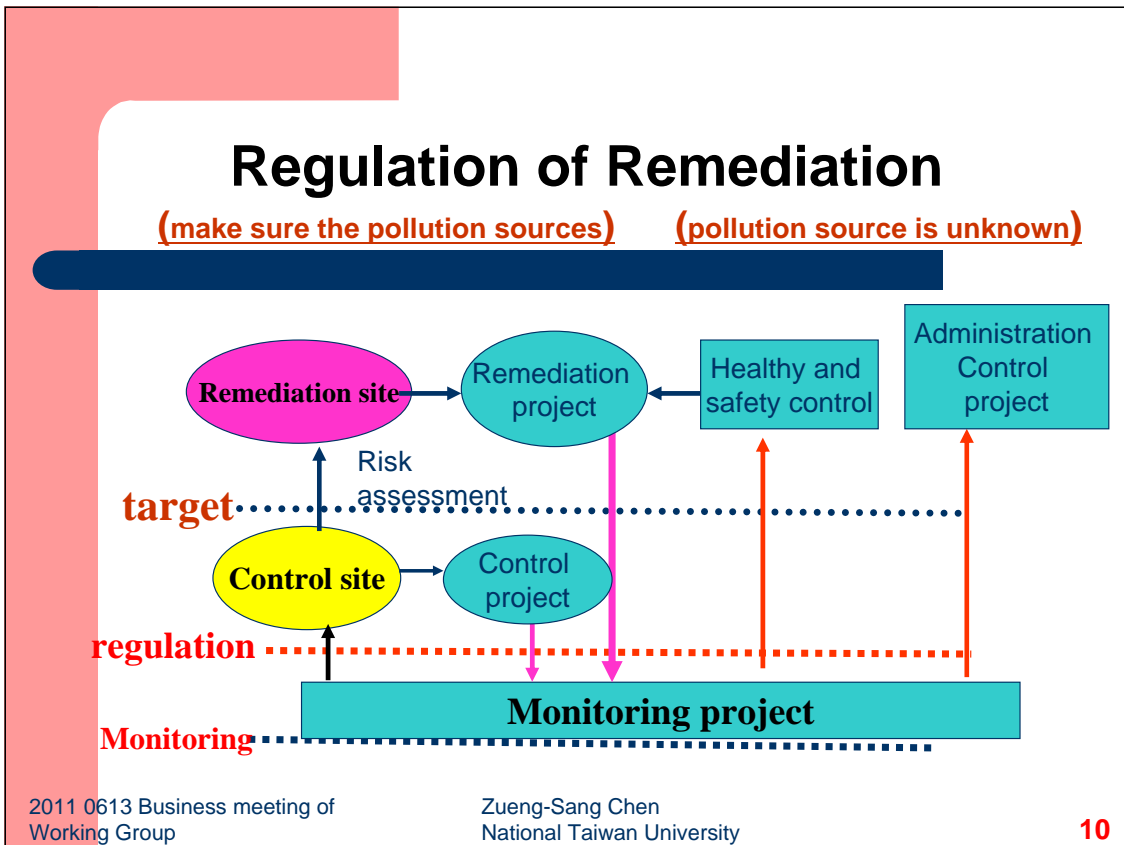
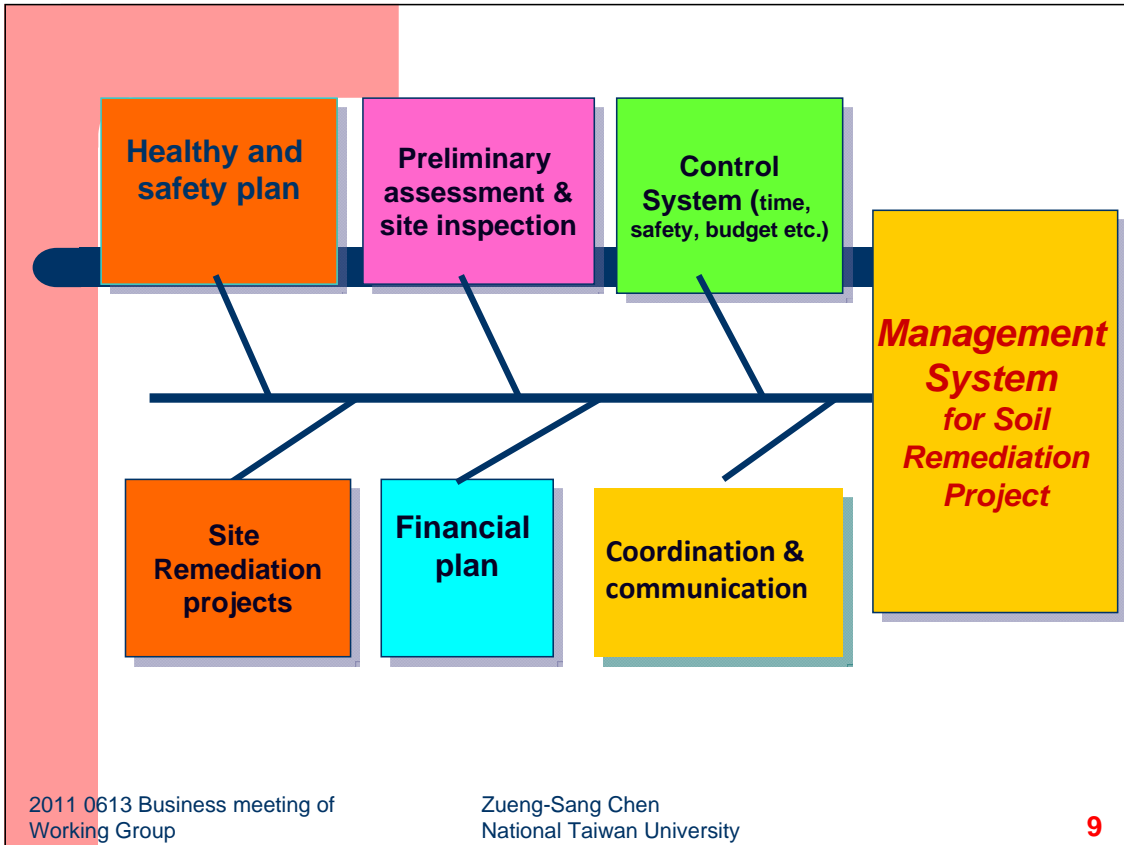


## Development of background concentration of pollutants

- During 1985-1997, the upper levels of background concentration of surface soil (0-15cm) were determined by the database of heavy metal content in the rural soils (**n=9155**) of Taiwan were developed.
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- The **soil control standard** of heavy metals in the SGWPR Act are listed as follows (mg/kg): As 60, Cd 5.0, Cr 250, Cu 200, Hg 5, Ni 200, Pb 500, and Zn 600, based on aqua regia and total digestion methods.
- The **regulation** of organic pollutants in soils and groundwater are also announced in the website of Taiwan EPA (<http://sgw.epa.gov.tw/public/En/index.htm>).





## Remediation techniques used in Taiwan

- **Phytostabilization and phytoremediation: field scale**
- **Attenuation: field scale**
- **Soil amendments: pilot scale**
- **Soil washing: pilot scale**
- **Soil vapor extraction (SVE): field scale on oil station**
- **Thermal desorption: field scale for organic pollutants**
- **Permeable reactive barriers (PRB): field scale**
- **Solidification: pilot**
- **Chemical Oxidation: pilot and field scales**
- **Electrokinetics Separation: pilot**
- **Bioremediation: field scale**

## Remediation techniques applied for metals-contaminated soils

- **Soil turnover and dilution, in situ stabilization by chemical amendments, and phytoremediation were used in the field scale.**
- **Soil amendment methods are also developed for reduced the solubility of heavy metals in the contaminated soils and to reduce the uptake of metals in brown rice and other upland crops for food safety in Taiwan.**
- **To develop the regulation of bioavailable concentration of metals in soil by different simulation models or approaches are future direction.**





## Well-performed regression equation to predict Cd in root and grain of rice

- Based on database collected from the field studies of Cd-contaminated soils in **regression equation** in Taiwan
- A well-performed was developed to predict Cd-root levels by soil available Cd and Zn concentrations.

## Remediation techniques for oil and DNAPL-contaminated sites

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## The survey and assessment of **sediments** are included in Act in 2010

- Taiwan EPA has included the survey, monitoring and making risk assessment into the SGWPR Act in February, 2010.
- To promote more activities on the development of remediation techniques and risk-based assessment by research, monitoring and assessment in this Act.

## Taiwan Association of Soil and Groundwater Environmental Protection (TASGEP)

- The association (TASGEP) was established for 10 years in Taiwan since 2000
- To promote and extend the techniques and knowledge between the governmental officials (Taiwan EPA and EPB), industrial companies, environmental consultant companies, colleges, and universities in Taiwan  
<http://www.tasgep.org.tw/>
- TASGEP is composed of > 600 members and 40 company members to share their knowledge and techniques to clean up the contaminated sites in Taiwan.



## Experience, strategies and policies of Taiwan SGWPR Act in the future -1

- **Risk-based assessment to be as a new approach direction to setup the regulation** and to cleanup the contaminated sites: We need to save budget and time to clean up the contaminated sites by risk-based approach techniques, not one target value-based approached to be followed in the future.
- **Need more communication and education between the community, scientists and EPA:** Taiwan EPA wants to promote and organize more communication workshops and communication education to compromise the remediation target of the contaminated sites in the future.

## Experience, strategies and policies of Taiwan SGWPR Act in the future -2

- To make a **detail survey on waste plants by x-ray fluorescence fast screening** and clean up the sites based on the risk-based assessment.
- To develop the **new strategies and management systems** of remediation projects to be cost-effective.
- To make sure the persons or the companies of **responsibility to clean up the pollution sites** in Taiwan.



## Experience, strategies and policies of Taiwan SGWPR Act in the future -3

- **Brownfield program or land revitalization program** to be reusing by Policy: Taiwan EPA wants to propose a more attractive program to clean up the slightly contaminated sites for reusing the natural resources.
- To develop a **new concept on the remediation train and life cycling** for different pollution locations and levels.
- To develop the **new management strategies and new materials and techniques.**

Thanks for your attention



## **Japan's Policies and Legislative Measures for Soil Contamination Countermeasures**

Masanori Kobayashi  
Senior Coordinator/Principle Researcher  
Programme Management Office (PMO)  
Institute for Global Environmental Strategies (IGES)

### **Abstract**

Soil contamination has been a priority policy issue in Japan as the number of incidents has increased rapidly where a high level of pollutants was detected in the soil of land for commercial transaction. The Ministry of the Environment, Japan (MOEJ) has convened a series of expert group meetings since December 2000. The Sub-committee on Soil Contamination of the Japan's Central Environment Council (JCEC) undertook discussions and JCEC provided MOEJ with the policy recommendations on 25 January 2002. The draft bill was submitted for the parliament on 15 February, and adopted on 22 May, and promulgated on 29 May 2002. The Act came into force on 15 February 2003. The Act was thereafter amended by the Cabinet decision on 9 October 2009 and the Amended Act came into force on 1 April 2010.

The Act provided the basic policy and institutional framework for tackling soil contamination in Japan. The Act obliged the land owner of the business using toxic substance to inspect soil contamination through the designated survey institutes at the time of terminating business/factory operation. The Act also authorized the local government (prefectures) to order land owner to inspect soil contamination when the local governments have a ground to believe in the possible soil contamination that may cause health hazard. The Act also stipulated various operational issues such as the local governments' obligation to create the directory of sites with soil contamination as well as the local governments' authority to order the land owners to remove the contaminants or contain contaminants. The Act also established the financing mechanism. When the land owner is not able to finance the remediation cost, the funds can be provided up to 75 per cent to assist land owner in undertaking remediation measures. The Act was accompanied by the series of guidelines.

The Sub-committee on Soil Contamination conducted a review on the implementation of the Act, and submitted a report in December 2008. The amendments were introduced mainly in response to the fact that the soil contamination surveys were conducted not based on the legislative requirements, but on a voluntary basis for commercial purposes, remediation measures were highly dependent on excavation, and there was a concern over the possible illegal dumping or improper dissemination of contaminated soil. The Amendment clauses include those that authorize the prefectural governments to order surveys in changing the use of land that exceeds 3,000 m<sup>2</sup>, and requiring land owners to report on the results of surveys when the contaminants were detected, and encouraging prefectural governments to share information on contaminated sites.





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**Institute for Global Environmental Strategies**

*Towards sustainable development - policy oriented, practical and strategic research on global environmental issues*

## Japan's Policies and Legislative Measures for Soil Contamination Countermeasures

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Senior Coordinator  
Programme Management Office

Business Meeting of  
the Working group on Remediation for Soil and  
Groundwater Pollution of Asian Countries

Taipei, 13 July 2011

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## Ashio Copper Mine Pollution



Copper mining intensified in 19<sup>th</sup>  
Century

Iron Oxide – Sulfuric Acid  
contaminated areas

Sickness exemplified by ophthalmic  
disorder illness and killed over 1,000



[www.mori-net.org/asio-mi/asi.html](http://www.mori-net.org/asio-mi/asi.html) and others



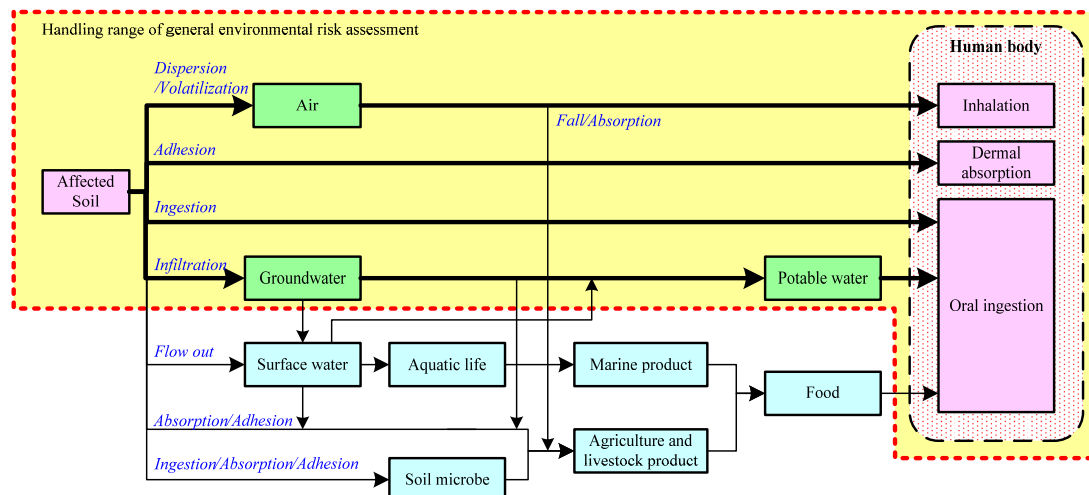
## Risk-based approaches for proper solutions

- Original goals of measures against soil and groundwater contamination
  - To reduce potential environmental risks caused by soil and groundwater contamination to an acceptable level (**Reducing and controlling environmental risks**).
- Risk-based measures against soil and groundwater contamination
  - To quantitatively assess and reduce potential environmental risks caused by soil and groundwater contamination.
  - To follow risk-based measures widely adopted in Europe and North America and successful in resolving brownfield issues.

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## Health risks caused by contaminated soil

- Exposure scenario for the contaminant from contaminated soil
- Key to block contaminant transmission or contaminant ingestion/human exposure



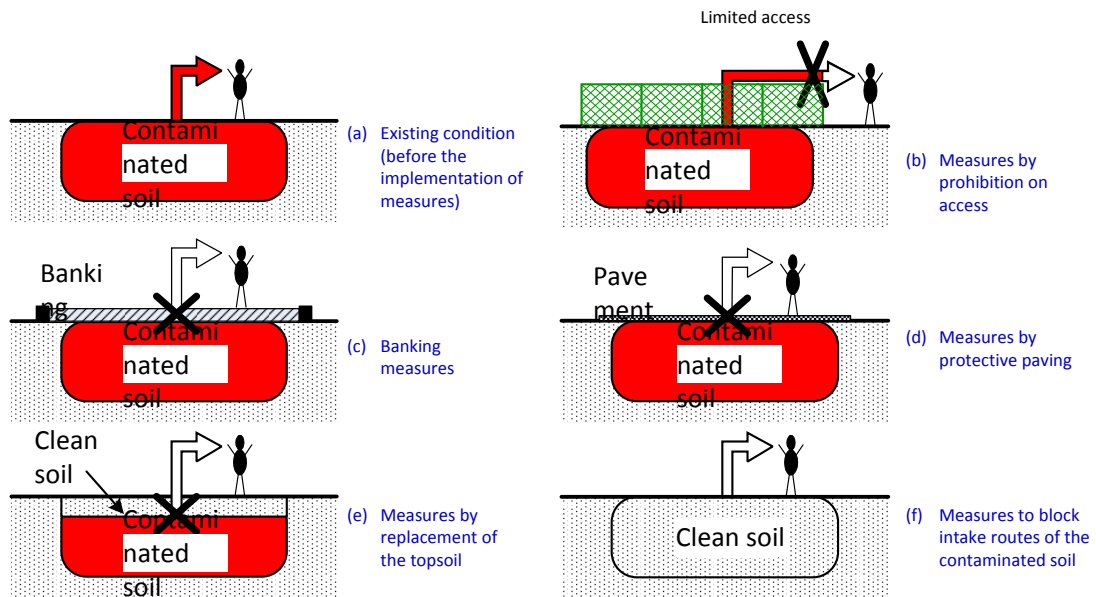
Source: Nakashima and Wu (2007)

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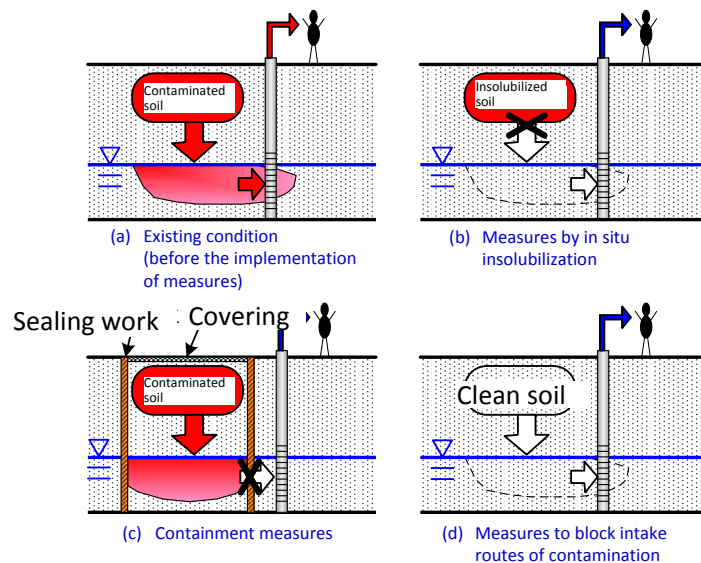
### Measures to block intake routes of contamination in conformity with the Soil Contamination Countermeasures Act (Measures related to risks due to direct ingestion)



Source: Nakashima (2009)

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### Measures to block intake routes of contamination in conformity with the Soil Contamination Countermeasures Act (Measures related to risks due to ingestion of the groundwater)



Source: Nakashima (2009)

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## Contaminated Agricultural Land

- 1880's~1970's' Mineral Poison Damage of Ashio Copper Mine, Tochigi Pref. in Watarase River (Damages on rice growth, etc)
- 1910's~1970's "Itai-Itai Disease" of Jinzu River Basin in Toyama Pref. (Health Damage: Cadmium poisoning by contaminated rice, etc)
- 1920's~1960's Mineral Pollution from Toroku Mine in Miyazaki Pref. (Damage: arsenic poisoning, and rice growth, etc)



In 1970, **the Agricultural Land Soil Pollution Prevention Act** was legislated by the Diet

The origin of Act related to Soil contamination in Japan  
(at the same time, the Diet established "Water Quality Pollution Control Act" and "Waste Management and Public Cleansing Act." The Diet was called "Pollution Session of the Diet")

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## Contamination in Urban areas (1)

- In 1975, Soil contamination caused by hexavalent Chromium compounds from a site where a chemical factory closed
- In 1980's, Groundwater Contamination caused by trichloroethylene, etc becomes a social issue
- In 1986, Drawing up of "Draft Countermeasures Policy related to Soil contamination in Urban cities" by Environment Minister Agency
- In 1989, Amendment of Water Pollution Prevention Act. Regulation, that ban of facilities utilizing designated hazardous substances disseminating those substances in underground, was implemented.
- In 1991, Establishment of "Environmental Standard related to Soil Contamination (Soil Environmental Standard)"

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- In 1994, Drawing up of “Guideline on Soil Contamination Survey and Countermeasures related to heavy-metal, etc” and “Draft Guideline on Soil and Groundwater Pollution Research and Countermeasures related to Volatile organic compounds” by Environment Minister Agency
- In 1995, Amendment of Water Pollution Prevention Act. Prefectural governor could order the polluter to clean up contaminated groundwater when this water is used for drinking.
- In 1996, Establishment of Environment Standard related to groundwater (Groundwater Environment) (adjust to Water Environment Standard in public water =clean up standard of groundwater)

Legal system of soil contamination countermeasures is not consolidated as a whole, but countermeasures based on guidelines, that are related to survey and measures for blocking intake routes of soil contaminations, through standardization conducted by Environment Minister Agency voluntary base is promoted

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## Soil Contamination caused by Dioxins

- The end of 1990's: High concentrations of dioxins are detected from soils (around waste incinerators). Soil contamination caused by dioxins became a social issue



In 1999, **the Act on Special Measures Concerning Dioxins** legislated by representatives' Initiative

Comprehensive Countermeasures; not only for soil contamination countermeasures, but also on dioxin emissions and disposal process of dust and ash from waste incinerators

In the framework of Environmental Standard for soil contamination, it was the first time that risk assessments were implemented with regards to the direct intake of contaminated soil

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## Contamination in Urban areas (2)

- Reports of soil contamination discovery were increasing
- The rules for investigation and countermeasures were not specified
- Concerns about health damage from soil contamination

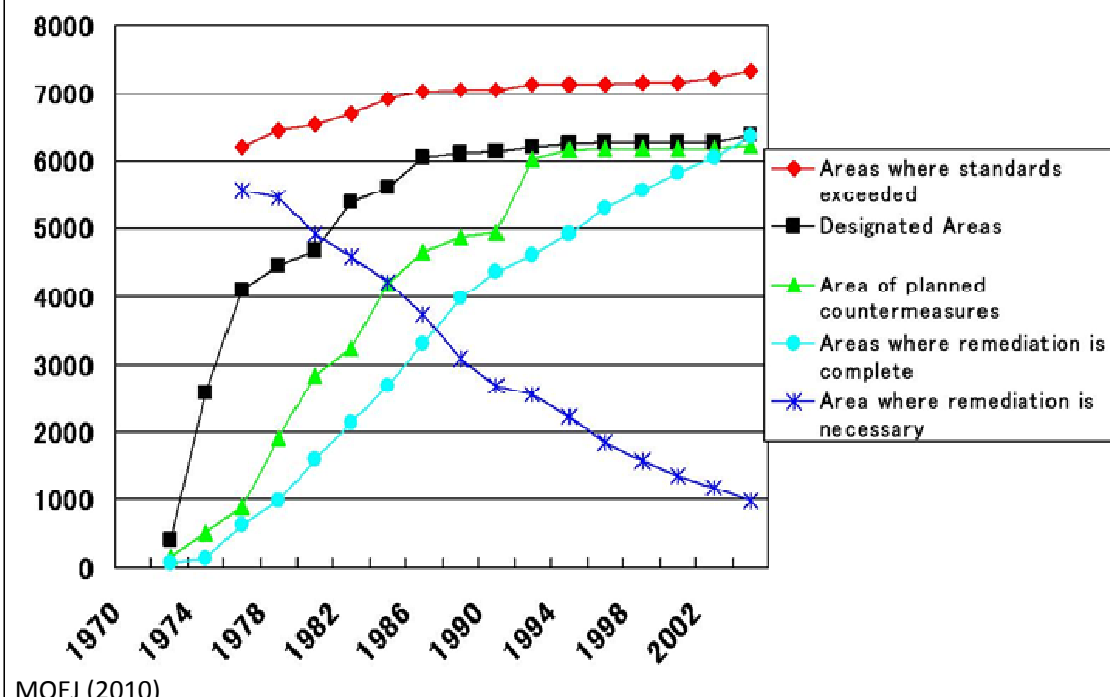
the Act on Special Measures Concerning Dioxins was established in 1999, but there were no regulations on other substances



In 2002, **Soil Contamination Countermeasures Act** was enacted at the regular Diet session  
(In 2009, **amendment** of Soil Contamination Countermeasures Act at regular Diet session)

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Change in the status of farmland soils since the enforcement of Agricultural Land Soil Pollution Prevention Act





### Measures against Illegal Dumping, etc. in the Waste Management and Public Cleansing Act and other Acts

- 1971: Enforcement of Waste Management and Public Cleansing Act
  - Introduction of notification system for waste disposal facilities (structure quality standard of disposal facility construction, and operating and maintenance quality standard of disposal facility running)
  - Introduction of a system of order for actions by prefectural governors and city mayors when there are cases of illegal dumping, etc.
  - Introduction of a subrogation system (if polluters have no financial ability to conduct countermeasures)
- 1990: Case of illegal dumping in Teshima, Kagawa Pref. is raised as a major problem
- 1991: Introduction of a permission system for waste disposal facilities over a certain size (regarding landfills, all are placed under the system regardless of the size)
- 1998: If polluters are unknown or absent, and prefectural governors execute countermeasures by subrogation, the expenses are covered by a fund from the Waste Management and Public Cleansing Act (fee is based on fund (public: private =1:2), and when polluters are later identified, the expenses are billed to them)
- 2002: establishment of the Act on Special Measures for Specified Industrial Wastes (in the case of illegal disposal done before 16 June, 1998, if subrogation is implemented by governors, financial support is provided via government subsidies or special municipal bond)
- 2005: (Local budget system reformation) for cases with ministerial approval after 2006, the provision of government subsidies under the Act on Special Measures for Specified Industrial Wastes are terminated. And in Special Measures, appropriation rate of General bond for single project funding is raised to 90%
- 2009: For pre-2005 cases under the Act on Special Measures for Specified Industrial Wastes, the government has been providing subsidies directly since 2008

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## Outline of 2002 Soil Contamination Countermeasures Act

- Target chemical substances (designated hazardous substances)**
- (1) Health impacts potential by direct ingestion of contaminated soil e.g. heavy metals which accumulate in the surface horizon over long periods
  - (2) Health impacts potential by ingestion of groundwater a soil leachate standard based on the ingestion of groundwater.

### Mechanism

#### Investigation

- When closing down specified facilities using hazardous substances
- When prefectural governors are concerned that the possibility of human health impacts from soil contamination



By landowner, site management

Investigation and reports

By designated investigation organization



(When soil contamination levels exceed designation quality standards)

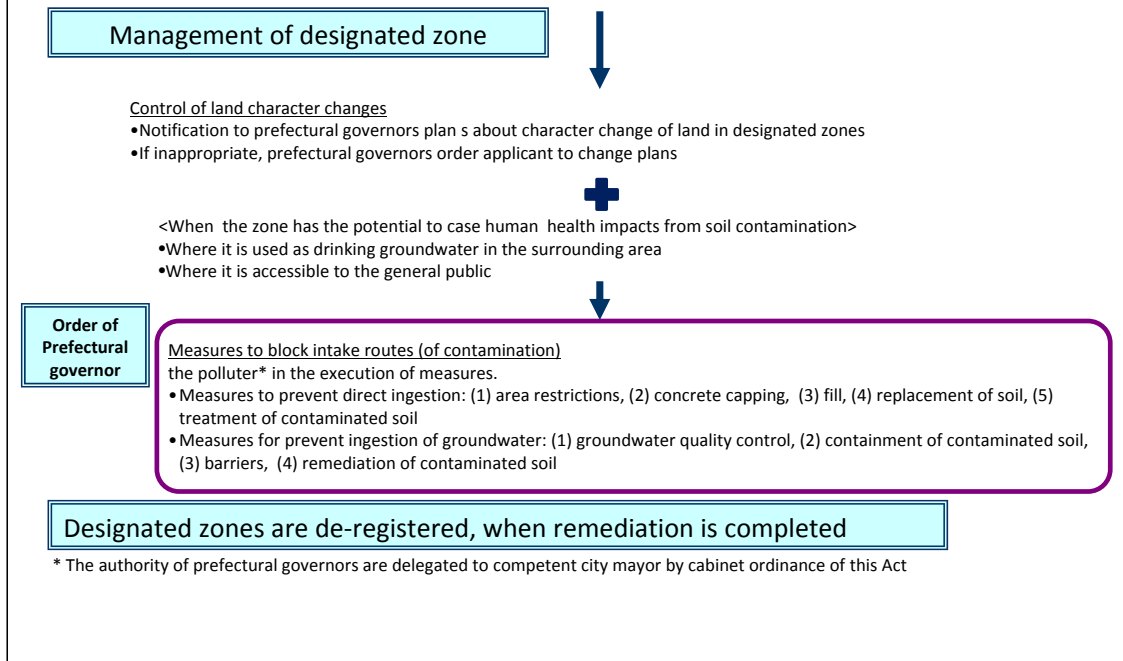


Prefectural governors designate and register on the list of designated zone for public disclosure

※ Proclamation in May 2002; Enforcement in February 2003



## Outline of 2002 Soil Contamination Countermeasures Act before amendment (2)



### Implementation of measures for reducing risks in the case of health risk probability

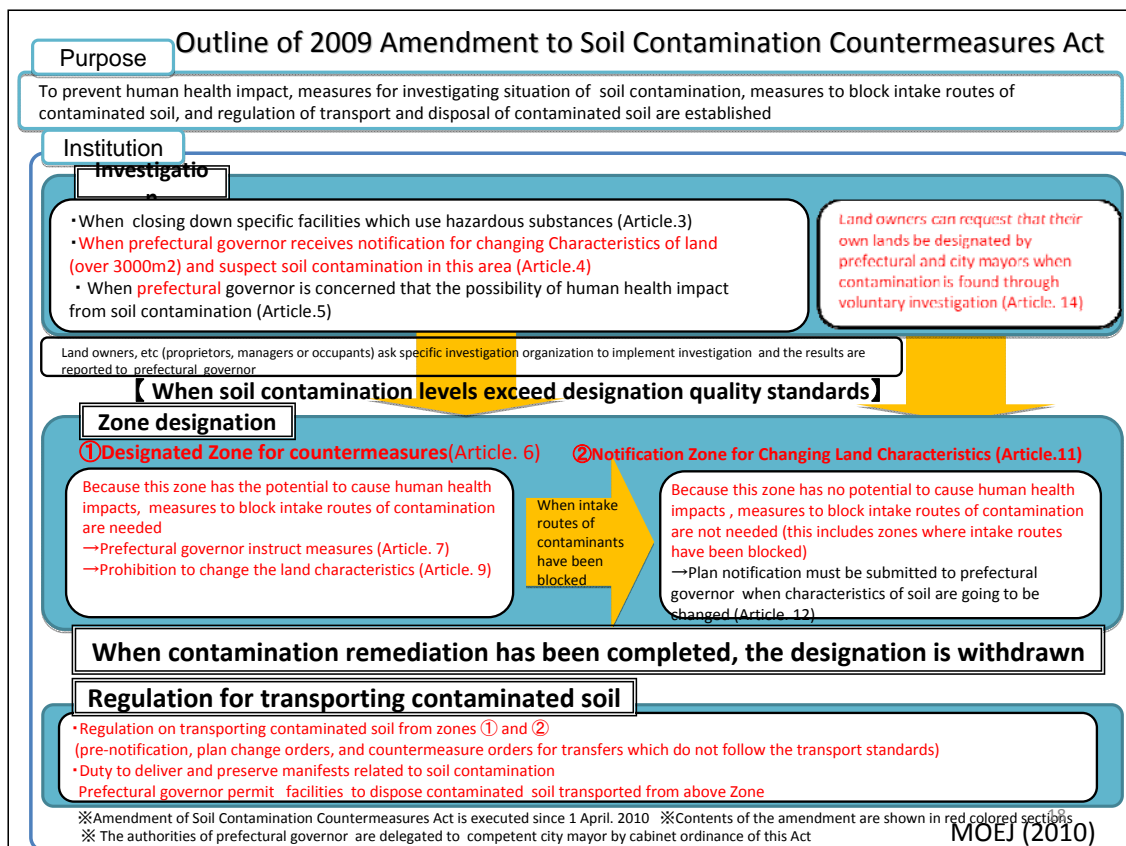
- Soil Contamination Countermeasures Act obliges Land owner to conduct measures to block intake routes of contaminated soil in the limited case where exist human health impacts potential even when he has no negligence of soil contamination  
When the land owners do not have enough financial capabilities, the government provides assistance through designated support organization.
- It is allowed that the authorities compel even no negligent landowners to conduct measures, because avoidance of public risk (=health impact potential ) is required. Financial assistance is allowed by the reason to avoid public risk. Unless public risk is left unattended  
Art. 8 of the Act Amendment allows land owner to demand the polluter to pay measure cost within the extent of instructed measure cost.
- There can be a case where no body is able to take measures in spite of public risk as polluters can be bankrupt or not pay enough expenses. Until polluters are identified, pollution can be left unattended despite of the health risk probability.
- Excluding land owner, polluters are not able to undertake measures that can entail land management change and no measure action can be undertaken.
- Countermeasures are for avoiding the current risk and not for seeking liability of pollution-thus, the Act doesn't require that soil be restored back to the original status prior to pollution.



## Key issues raised in improving the 2002 Act

- Promoting rational countermeasures based on the type of risks
- Categorizing designated sites, and disseminating info on the status
- Assessment based on land use types
- Checking countermeasures plans
- Economic instruments
- City planners, real estate agents, accountants
- Determining an appropriate scope of the Act
- For preserving safe and comfortable land → enough to target only the health risk?
- Information sharing mechanisms
- Management sheet on removed soil
- Enforcement measures on illegal cases
- Ensuring sound treatment of removed soil
- Enhancing accuracy/credibility of surveys and countermeasures
- Prevention of soil contamination

[http://www.env.go.jp/water/dojo/sesaku\\_kondan/rep080331/gaiyo.pdf](http://www.env.go.jp/water/dojo/sesaku_kondan/rep080331/gaiyo.pdf)

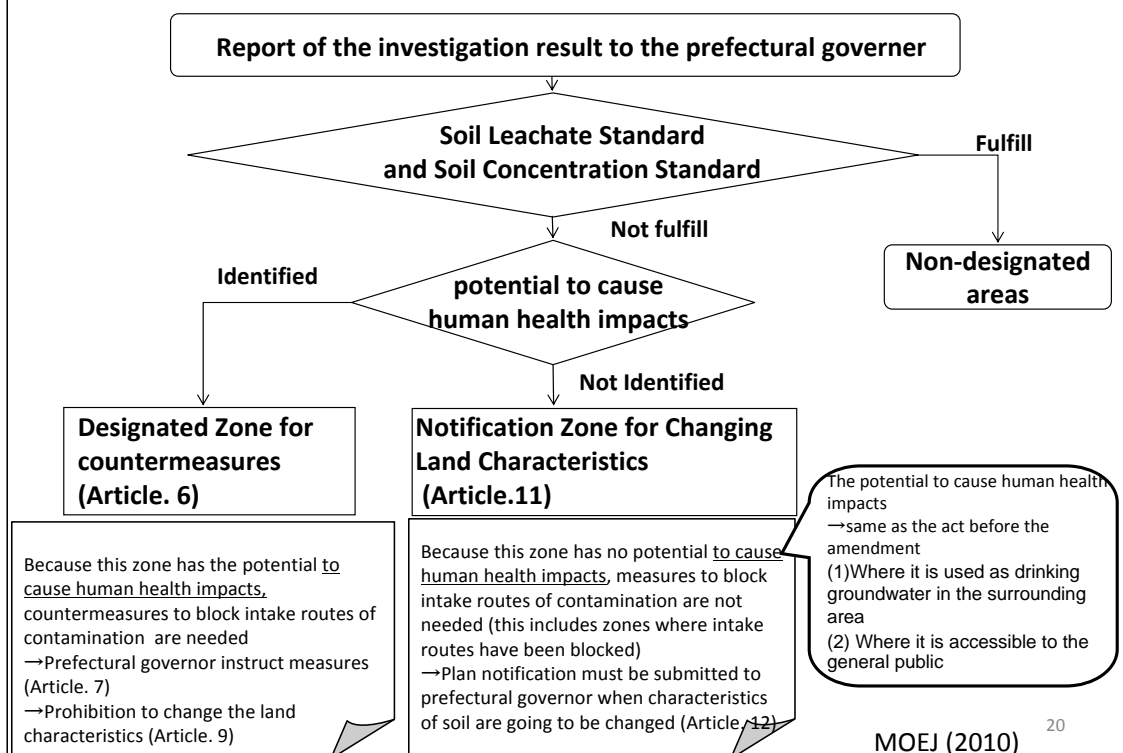




## Key changes introduced by the 2009 Amendment

- (1) Restraining the excavation and removal of contaminated soil, underlining proper management of removed contaminated soil,
- (2) Expanding the scope of the contaminated site registration systems to cover the cases of contamination revelation through voluntary investigations,
- (3) Allowing the contaminated site to be removed from the list of "Designated site" and to be listed as "Notification site" when the remediation measures were undertaken to block the in-taking/exposure route (e.g., containment, embankment)
- (4) Penalty for breaching the guideline of transporting contaminated soil,
- (5) Requiring the contaminated soil excavation and removal the permission from the local government,

○ The designation process of "Designated Zone for countermeasures" and "Notification Zone for Changing Land Characteristics" (based on Soil Contamination Countermeasures Act)

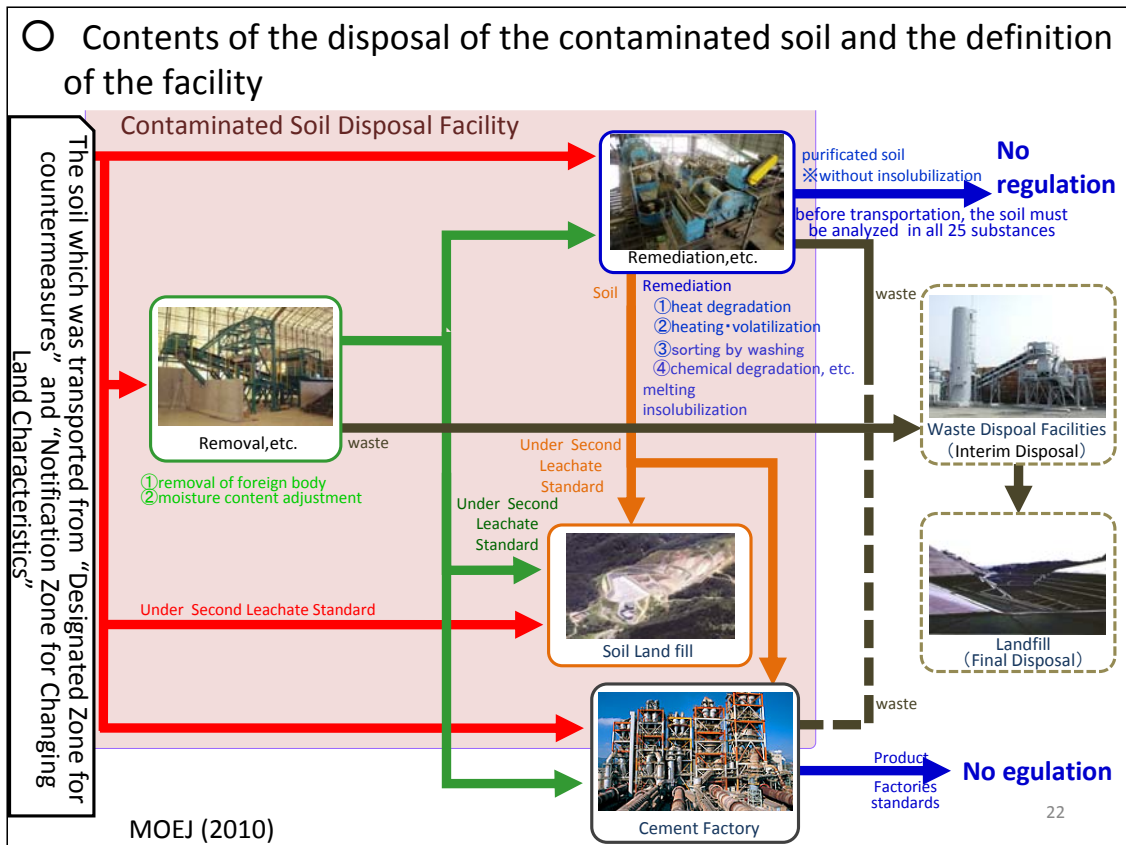






Target substances and standards			
Designated hazardous substances (Article 2 of the Act)	Designation standard (Article 5 of the Act)	Reference: Soil Environment Standard (except for copper)	
		Soil Concentration Standard <Risk for direct ingestion>	Soil Leachate Standard <Risk of ingestion from groundwater etc.>
Carbon Tetrachloride			≤ 0.002mg / L
1, 2-Dichloroethane			≤ 0.004mg / L
1, 1-Dichloroethylene			≤ 0.02mg / L
cis-1, 2-Dichloroethylene			≤ 0.04mg / L
1, 3-Dichloropropene			≤ 0.002mg / L
Dichloromethane			≤ 0.02mg / L
Tetrachloroethylene			≤ 0.01mg / L
1, 1, 1-Trichloroethane			≤ 1mg / L
1, 1, 2-Trichloroethane			≤ 0.006mg / L
Trichloroethylene			≤ 0.03mg / L
Benzene			≤ 0.01mg / L
Cadmium and its compound		≤ 150mg / kg	≤ 0.01mg / L
Hexavalent Chromium compounds		≤ 250mg / kg	≤ 0.05mg / L
Cyanides compounds		As isolated cyanides ≤ 50mg / kg	Less than detection limit
Total Mercury and its compounds		≤ 15mg / kg	≤ 0.0005mg / L
Alkyl Mercury		Less than detection limit	Less than detection limit
Selenium and its compounds		≤ 150mg / kg	≤ 0.01mg / L
Lead and its compounds		≤ 150mg / kg	≤ 0.01mg / L
Arsenic and its compounds		≤ 150mg / kg	≤ 0.01mg / L
Fluorine and its compounds		≤ 4000mg / kg	≤ 0.8mg / L
Boron and its compounds		≤ 4000mg / kg	≤ 1mg / L
Simazine		≤ 0.003mg / L	≤ 0.003mg / L
Thiuram		≤ 0.006mg / L	≤ 0.006mg / L
Thiobencarb		≤ 0.02mg / L	≤ 0.02mg / L
PCB		Less than detection limit	Less than detection limit
Organic phosphorus compounds		Less than detection limit	Less than detection limit

MOEJ (2010)





## Improvement for Reliability of designated investigation organizations

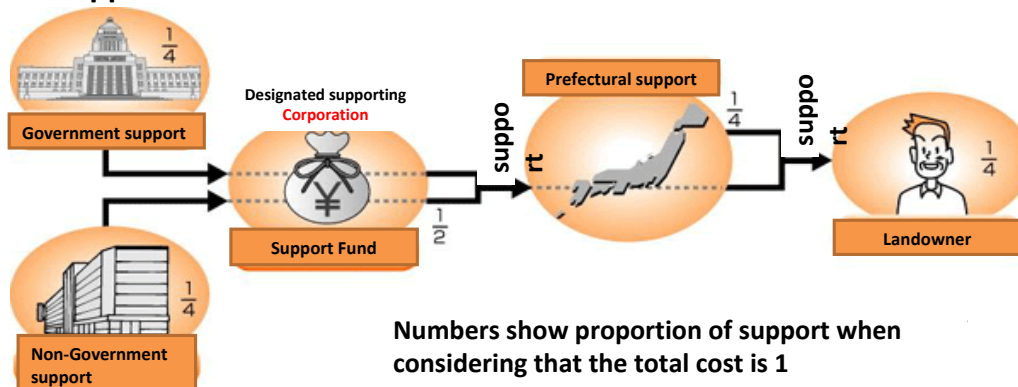
- Introduction of designated renewal plan (If renewal plan would be taken every 5 years, designation would be expired)
  - ✘ designated investigation organizations that have already been designation before the amendment, they are considered as designated organizations that are designated after the amendment, on 1<sup>st</sup> of April, 2010.
- To set up the position of technological managers, and to establish the duty for observation responsibilities by technological managers (technological managers who passed the examination implemented by minister of environment)
  - ✘ In designated investigation organizations before the amendment, person who manages technologies, based on ministry ordinance before the amendment, are identified as technological managers until 31<sup>st</sup> of March, 2013.
- To tighten designated standard for designated investigation organizations (To set up the appropriate position for technological managers)
- To establish duties for improving contents of business processes, and attach ledger sheets, and others

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### ○ Financial support from the Soil Contamination Countermeasures Fund

- The designated zone land owner who is order to take counter-measures/remediation measures must not be the polluter.
- Such a land owner does not have sufficient financial resources,
- Prefectural government provides 1/4 of cost for the counter/remediation measures to be supplemented by the Soil Contamination Countermeasures Fund,
- So far only 1 case funded under this scheme,
- Only two local governments have provisions on co-financing measures (as of Aug, 2010).

#### <Support Fund Scheme>



MOEJ (2010)

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## ○ The Flow of Soil Contamination Investigations

① Verification of the Investigation Target areas and Target Substances

② Classification of Contamination Risks

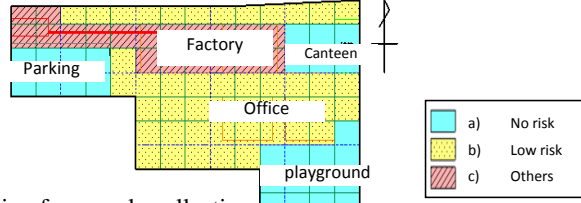
③ Zoning for sample collection

④ Measurements and Analyses

⑤ Evaluation of Contamination status and reporting

Nakashima (2009)

② Categories of Soil Contamination Risks (example)



③ Land Zoning for sample collection

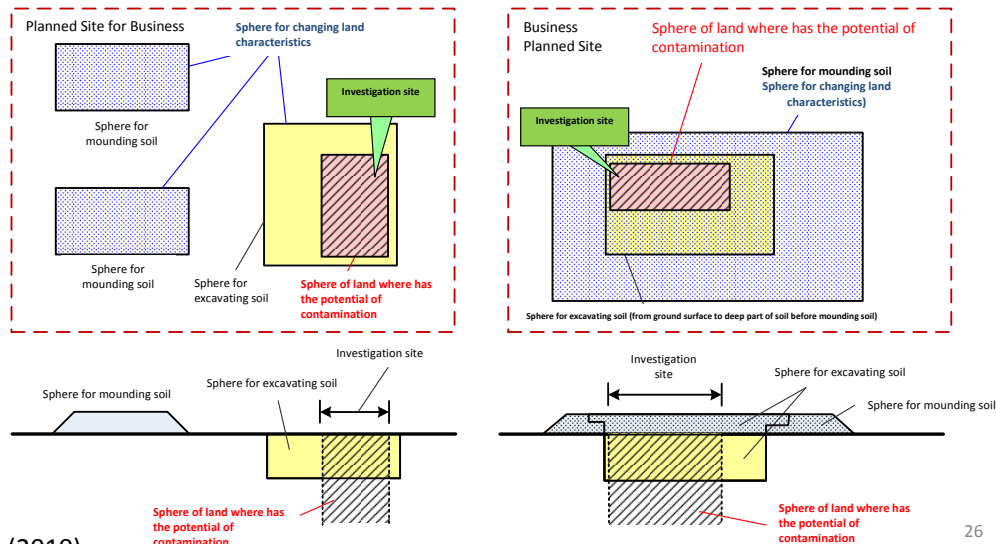
Categories	Collection method
(a) No risk of Soil Contamination Land that is independent and isolated from the organisations using Designated Hazardous Substances. (ex) mountains and forests, staff accommodation, sports grounds, etc	No need for samples
(b) Low Contamination Risk The land is not directly used for Soil Contamination Countermeasures, but may be under the influence of other facilities using Designated Hazardous Substances. (ex) Offices, Storages, Gardens, and areas not connected to the facilities using Designated Substances.	Collect samples from one spot or 5 spots within zones of 30m by 30m. (Every 900m <sup>2</sup> ) Note: VOC needs one sampling and heavy metals need 5.
(c) Others (ex) Buildings accommodating facilities for the use of Designated Hazardous Substances, pipelines connected to them.	10m by 10m sampling method

④ Measurements and Analyses

The collection of documents	Measurement methods
Investigation of gas emissions from soil	The designation of methods for investigating gas emissions (6 March 2003 MOEJ announcement n.16)
Investigation of Soil Elution Levels	The designation of methods for investigating elution (6 March 2003 MOEJ announcement n.18)
Investigation of elements contained in the Soil	The designation of methods for investigating soil contents (6 March 2003 MOEJ announcement n.19)

## Article 4. Specific Plot for Investigation

○ Sphere of land where; (1) characteristics of land would be changed, (2) is planned to excavate, and (3) Prefectural governor identifies the land has the potential of contamination.



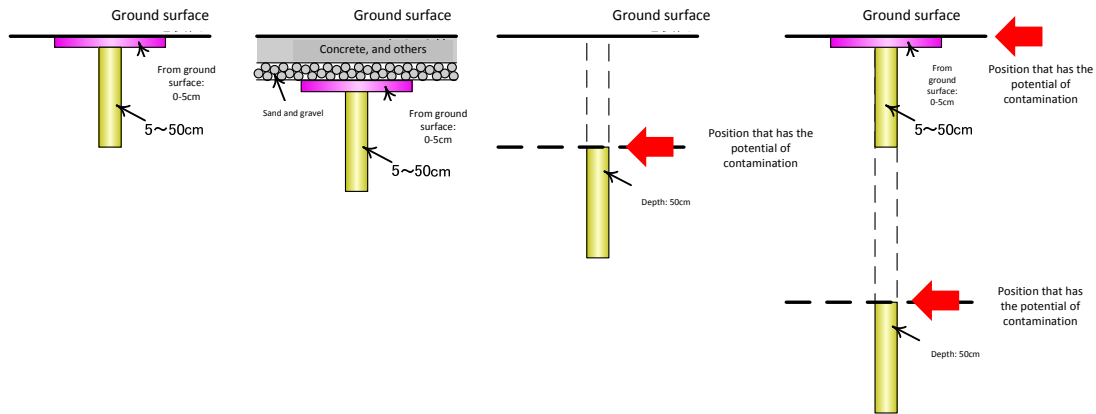
MOEJ (2010)

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### Depth for soil sampling extractions (except for soil gas investigation)

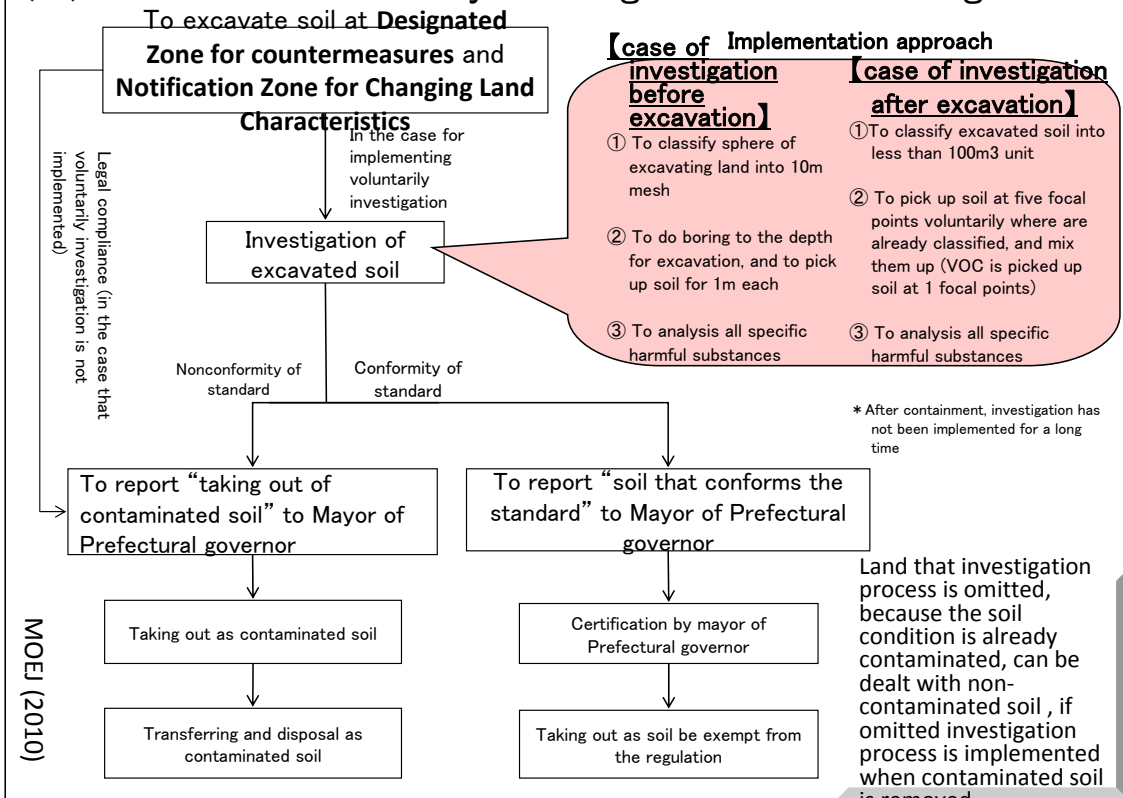
○ To implement sampling extractions, but the place where has the potential of contamination should be taken into account (within 10m in depth)



MOEJ (2010)

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### (3) Process of voluntarily investigation for Removing soil





## Japan's Soil Contamination Countermeasures Act Performance (Before amendment: Feb. 2003 – Feb 2008)

Surveyed sites 898 cases

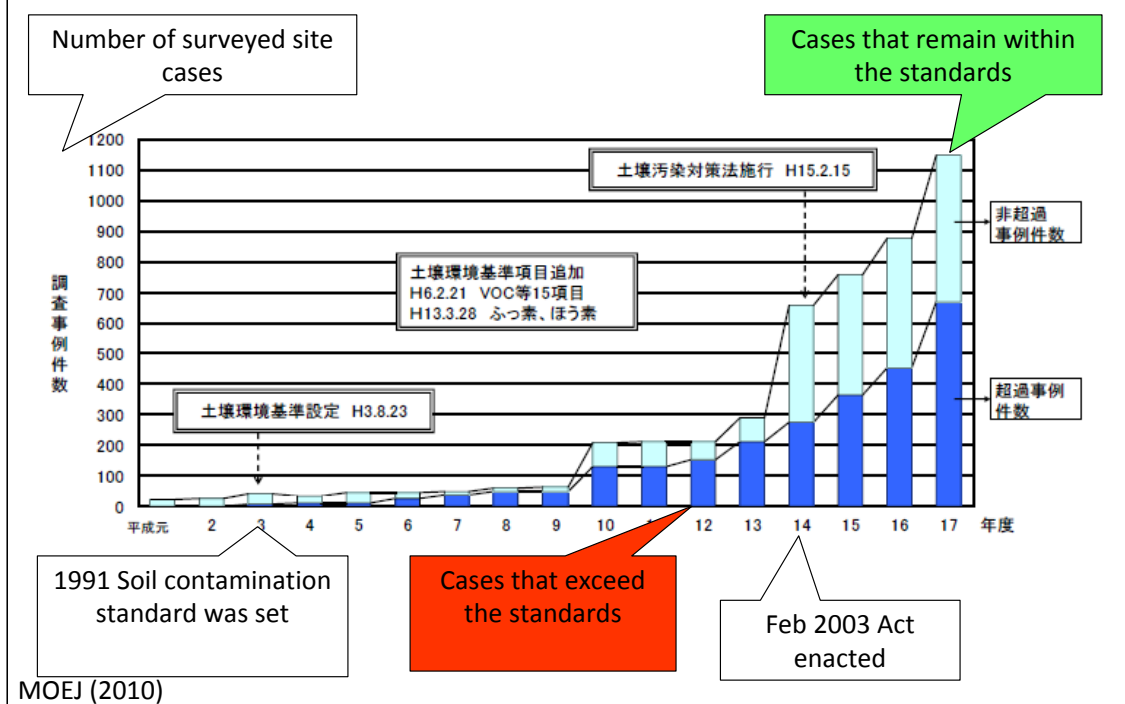
Designated sites 259

Sites declared to require contamination removal 63 (33 removed, 30 in the process of removal or under consideration, 0 – no action)

Sites declared not to require contamination removal  
W196 (111 treated, 62 in the process of treatment or under consideration, 23 – no action)

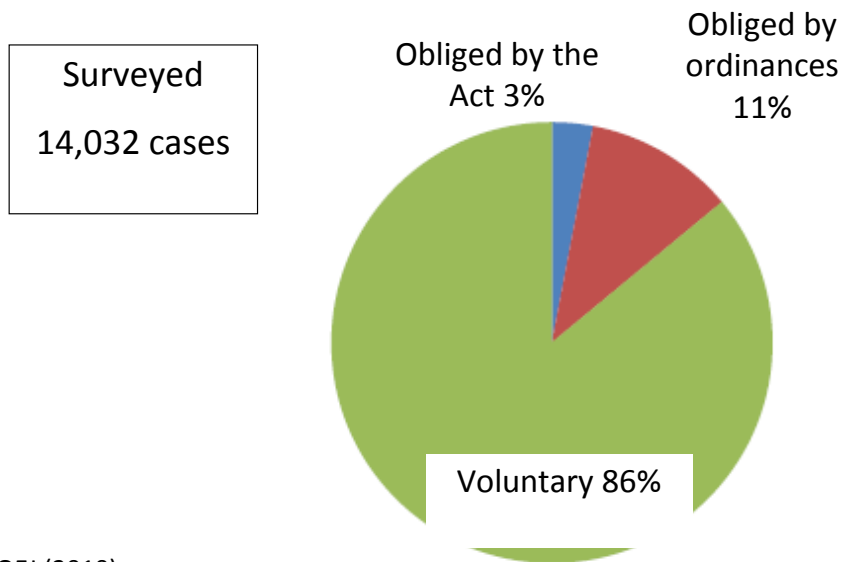
Lifting the designation of sites under the Act 128

## Surveyed site cases



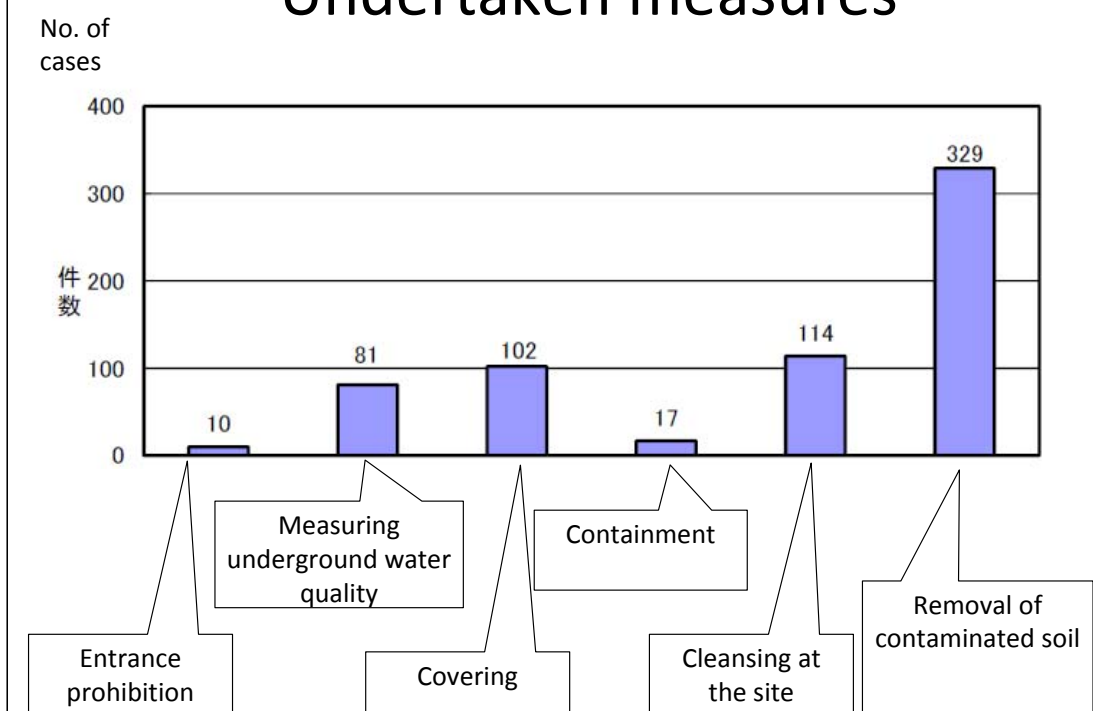


## Number of surveys in 2006



MOEJ (2010)

## Undertaken measures

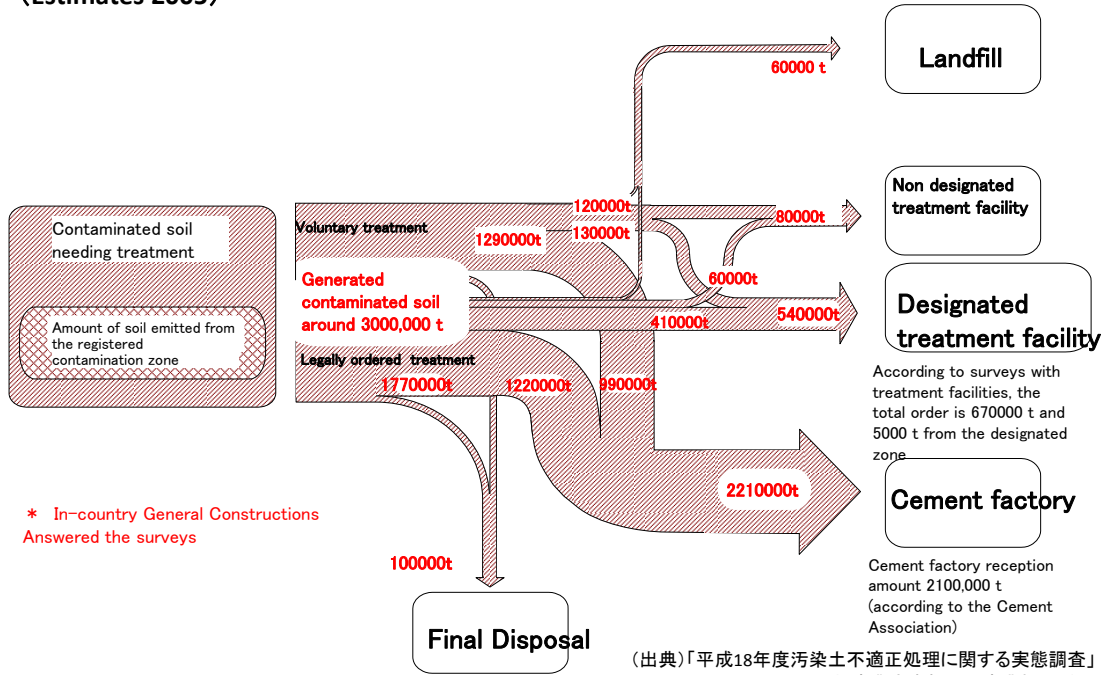


MOEJ (2010)



## ○ The flow of contaminated soil (Problem after legislation)

(Estimates 2005)



## ○ Inappropriate treatment of contaminated soil

According to the data from the regional governments, there are many cases of inappropriate treatment of contaminated soil as can be seen in the following:

① Hexavalent chromium contaminated soil was abandoned (July 2006)

Hexavalent chromium was detected from the soil dumping site and despite the municipal request to rehabilitate the area, nothing was done. Now the buyer of the land is dealing with the soil contamination countermeasures



Contaminated soil 15,000



② Mercury contaminated soil (November 2003)

Mercury contamination occurred at a thermometer manufacturing centre. The soil was planned to be treated at appropriate facilities but in reality was transported elsewhere to undergo the melting process.



The manufacturers had planned to treat 250m<sup>2</sup>



③ Arsenic-contaminated soil (October 2003)

Arsenic exceeding the standards was detected in a soil storage mound.



MOEJ (2010)

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## Challenge one: Stakeholder coordination and partnership

Differing preoccupations of key actors/stakeholder groups

### MOEJ

- Reducing overall environmental/health risk (pollutant transmission, proliferation of polluted soil) → pollution containment is an immediate action

### Local government


- Trying to introduce more strict reporting requirements on land use change through the local ordinance than the national Act (3,000 h.a. under the Act vs possibly 1,000 h.a. in local ordinance)

### Business

- Sustaining real estate value (buyers' perception is more important than actual environmental risk)

### Civil society

- Access to information, Reducing public cost

 Capturing major interests and finding common grounds while noting difference

## Challenge Two: Identifying and synthesizing good practice



A. Living on the contained contaminated soil?

B. Living on the cleaned soil?

↓  
Containment of polluted soil/  
risk communication

↓  
Technology for cleansing  
contaminated soil

- Safe,
- But some feel uneasy,
- Reluctance to disclosing information to the public

- Uneasiness diminishes,
- But costly,
- Risk of polluted soil proliferation

Ideal approach

Reality

Suggested practice not yet widely implemented, difficult to access info/interact with stakeholders





## Recent lawsuit case – Seiko Epson vs Ohji Paper

SE bought land from Ohji Paper and it turned out that the soil was contaminated with dioxin and PCB (Polychlorinated Biphenyl).

SE estimates that 9,200 tons of contaminate soil would require removal/cleansing

SE have taken measures to remove/cleanse contaminated soil

SE sought 640 million JPY(6.4 million USD) for damages

The court ruled on 8 July 2008 that Ohji must pay 589,75850 (5.9 million USD)

## Adachi Ward Land Development Authority vs AGC Seimi Chemical

Adachi Ward LDA bought land from AGC SC bought 3,600 m<sup>2</sup> at JPY2.3 billion (USD23 million) in 1991. In 2005, it turned out the level of fluorine was over the regulatory standard introduced in 2003.

Tokyo Lower court ruled in favor of AGC SC.

On 26 September 2008, the Tokyo High court ruled in favour of Adachi Ward LDA stating that AGC SC must pay JPY449 million.

This ruling was seen as epoch making in a sense that the chemical that is not regulated at the time of land transaction can be a cause of liability at the later stage when the chemical is provided as toxic in the legislation.

The current legislation designate 26 substances as toxic, but this list may grow in the future and land owner/seller must undertake an precautionary measures to reduce soil contamination or remove contamination.



## The proposed relocation of Tsukiji Fish Market to Toyosu



Tsukiji, Over 70 years old – biggest fish market of the world

Proposed relocation to Toyosu – 2 km away to the land that used to be a factory of Tokyo Gas

1. In 1999, a newly elected governor announced the relocation as it has become “old, dirty and small.”
2. In 2008, it was discovered that benzene is contained in the soil at the level of over 43,000 times more than the regulatory standard.
3. The cost of cleaning is estimated at JPY67 billion jumped from JPY130 billion of the original estimate.

[www.esco-architects.co.jp](http://www.esco-architects.co.jp)

Wednesday, March 7, 2007 Japan Times

### NEW SITE UNHEALTHY, CRITICS CHARGE

## Tsukiji fish mart relocation plan draws toxin gripes

By MASAKO OZAKI  
Kyodo News

Relocating Tsukiji market, home to the world's largest fish bazaar, is not as easy as transporting a box of tuna from one wholesaler to another by pallet truck.

It is clear that nobody is in a rush as the middle traders move around on their mini-trucks through the market in the heart of Tokyo.

And although the metropolitan government has decided on the relocation and plans to finish construction by 2012, the plan has hit a snag, due partly to environmental concerns at the proposed relocation site on Toyosu wharf.



Wholesalers cross the bustling Tsukiji market recently, where fish is distributed for Tokyo and the rest of the country. KYODO PHOTO



Relocation plan in on-hold due to the opposition to the plan



### Other landmark recent cases and news on soil contaminations

- Tokyo District Court ruled to order the land seller to pay JPY 590 million for the cost of treating soil contaminated with dioxin (8 July 2008),
- Supreme Court revoked the ruling of the High Court and ruled that the land buyer doesn't assume responsibility for soil contamination with Fluorine that was not regulated at the time of land sale transaction. Tokyo District Court rejected the claim by the land buyer, but the High Court ruled for the land seller to pay for JPY448,900 million (1 June 2010)
- Managers of the real estate developers were investigated and the police reports were sent to the Prosecutors Office based on the violation of the Building Lots and Buildings Transaction Business Act for selling the apartment units by concealing the fact of soil contamination. (30 March 2005)
- The Ministry of Defense disclosed that the maximum of 30 times lead from the permissible standard was found in the site of the former foreign military base in Yokohama (30 June 2010)
- The Weekly Magazine reported on soil contamination in residential areas in Tokyo (8 July 2010)



Increasing public awareness through court ruling, policy investigation and media coverage – developing policy and social issues

### Observation and future challenges for effective soil contamination countermeasures

- Improving the policy performance on policy and legislative measures for preventing pollution,
- Enhancing the public understanding on the environmental soundness of various countermeasures,
- Ensuring compliance with the guidelines for treating excavated contaminated soil,
- Ensuring the proper management of the directory of the designated sites and notification sites,
- Promoting activities on environmental risk communication,
- Developing the cost-sharing schemes for counter/remediation measures particularly those substances that were post facto designated as toxic,
- Sharing good practices and lessons with other countries





# Policy and Legal Framework on Soil Contamination Management

2011. 6.

## CONTENTS

- I** Soil Environment
- II** Soil Environment Policy in Korea
- III** Introduction to contaminated soil monitoring



# I. Soil Environment Policy in Korea

## 1-1. History of Soil Environment Policy

### Early Phase(before 1980)

- Farmland-centered soil management policy for increase of production
- Soil contamination occurred such as excessive uses of soil and chemicals
- Little understanding of soils, absence of soil policy
  - Establish the Environmental Pollution Preservation Act ('63.11.5) and Decree ('69.11)

### Growth Phase(1980~1994)

- Development of heavy chemical industry → Serious soil contamination
  - Set up Ministry of Environment ('80.1.5), a unit to take charge in soils
- Run soil measuring networks, conduct soil contamination survey throughout the country('87)
- Establish Framework Act on Environmental Policy
- Divide the law into air, water, waste, and/or natural environment
- MOE was raised to higher status('90)
  - Soil management Dept. became soil conservation Dept.



## 1-1. History of Soil Environment Policy

### Development Phase(after 1995)

- Try to conserve soil environment by prevention and remediation
- Establish Soil Environment Conservation Act('95.1), Decree and Regulations('96.1)
- Expansion and tightened responsibility of person causing pollution, introduction of Assessment of Soil Environment ('03.1)
- Introduce system of advanced countries such as risk assessment, registration of soil remediation work, verification of soil remediation('04.12)

## 1-2. Base for Soil Environment Conservation

### Establish Single Law

- Until 1970s, soil was treated and managed as parts of water, waste and/or natural environment
- After 1970s, soil contamination became serious social problem due to recklessly discharge of contaminants and absence of systematic control
- Need for comprehensive and systematic policy for soil environment conservation is raised
- Establish Soil Environment Conservation Act ('95)
  - It is the second single law in the world after Netherland



## 1-3. Structure of Soil Environment Conservation Act



## 1-4. Standard of Soil Environment Management

### Set soil contamination standard

- 21 items (Cd, Cu, As, Hg, petroleum, organic solvents) were chosen as soil contaminants
- Divide into two standards, worrisome level and response level considering effects on human health or properties or rearing of animals and plant
- Change from elution method into content method for management based on risks

### Remediation Standards for contaminated soils

- Remediation standards are established as worrisome level.
- Remediation work are decided to be conducted by soil remediation business operator with biological, physical, chemical and thermal processes regulated by Soil Environment Conservation Act.





## 1-4. Standard of Soil Environment Management

### Worrisome level of soil contamination

<valid until 2009.12.31>

Material	Area A	Area B
Cd	1.5	12
Cu	50	200
As	6	20
Hg	4	16
Pb	100	400
Cr <sup>6+</sup>	4	12
Zn	300	800
Ni	40	160
F	400	800
Organic Phosphorus	10	30
PCB	-	12
CN <sup>-</sup>	2	120
Phenol	4	20
Petroleum		
-BTEX	-	80
-TPH	500	2,000
TCE	8	40
PCE	4	24

Area A : farm, rice paddy, orchard, woodland, school, river, park, gym, amusement park, religious site, historic site.

Area B : factory, road, railroad, etc.

<valid from 2010.1.1>

Material	Area 1	Area 2	Area 3
Cd	4	10	60
Cu	150	500	2,000
As	25	50	200
Hg	4	10	20
Pb	200	400	700
Cr <sup>6+</sup>	5	15	40
Zn	300	600	2,000
Ni	100	200	500
F	400	400	800
Organic Phosphorus	10	10	30
PCB	1	4	12
CN <sup>-</sup>	2	2	120
Phenol	4	4	20
Benzene	1	1	3
Toluene	20	20	60
Ethylbenzene	50	50	340
Xylene	15	15	45
TPH	500	800	2,000
TCE	8	8	40
PCE	4	4	25
Benzo(a)pyrene	0.7	2	7

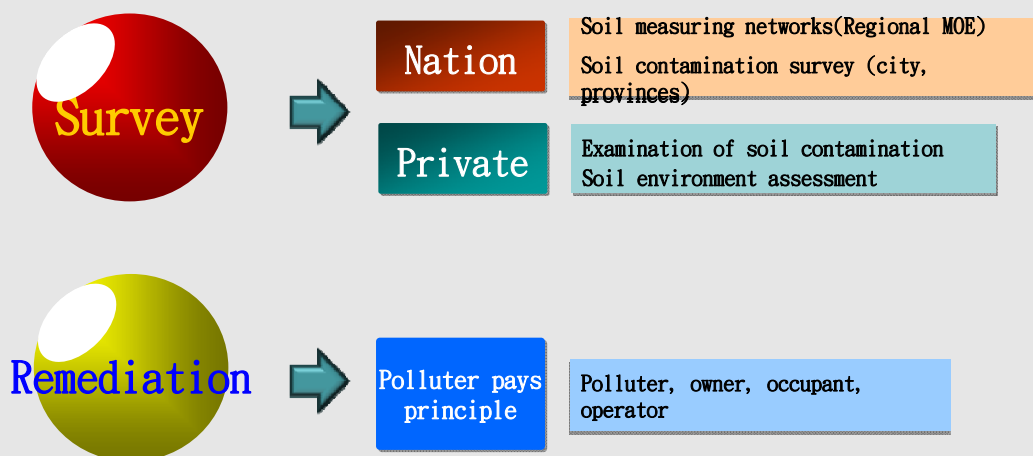
Area 1 : farm, rice paddy, orchard, spring, university, fishery, park, historic site, cemetery

Area 2 : woodland, salt pond, warehouse, river, gym, amusement park, etc.

Area 3 : factory, parking lot, gas station, road, railroad, embankment, military facility

## 1-5. System of Soil Environment Management

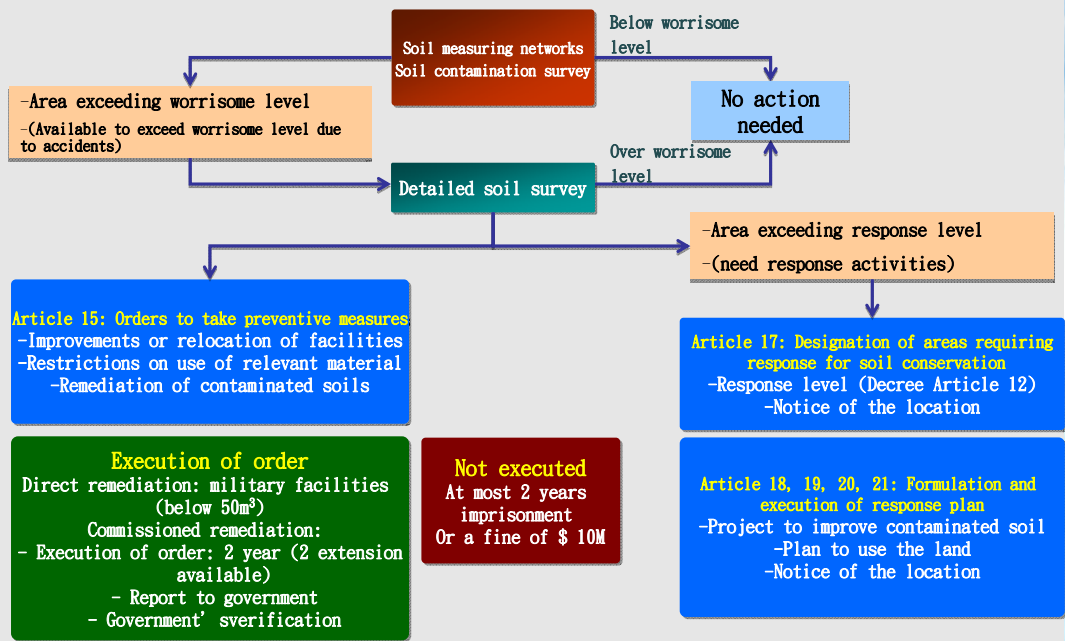
### Survey and remediation





## 1-5. System of Soil Environment Management

### Management system of soil contamination





## 2-1. Risk Assessment Policy

### Prescription of Risk Assessment (Article 15-4)

- The Minister of Environment, the governor of a province, and Polluter can hire a risk assessment agency to measure the impact of soil contaminant to human and environment, considering the kind and degree of contaminants, surrounding environment, future usage of the property and other related concerns to decide the scope, time and the level of remediation.

### Conditions Requiring Risk Assessment

- If a property belongs to the nation, and the Minister of Environment is responsible for remediation (nation is the polluter, and the issue is urgent)
- Polluter cannot be identified, or the polluter cannot take remediation action
- Pollution has been resulted from a natural cause
- Other cases requiring Risk Assessment

## 2-1. Risk Assessment Policy

### Ways to prove nature-caused soil contamination

- If the degree of soil contamination in the subjected area is similar with the background level of the vicinity area
- If contamination has occurred by bedrock, according to the geophysical characteristics survey result
- If there is a scientific proof of natural sources of soil contamination

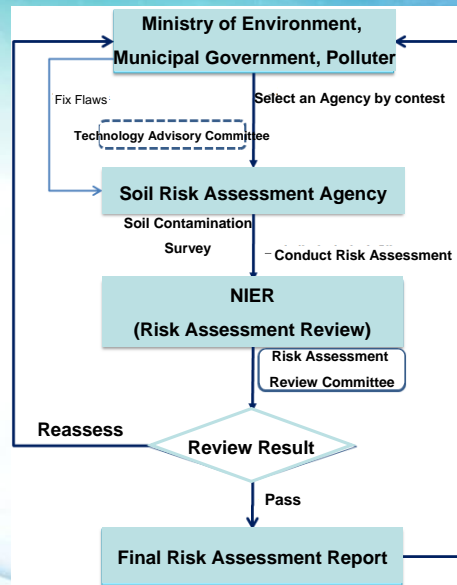
### Qualifications of a Risk Assessment Agency

- A qualified agency should be able to take soil sample and analyze the degree of soil contamination, have specialists in soil risk assessment, and be certified by the Minister of Environment.



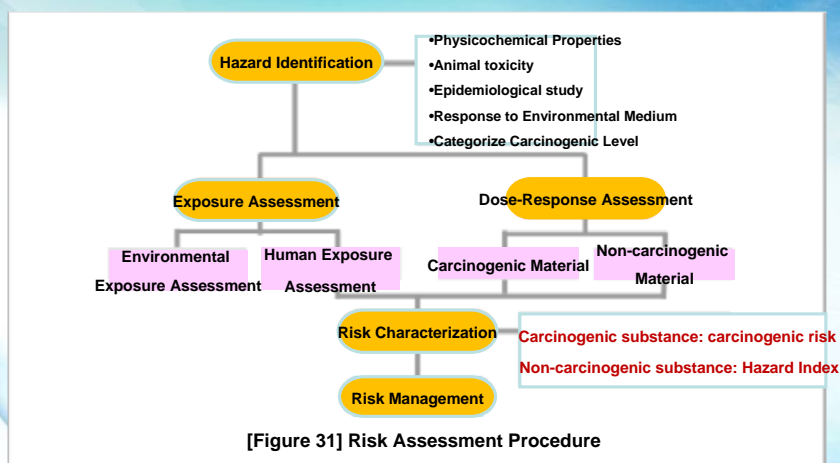
## 2-1. Risk Assessment Policy

### Risk Assessment Process and Verification



## 2-1. Risk Assessment Policy

### Risk Assessment Process and Verification

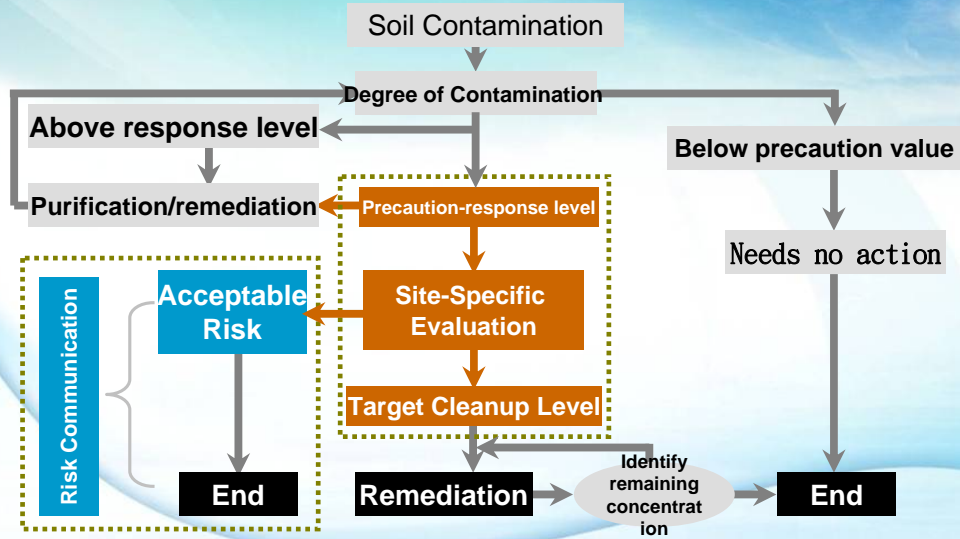


[Figure 31] Risk Assessment Procedure



## 2-1. Risk Assessment Policy

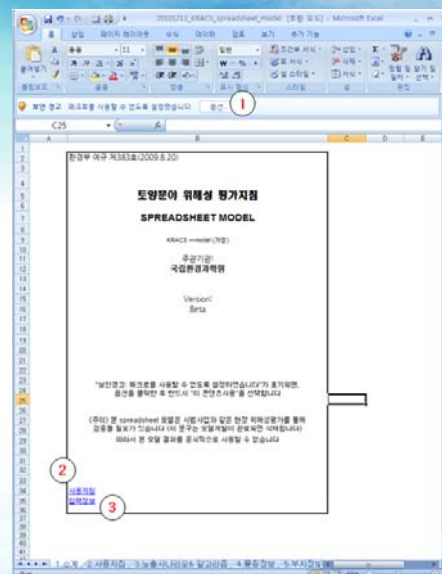
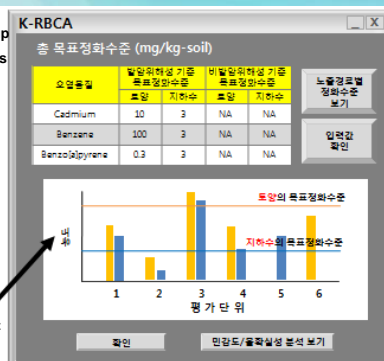
### Risk Assessment Process and Verification



## 2-1. Risk Assessment Policy

### Risk Assessment Model

- Calculate target cleanup levels per contaminants exposure pathway and assessment unit
- Analyze sensitivity and uncertainty of results
- Make tables and charts for easier understanding
- Visualize Target Cleanup Levels per assessment unit

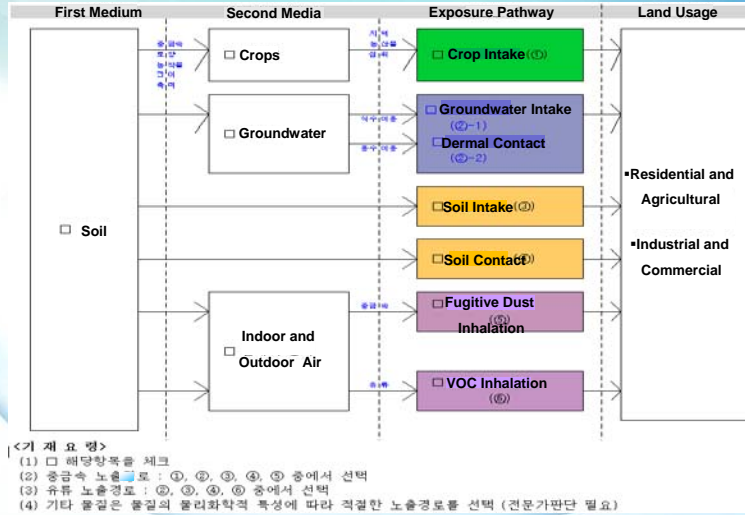




## 2-1. Risk Assessment Policy

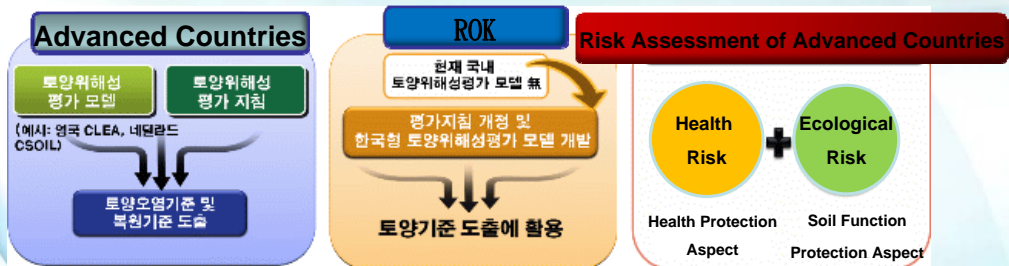
### Direction of Risk Assessment

#### Human Exposure Pathway Selection



## 2-1. Risk Assessment Policy

### Direction of Risk Assessment



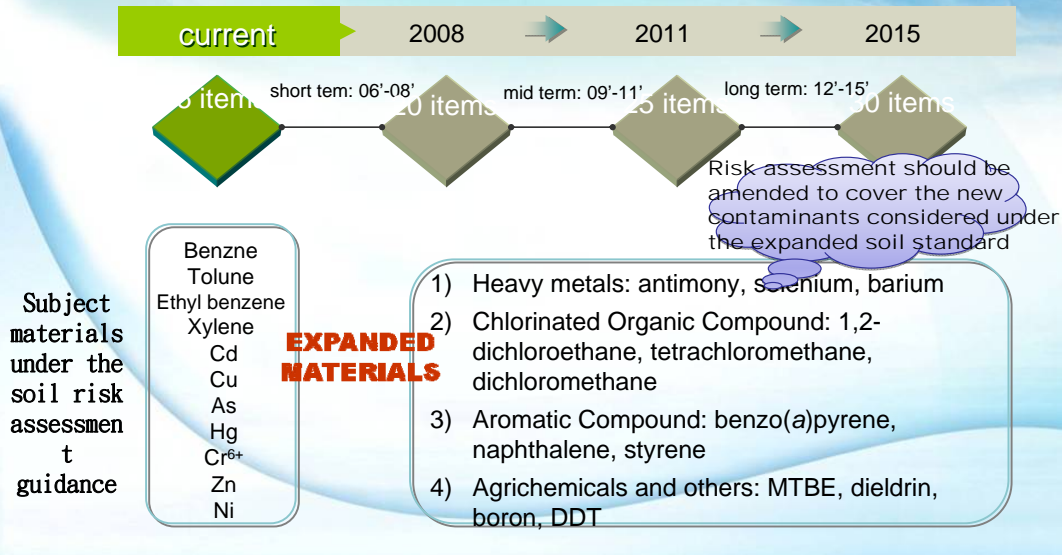


## 2-1. Risk Assessment Policy

### Direction of Risk Assessment

#### Materials Subjected to Assessment

<Research for Establishing Basic Soil Conservation Plan>



## 2-1. Risk Assessment Policy

### Direction of Risk Assessment

2010	<ul style="list-style-type: none"> <li>- Develop and reveal a Window-based Korean model of soil risk assessment</li> <li>- Assess the risk to human and research the exposure</li> </ul>
2011	<ul style="list-style-type: none"> <li>- Continue to expand the soil risk assessment model</li> <li>- Research the risk assessment of pollutant compounds</li> </ul>
2012	<ul style="list-style-type: none"> <li>- Continue to expand soil risk assessment model</li> <li>- Research ecological risk assessment and exposure</li> <li>- Research risk assessment to establish soil environment standard and remediation standard including new contaminants</li> </ul>
2013 -	<ul style="list-style-type: none"> <li>- Continue to expand soil risk assessment model</li> <li>- Research risk assessment for human and ecology</li> <li>- Research exposure assessment of soil contaminants from multiple media</li> <li>- Research property characteristics and risk assessment per each characteristics</li> </ul>



**Thank you !**







# **Rationale**

## **To establish a technical Working Group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG)**

**Mr. Hung-Teh TSAI**

Technical Superintendant and Executive Secretary  
Soil and Groundwater Remediation Fund Management Board (SGRFMB)  
Environmental Protection Administration of Taiwan  
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Email: [httsai@epa.gov.tw](mailto:httsai@epa.gov.tw)

### **1. Background**

2010 is the 10<sup>th</sup> anniversary of the Soil and Groundwater Pollution Remediation Act enforced in Taiwan. To celebrate the 10 years achievement and to continuously improve our technologies on investigation, remediation and management on soil and groundwater contaminated sites in Taiwan, Environmental Protection Administration of Taiwan (Taiwan EPA) organized an international Conference on the investigation, remediation and management of soil and groundwater contaminated sites at Taipei on October 27, 2010, and provided a platform for administrators, researchers, and environmental engineers from Asia and other countries for exchanging and promoting advanced concepts, technologies and products in this field.

More than 50 distinguished experts were invited from more than 20 countries to share their knowledge and experience in this conference. All honorable speakers focus on legislation, remediation technology and cases studies on the soil and groundwater contamination sites. They also delivered in-depth analyses, and share their experiences to enhance future scientific developments and secure the sustainable utilization of soil and groundwater resources.

### **2. Situations changed after the Remediation Act was announced**

Since the promulgation of the Soil and Groundwater Remediation Act developed in Taiwan in 2000, several other changes have been occurred in the last decade in Taiwan.



- The industry has learned that it has to pay the high price to cleanup the land they polluted if the Taiwan EPA discovered the contamination and ordered them to complete the remediation within a certain period of time.
- Many universities and environmental consultant companies in Taiwan are offering soil and groundwater study programs for Master's or Ph.D. degrees. Many universities also have established research centers for developing innovative remediation technologies.
- New investigation tools have been utilized in the laboratories and contaminated fields. Taiwan used the cable tool to install the groundwater monitoring wells. Now Taiwan can use the direct push or air hammer to install the groundwater monitoring wells in everywhere.
- In order to reduce the cost and time effectiveness of investigation and monitoring of pollutants in the soil and groundwater environments, Taiwan consultant companies have developed some innovative monitoring techniques in recent years, including MIP (membrane interface probe) to detect volatile contaminants, XRF (x-ray fluorescence) to detect heavy metals distribution, and field test kits to detect TPHs (total petroleum hydrocarbons) and explosive pollutants. Then according to the screening results, we only take the suspected portion of soil and groundwater samples for further confirmation to be conducted in the laboratory.

### **3. Achievements, milestones and future service for Asian countries**

Taiwan has created some achievements and many milestones to share to other countries in this field for last decade, especially for Asian countries. The goals of Taiwan EPA future work are to revitalize the usage of the contaminated land with green remediation strategies, protecting our resources by rigorously carrying out the regulations, provide training courses of advance technologies for our professionals, and share our experiences with other countries, especially for East and Southeastern Asian countries. Therefore, a special meeting program was also organized for East and South-Eastern Asian countries in the afternoon of October 27, 2011.

### **4. Special Meeting of East and South-Eastern Asian countries in October 27, 2011**

This specially meeting for East and South-Eastern Asian countries has been successful in bringing together for scientists and government officers in this region, including Japan, Korea, Philippines, Indonesia, Malaysia, Thailand and Taiwan, to realize and concur on the urgent need to establish a technical working group on Remediation for Soil and Groundwater Pollution of Asian Countries (**ReSGPAC WG**) in the closing remarks on October 27, 2011 at Taipei. The primary objectives of



this working group would be to provide a technical-based network for Asian countries that is capable of exchange and cooperate of remediation techniques in Asia and to serve the remediation techniques for the changing and challenging social demands and to function as a rational platform for decision and policy makers to make informed decisions for risk-based assessment of the contamination sites in the future.

## **5. Closing remarks of special meeting**

In the closing remarks of this special meeting program, all the participants of scientists and government officers from Asian countries agreed that Taiwan was approved as the Chairman, Japan is the Vice Chairman, and Korea is the Secretary General of this working group to serve in the first term (January 2011 to December 2012). Conference, training course or workshop as well as functions as a powerful and indispensable group for technology transfer can be organized in this region. Distinguished Professor Zueng-Sang Chen, serving at the Department of Agricultural Chemistry of National Taiwan University, has been appointed by Taiwan EPA as the chairman of the first term of this working group since January 2011.

## **6. Main objectives of the ReSGPAC WG**

The main objectives of the ReSGPAC WG are proposed as:

- To establish a risk-based approach and sustainable land management network at the Asian level;
- To share the database of pollution sites, recycling use of natural resources including the sediments,
- To serve the wider context of the changing and challenging social demands, and
- To function as a rational platform for decision and policy makers to make the remediation on sites of soil and groundwater pollution.

## **7. Some programs will be organized**

The chairman of ReSGPAC WG began to discuss with Taiwan EPA officers in early 2011 and to organize some programs for the first term of this working group, including:

- Business meeting of the ReSGPAC WG to be held on June 13, 2011 and June, 2012 .
- First workshop on health risk assessment to be held on June 14, 2011.
- Workshop on the remediation and risk-based assessment of sediments



contaminated sites to be held on June 15-16, 2011.

- **Workshop on the Management strategies and developing the regulation of pollutants to be held on November, 2011**
- **Workshop and training courses to be organized by the Scientific Committee and Service and Communication Committee of Working Group to be held in June or other time in 2012**
- **2012 International Conference on the investigation, remediation and management of soil and groundwater contaminated sites at Taipei to be held on October, 2012.**
- **Two field study tours on the oil and heavy metals contaminated sites in Taiwan to be held on June 17 and November in 2011 in Taiwan.**



# Rationale

## To establish a technical Working Group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG)

### Mr. Hung-Teh TSAI

Technical Superintendant and Executive Secretary  
Soil and Groundwater Remediation Fund Management Board (SGRFMB)  
Environmental Protection Administration of Taiwan

## Background-1

- 2010 is the 10th anniversary of the Soil and Groundwater Pollution Remediation Act enforced in Taiwan
- To celebrate the 10 years achievement and to continuously improve our technologies on investigation, remediation and management on soil and groundwater contaminated sites in Taiwan, Environmental Protection Administration of Taiwan (Taiwan EPA) organized an international Conference at Taipei on October 27, 2010



## Background-2

- More than 50 distinguished experts were invited from more than 20 countries to share their knowledge and experience in this conference
- All honorable speakers focus on legislation, remediation technology and cases studies on the soil and groundwater contamination sites
- They also delivered in-depth analyses, and share their experiences to enhance future scientific developments and secure the sustainable utilization of soil and groundwater resources

3

## Soil and Groundwater Remediation Act

- The industry has learned that it has to pay the high price to cleanup the land they polluted if the Taiwan EPA discovered the contamination and ordered them to complete the remediation within a certain period of time

4



## Situations changed after the Remediation Act was announced

- Many universities and environmental consultant companies in Taiwan are offering soil and groundwater study programs for Master's or Ph.D. degrees.
- Many universities also have established research centers for developing innovative remediation technologies
- New investigation tools have been utilized in the laboratories and contaminated fields.
- Taiwan used the cable tool to install the groundwater monitoring wells. Now Taiwan can use the direct push or air hammer to install the groundwater monitoring wells in everywhere

5

## Innovative monitoring techniques

- To reduce the cost and time effectiveness of investigation and monitoring of pollutants in the soil and groundwater environments, Taiwan consultant companies have developed some innovative monitoring techniques in recent years
- MIP (membrane interface probe) to detect volatile contaminants, XRF (x-ray fluorescence) to detect heavy metals distribution, and field test kits to detect TPHs (total petroleum hydrocarbons) and explosive pollutants.
- We only take the suspected portion of soil and groundwater samples for further confirmation to be conducted in the laboratory

6



## **Achievements, milestones and future Service for Asian countries**

- Taiwan has created some achievements and many milestones to share to other countries in this field for last decade, especially for Asian countries
- To revitalize the usage of the contaminated land with green remediation strategies, protecting our resources by rigorously carrying out the regulations,
- To provide training courses of advance technologies for our professionals, and share our experiences with other countries, especially for East and Southeastern Asian countries

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## **Special Meeting of Asian countries in October 27, 2011**

- A special meeting program was also organized for East and South-Eastern Asian countries in the afternoon of October 27, 2011
- Japan, Korea, Philippines, Indonesia, Malaysia, Thailand and Taiwan, were included to realize and concur on the urgent need to establish a technical working group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG) in the closing remarks on October 27, 2011 at Taipei

8





## Proposed objectives of working group

- To provide a technical-based network for Asian countries that is capable of exchange and cooperate of remediation techniques in Asia,
- To serve the remediation techniques for the changing and challenging social demands,
- To function as a rational platform for decision and policy makers to make informed decisions for risk-based assessment of the contamination sites in the future.

9

## Closing remarks of special meeting

- All the participants of scientists and government officers from Asian countries agreed that:
  - Taiwan was approved as the Chairman
  - Japan is the Vice Chairman, and
  - Korea is the Secretary General
  - First term (January 2011 to December 2012)

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## Functions of Working Group

- Conference, training course or workshop as well as functions as a powerful and indispensable group for technology transfer can be organized in this region.
- Professor Zueng-Sang Chen has been appointed by Taiwan EPA as the chairman of the first term of this working group since January 2011

11

## Main objectives of the ReSGPAC WG

- To establish a risk-based approach and sustainable land management network at the Asian level;
- To share the database of pollution sites, recycling use of natural resources including the sediments,
- To serve the wider context of the changing and challenging social demands, and
- To function as a rational platform for decision and policy makers to make the remediation on sites of soil and groundwater pollution

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## **Some programs will be organized -1**

- **Business meeting of the ReSGPAC WG to be held on June 13, 2011 and June, 2012**
- **First workshop on health risk assessment to be held on June 14, 2011**
- **Workshop on the remediation and risk-based assessment of sediments contaminated sites to be held on June 15-16, 2011**
- **Workshop on the Management strategies and developing the regulation of pollutants to be held on November, 2011.**

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## **Some programs will be organized -2**

- **Workshop and training courses to be organized by the Scientific Committee and Service and Communication Committee of Working Group to be held in June or other time in 2012**
- **2012 International Conference on the investigation, remediation and management of soil and groundwater contaminated sites at Taipei to be held on October, 2012**
- **Two field study tours on the oil and heavy metals contaminated sites in Taiwan to be held on June 17 and November in 2011 in Taiwan**

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# General Rules for The Working Group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG)

(Enacted at the First Official Business Meeting on June 13, 2011, at Taipei, Taiwan)

Printed on June 07, 2011

**Proposed by Prof. Dr. Zueng-Sang CHEN**  
**Chairman of Working Group**

Distinguished Professor and Associate Dean

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E-mail: [soilchen@ntu.edu.tw](mailto:soilchen@ntu.edu.tw); <http://Lab.ac.ntu.edu.tw/soilsc>

## 1. Name

The name of the working group should be the Working Group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG), herein referred to as the “Working Group”. The ReSGPAC WG is the official acronym of the working group.

## 2. Objectives

The Working Group shall aim on promoting the research activities and management technologies to developing the innovative remediation techniques on soil and groundwater-contaminated sites and also on disseminating the knowledge and technologies for the benefit of the member of the working group in the region of East and Southeast Asian countries.

The Working Group shall contribute for the sustainable development of the region through harmonization of healthy and safety agricultural production and environmental protection. The Working Group shall also aim at promoting the effective participation of members and of individual scientists from this region.

## 3. Membership

Regular members shall consist of any scientists and governmental officer concerned with soil science and groundwater management and remediation technologies in any countries of The Working Group. The country members are 9 including India, Indonesia, Japan, Korea, Malaysia, Philippines, Taiwan, Thailand, and Vietnam.

The country members within the region shall be regarded as the core



members and those which are located inside of the region but interested on the activities of the Working Group shall be regarded as the associate members.

#### **4. Officers**

The Officers of the Working Group shall be: (1) one Chairman, (2) one Vice Chairman, (3) one Secretary General, (4) Past chairman and (5) one representative steering committee members from each country member. The service time of each term is two years starting from January 2011. Each of the country members shall designate a representative person as a member of steering committee to attend the official business meeting during the service term.

The Office of the Working Group shall be moved from one member country to another every two years and the chairman of the Working Group which holds the Office shall be automatically appointed as the Past chairman of the WG. The President of the Working Group which will hold the Office for the next term shall be appointed as the Vice-President of the WG.

#### **5. Structure**

The Working Group shall include three committees including (1) steering committee, (2) scientific committee, and (3) service and communication committee.

The members of the steering committee shall consist of **only one** representative governmental officer nominated from Environmental Protection Agency of each country to approve all the activities and programs of the working group.

The members of the scientific committee shall consist of **3 to 5** scientists or governmental officers in each member countries to organize some scientific workshops, training courses or conferences to promote the technology transfer and experience exchange on management and remediation technologies for member countries.

The members of the service and communication committee shall consist of **3 to 5** scientists or governmental officers in each member countries to organize some workshops, forum and seminars to promote the new concepts, education and communication on risk-based assessment for the soil and groundwater contaminated sites in the member countries.



## **6. Function of Steering Committee**

- To approve the annual project plans of the working group
- To review the performance and the conformity of annual project plans of the working group
- To promote country members to join the activities of working group in order to achieve the proposed goals
- To distribute the annual report and activities information to all the country members
- To help the working group to raise the funding and reimbursement plans for the activities
- To control the annual budget of the working group
- To approve the activities proposed by the Science Committee and the Service & Communication Committee of the working group.

## **7. Function of Scientific Committee**

- To promote to establish the database and to share the experience on site investigation, risk assessment, and remediation techniques of the soil and groundwater contamination sites of the country members.
- To share the innovative, scientific and cost-effective techniques for site investigation and remediation of the contaminated sites by organizing the international workshops, symposium, training courses, or field study in this region.
- To help the country members to apply and validate the innovative techniques for site investigation and remediation techniques which were transferred from other countries
- To promote the country members to communicate with international research centers, Universities, or Environmental consultant companies for technology transfer on remediation techniques.

## **8. Function of Service and Communication Committee**

- To organize the education and training projects to promote the professional skills and knowledge of the government officers or general people,
- To share the experience from the reports, books and proceedings published by the country members.
- To develop some integrated training courses with universities or environmental consultant companies for country members.



- To promote the ideas, concepts and regulation for protecting the resources of soil and groundwater and to cleanup the contamination sites by organizing forum and workshops
- To coordinate the forum on communication education for governmental officers, financial sponsors, and the public communities for the country members.
- To promote the communication with the media reporters for communities to understand the risk-based assessment and final decision of remediation techniques.

## **9. Activities**

A website shall be established by the Office of the Working Group as a medium to exchange the information on the news and activities among the country member. Workshop, training courses, forum, seminar or conference shall be sponsored or co-sponsored by the WG as frequently as possible. Country member shall be encouraged to organize related activities under the umbrella of the Working Group.

## **10. Official Business Meeting**

One representative member of the steering committee from each country member shall meet at the time of conferences, training courses or workshops, which shall be held occasion depend on the budget, to discuss the official business meeting related to the structure, function, activities and finance of the Working Group

## **11. Finance**

The chairman of the Working Group which holds the Office of the working group shall collect the financial budget for all the activities of the WG. The Officers shall make their best effort to raise funds for such activities as symposia and workshops in this region.





# Discussions on General Rules

## for The Working Group on Remediation for Soil and Groundwater Pollution of Asian Countries (ReSGPAC WG)

Prof. Dr. Zueng-Sang CHEN  
Chairman of Working Group  
Distinguished Professor and Associate Dean  
Department of Agricultural Chemistry

1

## Name

- ✚ The name of the working group should **(shall)** be the **Working Group (?)** on Remediation for Soil and Groundwater Pollution of **Asian (?)** Countries (ReSGPAC WG), herein referred to as the "Working Group"
- ✚ The ReSGPAC WG is the official acronym of the working group

2



## Objectives of WG

- ✚ The Working Group shall aim on promoting the **research activities, policy development, and management strategies** to develop the innovative remediation techniques on soil and groundwater-contaminated sites and also
- ✚ On **disseminating** the knowledge and technologies for the benefit of the members of the working group in the region of Asian countries

3

## Objectives (cont.)

- ✚ The Working Group shall contribute for the sustainable development of the region through enhancing and integrating human health, environmental and natural resources management, and safe agricultural production
- ✚ The Working Group shall also aim at promoting the effective participation of members and of individual scientists from this region

4



## Memberships

- ✦ Regular members shall consist of any **scientists and governmental officers** concerned with soil science and groundwater management and remediation technologies in any countries of The Working Group
- ✦ The **country members are** 9 including India, Indonesia, Japan, Korea, Malaysia, Philippines, Taiwan, Thailand, and Vietnam

5

## Memberships (cont.)

- ✦ The country members within the region shall be regarded as the **core members**, and
- ✦ Those which are located in Asian countries but interested on the activities of the Working Group shall apply as the **associate members** and can be approved by the steering committee

6



## Officers

- ✚ The Officers of the Working Group shall be: (1) one Chairman, (2) one Vice Chairman, (3) One coordinator of each committee (4) Past chairman and (5) one representative steering committee members from each country member
- ✚ The service time of **each term is two years (?)** starting from January 2011.
- ✚ Each of the country members shall designate a representative person as a member of steering committee to attend the official business meeting during the service term

7

## Officers (cont.)

- ✚ The Office of the Working Group shall be rotated from one member country to another every two years and the chairman of the Working Group which holds the Office shall be automatically appointed as the Past chairman of the WG
- ✚ The **Chairman** of the Working Group which will hold the Office for the next term shall be appointed as the **Vice-chairman** of the WG

8



## Structure of WG

- ✦ The Working Group shall include three committees including:
  - ✦ (1) steering committee,
  - ✦ (2) scientific committee, and
  - ✦ (3) service and communication committee

9

## Steering committee

- ✦ The members of the steering committee shall consist of **only one** government official nominated by the government of each country
- ✦ The governmental official can appoint his or her alternative person to attend the business meeting
- ✦ to approve all the activities and programs of the working group

10



## Scientific committee

- ✚ The members of the scientific committee shall consist of ***no more than 5 scientists or governmental officers*** in each member country
- ✚ to organize some scientific workshops, training courses or conferences to promote the technology transfer and experience exchange on management and remediation technologies for member countries

11

## Service and communication committee

- ✚ The members of the service and communication committee shall consist of ***no more than 5 scientists or governmental officers*** in each member country
- ✚ to organize some workshops, forum and seminars to promote the new concepts, education, service, outreach, and communication on risk-based assessment for the soil and groundwater contaminated sites in the member countries

12



## Function of **Steering Committee**

- ✚ To approve the annual project plans of the working group
- ✚ To review the performance and the conformity of annual project plans of the working group
- ✚ To promote country members to join the activities of working group in order to achieve the proposed goals
- ✚ To distribute the annual report and activities information to all the country members

13

## Function of **Steering Committee**

(cont.)

- ✚ To help the working group to raise the funding and reimbursement plans for the activities
- ✚ To review the annual budget of the working group
- ✚ To approve the activities proposed by the Science Committee and the Service & Communication Committee of the working group

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## Function of **Scientific Committee**

- ✚ To promote **the establishment of the database** and to share the experience on site investigation, risk assessment, and remediation techniques of the soil and groundwater contamination sites of the country members
- ✚ To share the innovative, scientific and cost-effective techniques for site investigation and remediation of the contaminated sites by organizing the international workshops, symposium, training courses, or field study in this region

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## Function of **Scientific Committee** (cont.)

- ✚ To help the country members to apply and validate the innovative techniques for site investigation and remediation techniques which were transferred from other countries,
- ✚ To promote the country members to communicate with international research centers, universities, or environmental consultant companies for sharing good practices, technologies, and policies on investigation and remediation

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## Function of Service and Communication Committee

- ✿ To organize the education and training projects to promote the professional skills and knowledge of the government officers or general people
- ✿ To share the experience from the reports, books and proceedings published by the country members
- ✿ To develop some integrated training courses with universities or environmental consultant companies for country members

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## Function of Service and Communication Committee (cont.)

- ✿ To promote the ideas, concepts and regulation for protecting the resources of soil and groundwater and for promoting the effective countermeasures for the contamination sites by organizing forum and workshops
- ✿ To coordinate the forum on communication education for governmental officers, financial sponsors, and the public communities for the country members
- ✿ To promote the communication with the media reporters for communities to understand the risk-based assessment and final decision of remediation techniques

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## Activities

- ✚ A **website** shall be established by the Office of the Working Group as a medium to exchange the information on the news and activities among the country member
- ✚ **Workshop, training courses, forum, seminar or conference** shall be sponsored or co-sponsored by the WG as frequently as possible
- ✚ Country member shall be encouraged to organize related activities under the umbrella of the Working Group

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## Contents of Website

- ✚ Rational,
- ✚ Working Group (Structure, function and Rules)
- ✚ Steering Committee Member
- ✚ Scientific Committee Member
- ✚ Service and Communication Member
- ✚ Contact person
- ✚ Newsletter (one issue per half year)
- ✚ Term Program (2011-2012)
- ✚ Pollution status of the Asian countries

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## Contents of Website *(continued)*

- ✚ Act on Soil and GW Pollution of the Asian countries
- ✚ Gov. Structure for Soil and GW Pollution Management
- ✚ Remediation **Case Studies** of the Asian countries
- ✚ Service Consultant **Companies** of the Asian countries
- ✚ Service Consultant **persons** of the Asian countries
- ✚ **Proceedings** of Workshop, Seminar and training courses
- ✚ **Information** of coming conference, workshop, training courses to be held in Asia or world

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## Official Business Meeting

- ✚ **One representative member** of the steering committee from each country member shall meet at the time of conferences, training courses or workshops, which shall be held occasionally depend on the budget,
- ✚ **To approve the next term chairman or next two terms chairman nominated from country members**
- ✚ to discuss the official business meeting related to the structure, function, activities and finance of the Working Group

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## Finance

- ✦ The **chairman** of the Working Group shall mobilize possible resources to support the budget for all the activities of the Working Group,
- ✦ The Officers shall **make their best effort to raise funds** for such activities as symposia and workshops in this region

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## Need to reconfirm the name lists

- ✦ Chairman of the next two terms (2013-2014 and 2015-2016)
- ✦ Steering committee member (1 for each country)
- ✦ Scientific committee member (up to 5 for each)
- ✦ Service and Communication committee member (up to 5 for each)
- ✦ Contact person (2, fixed for each) for communication to working group and website information
- ✦ Submitted to the chairman **before July 31, 2011**

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## Officers of first term (2011-2012)

- ✚ **Chairman of Working Group, Taiwan**
- ✚ **Prof. Dr. Zueng-Sang CHEN**
  - ✚ Distinguished Professor and Associate Dean
  - ✚ Department of Agricultural Chemistry, National Taiwan University,
- ✚ **Vice-chairman of Working Group, Japan**
- ✚ **Mr. Masanori KOBAYASHI recommended by the Working Group**
  - ✚ Senior Coordinator/ Principal Researcher
  - ✚ Programme Management Office
  - ✚ Institute for Global Environmental Strategies (IGES)

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## Chairman of the next term

- ✚ **Chairman of the next term (2013-2014)**  
**Taiwan EPA**
- ✚ **Chairman of the next term (2015-2016)**  
**Japan to be confirmed**

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## Steering committee member (2011-2012)

- ✦ Submitted to the chairman **before July 31, 2011**

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## Deadline to submitted

- ✦ Scientific committee member (up to 5)
- ✦ Service and Communication committee member (up to 5)
- ✦ Contact person (2, fixed) for communication to working group and website information
- ✦ Submitted to the chairman **before July 31, 2011**

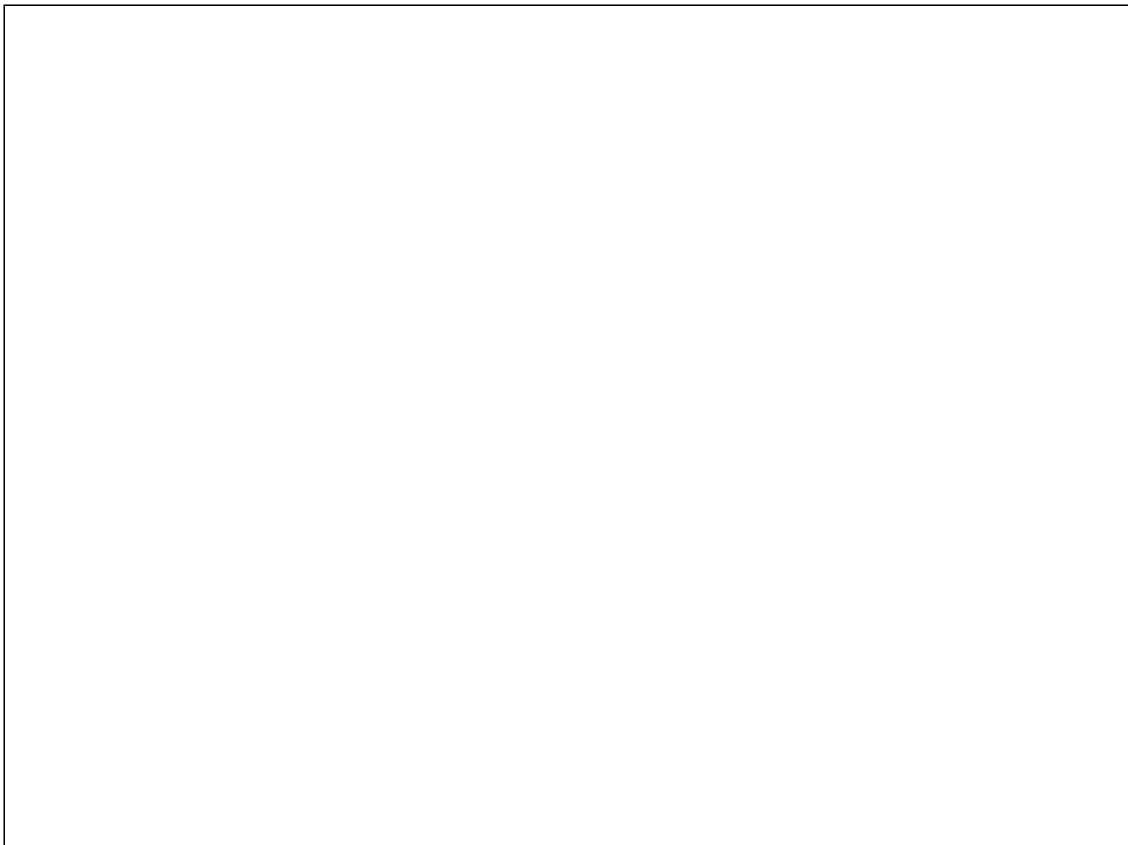
28



## Others to be discussed

29

## Thanks.







## Meeting Location

R401 & R405, EPA building

No.83, Zhonghua Rd. Sec. 1, Zhongzheng District, Taipei, Taiwan .

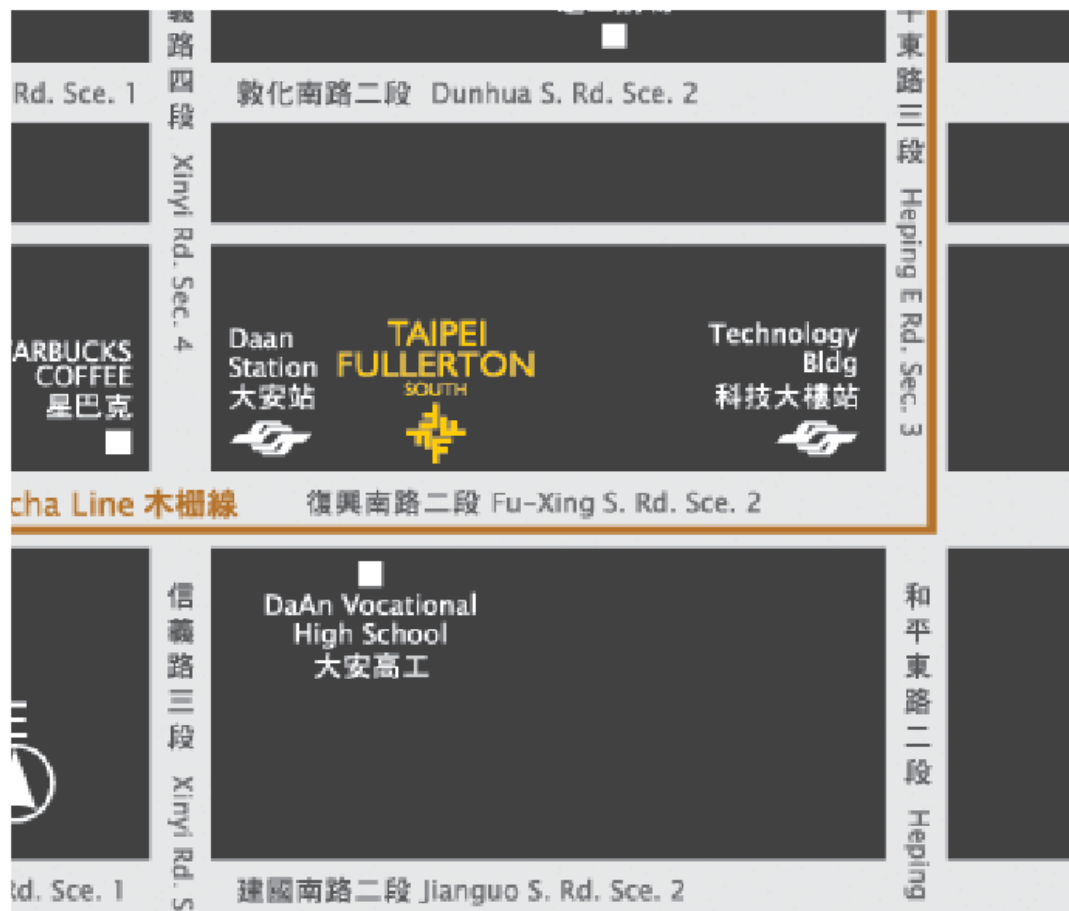




## Accommodation

### Taipei Fullerton-South

No.41, Sec. 2, Fusing S. Rd., Da-an District, Taipei, Taiwan





# Discover Taiwan

## Location

Taiwan's total land area is only about 36,000 square kilometers (14,400 square miles). It is shaped like a leaf that is narrow at both ends. It lies off the southeastern coast of mainland Asia, across the Taiwan Strait from China-- an island on the western edge of the Pacific Ocean. To the north lies Japan; to the south is the Philippines. Many airlines fly to Taiwan, helping make it the perfect travel destination.  
(Reprint with permission)

Taiwan lies on the western edge of the Pacific "rim of fire," and continuous tectonic



movements have created majestic peaks, rolling hills and plains, basins, coastlines, and other natural wonders. Taiwan's tropical, sub-tropical, and temperate climates provide clear differentiation between the different seasons. There are about 18,400 species of wildlife on the island, with more than 20% being to rare or endangered species. Among these are the land-locked salmon, Taiwan mountain goat, Formosan rock monkey, Formosan black bear, blue magpie, Mikado pheasant, Xueshan grass lizard, and many more.

The government has established 8 national parks and 13 national scenic areas to preserve Taiwan's best natural ecological environment and cultural sites. Take a hike in the splendor and sheer heights of the cliffs at Taroko Gorge; take a ride on the Ali Mountain (Alishan) Forest Railway and experience the breathtaking sunrise and sea of clouds; hike up to the summit of Northeast Asia's highest peak, Yu Mountain (Yushan) .

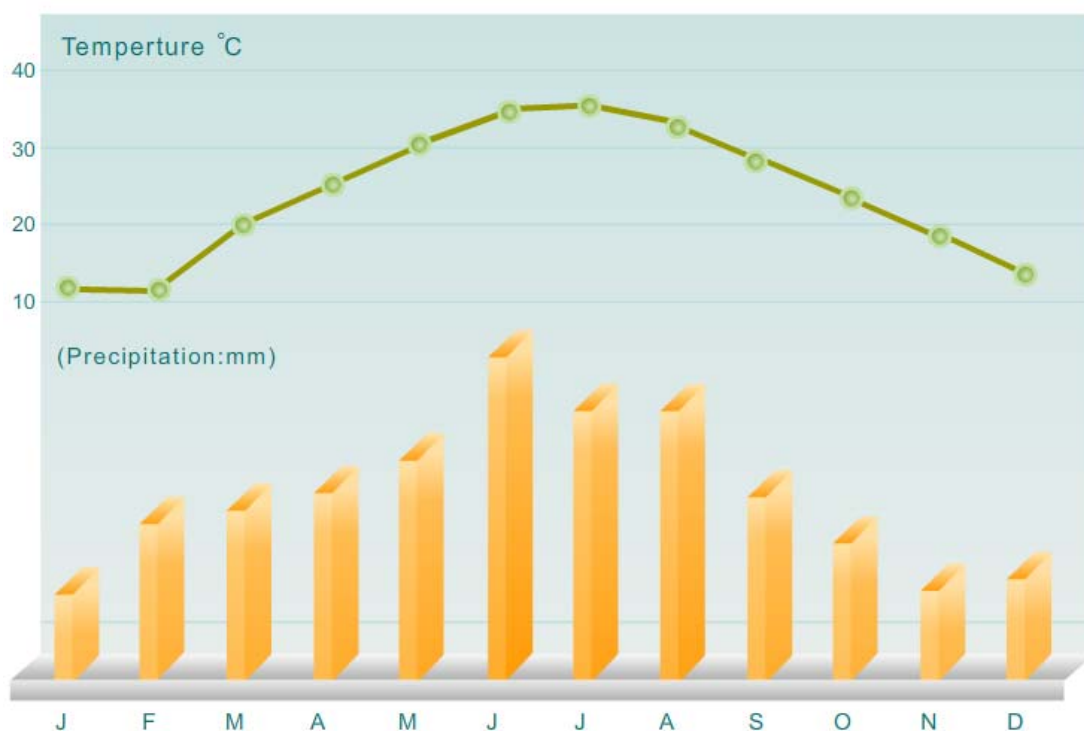


You can also soak up the sun in Kending (Kenting) , Asia's version of Hawaii; stand at the edge of Sun Moon Lake; traipse through the East Rift Valley; or visit the offshore islands of Kinmen and Penghu. It's fun in capital letters as well as an awesome journey of natural discovery!

## Climate

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If you are from a low-latitude country, you will certainly revel in the nice warmth of Taiwan's sun. Because of the coolness that hangs in the air, it is a welcoming change from the simmering heat of your native country. You can do some hiking in the mountains, immersing yourself into the beautiful trees of the forest while inhaling some of that pure and fresh air that blows on the island of Taiwan.



Taiwan enjoys warm weather all year round. The strongest fluctuations in weather conditions are during springs and winters, while during summers and autumns the weather is relatively stable. Taiwan is extremely suitable for traveling, as the annual average temperature is a comfortable 22 degrees Celsius with the lowest temperatures ranging from 12 to 17 degrees Celsius (54-63 Fahrenheit). Therefore, with the exception of a few mountain areas where some traces of snow can be found during winters, no snow can be seen throughout Taiwan. When summers are about to dismiss springs (March to May), continuously drizzling rain will sometimes fall on Taiwan. When visiting Taiwan during this period, remember to carry an umbrella at all time; because although it might seem romantic to have a stroll in the rain, it is no fun to travel when you're soaking wet. During the summer (June to August) typhoons sometimes approach or land the country.



## Nature

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Formosa (beautiful island)

Formosa is what the Portuguese called Taiwan when they came here in the 16th century and saw the island's verdant beauty.

Located along the southeast coast of the Asian Continent at the western edge of the Pacific Ocean, between Japan and the Philippines and right in the center of the East-Asian island arc, Taiwan forms a vital

line of communication in the Asia-Pacific region. It covers an area of approximately 36,000 square kilometers (14,400 square miles) and is longer than it is wide. Two-thirds of the total area is covered by forested mountains and the remaining area consists of hilly country, platforms and highlands, coastal plains and basins. The Central Mountain Range stretches along the entire country from north to south, thus forming a natural line of demarcation for rivers on the eastern and western sides of the island. On the west side lies the Yu Mountain (Yushan) Range with its main peak reaching 3,952 meters, the highest mountain peak in Northeast Asia.



## Tour of Taipei City

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### National Palace Museum



abundance and artistic value world widely, the collection at the National Palace Museum is one of the main attractions to a considerable number of visitors everyday.

The National Palace Museum houses the world's largest collection of priceless Chinese art treasures, one which spans China's nearly 5,000-year history. Most of the museum's 620,000 art objects were part of the Chinese imperial collection, which began over 1,000 years ago in the early Song dynasty.



### Taipei 101

Taipei 101 is the 2<sup>nd</sup> tallest building in the world now, with a mass of shops on the lower floors, incorporating many top brands under the LVMH group, such as Louis Vuitton, Dior, Celine, etc. The fourth floor houses the Page One bookstore from Singapore, with the highest-roofed coffee house in Taipei and many fine restaurants.



### Chiang Kai-shek Memorial Hall

Chiang Kai-shek Memorial Hall is located in the heart of Taipei City. The area is 250,000 square meters and it is the attraction most visited by foreign tourists. Outside the gate of Chiang Kai-shek Memorial Hall, there are poles carrying the sign of true rightness. The architecture of Chiang Kai-shek Memorial Hall is inspired by Tianan in Beijing. The four sides of the structure are similar to those of the pyramids in Egypt. The material is white marble. The roofs are decorated with deep-blue glass as part of the reflection of blue sky and bright sun. It adds a touch of grandeur. The garden is planted with red flowers. As a whole, the colors of blue, white and red express the National Flag and the spirit of freedom, equality and brotherhood.



The great building has become a landmark of Taipei City. There are also places for international art performances. They are National Theater and National Concert Hall. World famous musicians (such as the great cello performer Yo Yo Ma and the great violinist Shao Lian Lin) and renowned playgroups have conducted performance here. The garden with beautiful flowers, miniature hills and plants, ponds, ornamental bridge and waterfalls as well as green grass presents scenery beauty. The walls surrounding the area are with nostalgic design. The place is enriched with the beauty of traditional Chinese gardens. There are various activities taking place in the square. There are the concert of the world renowned three tenors, school band performances, cheerleader performances and fairs. One can pay respect to the historical great leader, as well as participate in the relaxation activities of local residents. The place provides a precious plain view among the tall buildings of Taipei.



## Longshan (lungshan) Temple



Longshan (lungshan) Temple is a famous old temple in Taiwan. It is for worshiping Guanshiyin Buddha and other divine spirits. Longshan (lungshan) Temple is facing the South. Its architecture is a three-section design in shape. There are the front hall, the rear hall and the right/left dragons protecting the middle hall. The layout is square and serene. The temple was built in Qianlong 5th year in Qing Dynasty. Due to natural disaster and damages caused by men, the temple was restored for several times. The doors, beams, and poles are beautifully decorated. There is a pair of bronze dragon poles in the front hall, four pairs of dragon poles in the middle hall. The sculptures are delicate. There are also exquisite wood sculptures. Among them, the well and Buddha setting in the main hall are highly appreciated. The temple has many Chinese poems, verses and lyrics on signs. These add a touch of literature in addition to the religious and sightseeing value.

## Shilin Night Market



Shilin Night Market is the one of the largest night markets in Taipei. The market is centered on Yangming Theater and Cicheng Temple. The night market is formed by many prosperous shops on Wenlin Road, Dadong Road and Danan Road, etc. Among them, Shilin Market was built as early as in 1899 and the market is famous for various snacks and eatery. Many visitors have come to Shilin Night Market to enjoy the delicious foods, such as large pancake, hot pot on stone or Shilin sausage. Shilin Night Market has become a renowned place for great foods.

Because the night market is close to many schools, students are the main customer group. Goods are sold at less expensive prices as compared to regular stores. There are special areas for furniture, clothing, photo shops or pet shops. The finery shops and cold dessert shops in "lover's lane" attract most student customers.

Shilin Night Market covers a large area. When one walks in the turning lanes and alleys, he (she) would often find something unexpected. The night market is packed with many people during holidays. We can often see families carrying many things from shopping and enjoying good meals. Their satisfaction is fully shown from their happy expressions.



## Gourmet Guide

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Chinese cuisines go back to the ancient times and achieved its present level through the accumulation of thousands of years of practical knowledge of and experience in cookery. Emphasis is placed on the perfect combination of color, aroma, flavor and shape, through which the most common ingredients are transformed into culinary tours de force. Chinese cuisines have therefore become well-known around the world and



continue to attract gastronomes alike. In Taiwan, cooking techniques from all areas of China have fused, and the Taiwanese do not only master the traditional local Chinese specialties, but also continuously use traditional techniques to develop new culinary treats. It is therefore that each year Taiwan attracts many tourists who come to savor these Chinese specialties, ranging from small steamed buns to water-boiled dumplings.

Traditional Chinese food to be found in Taiwan, next to Taiwanese and Hakka-style dishes, mainly includes dishes from Fujian, Guangdong, Jiangxi, Shanghai, Hunan, Sichuan and Beijing.

Following we'll give an introduction to the characteristics and different cooking styles of dishes from each region:

1. Taiwan :  
Natural original flavors are preserved and there is a focus on light-seasoned, fresh and simply flavored dishes, influenced by the Dutch and Japanese, raw and slightly water-scalded food is widely accepted.
2. Fujian :  
Dominated by seafood, preferably steamed, mainly light-seasoned, sweet, and sour flavorings.
3. Guangdong :  
Great variety of ingredients, focus on light-seasoned, fresh, smooth, sweet, tasty and tender dishes, main methods of food preparation consist of frying, baking, stir-frying, steaming, and boiling.
4. Jiangxi :  
Focus on original flavors, main methods of food preparation consist of stewing, braising, steaming, stir-frying, and cooking, for all of which temperature control is the most important aspect, flavors are light but do not lack taste, bones are removed while keeping shapes intact, although smooth and tender dishes have kept their taste.
5. Shanghai :  
Dishes breathing international fame originate here, local flavors are adhered to and dishes are mostly oily, drowning in sauce and brightly colored.





6. Hunan :

Sour, hot, and rich flavors are the secrets behind the popular dishes from this area, a well-known specialty is the smoked bacon, and dishes from Hunan and Sichuan show some similarities as many are spicy because of the use of large amounts of red pepper.

7. Sichuan :

Famous for its spicy-flavored dishes as preferably dried and fresh red pepper is used during preparation, fish and other seafood is favored, extremely popular among those who favor strongly-flavored food.

8. Beijing :

A combination of flavors from all corners, magnificently and delicately prepared, dishes combine color, shape, flavor, and nutrition, and are mostly light and tender.

9. Hakka :

Dried and preserved materials form important ingredients of the Hakka kitchen; dishes are mostly strongly flavored (burnt, flavored, well-done, salty, fat)



*Pearl Milk Tea*



*Oyster Omelet*



*Stinky Tofu*



*Steamed Dumpling*



*Steamed Sandwich*



*Taiwanese Meatballs*



*Meat Rice Tamales*



*Crushed Ice Dessert*







ROC (Taiwan)  
Environmental Protection  
Administration



United States  
Environmental Protection  
Agency



Taiwan Association of  
Soil and Groundwater  
Environmental Protection

Working Group of  
East and Southeastern Asian Countries on  
Soil and Groundwater  
Pollution and Remediation