

TPM11 - Session 4

PRA7. Solid Waste Management
- The Co-operative Research of
Tripartite on Safety Recycling of
Solid Waste





The 11th Tripartite Presidents Meeting(TPM)
Kawasaki, Japan, Nov. 11~15, 2014

The Co-operative Research of Tripartite on Safety Recycling of Solid Waste

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1

1. **Background and Overview**
2. Current Status of Cooperative Project
3. Future Our Challenge

1-1. New Treat : Climate Change

Lacking Resources

Exhaustion of Natural Resources



Natural resources to their limits
(Petroleum: 40Y, Natural gas 58Y, Copper 28Y)

World Resource Institute

Frequent Drought

Water shortage Problem

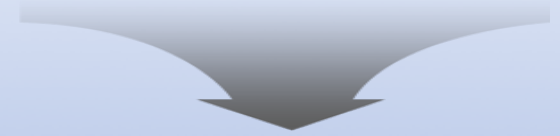


Expected 30% reduction of fresh water supply per capita in 25 years
• Shortage of agricultural water

UN, Water Development Report

Rising Temperature

Continuous Emission of Green House Gas



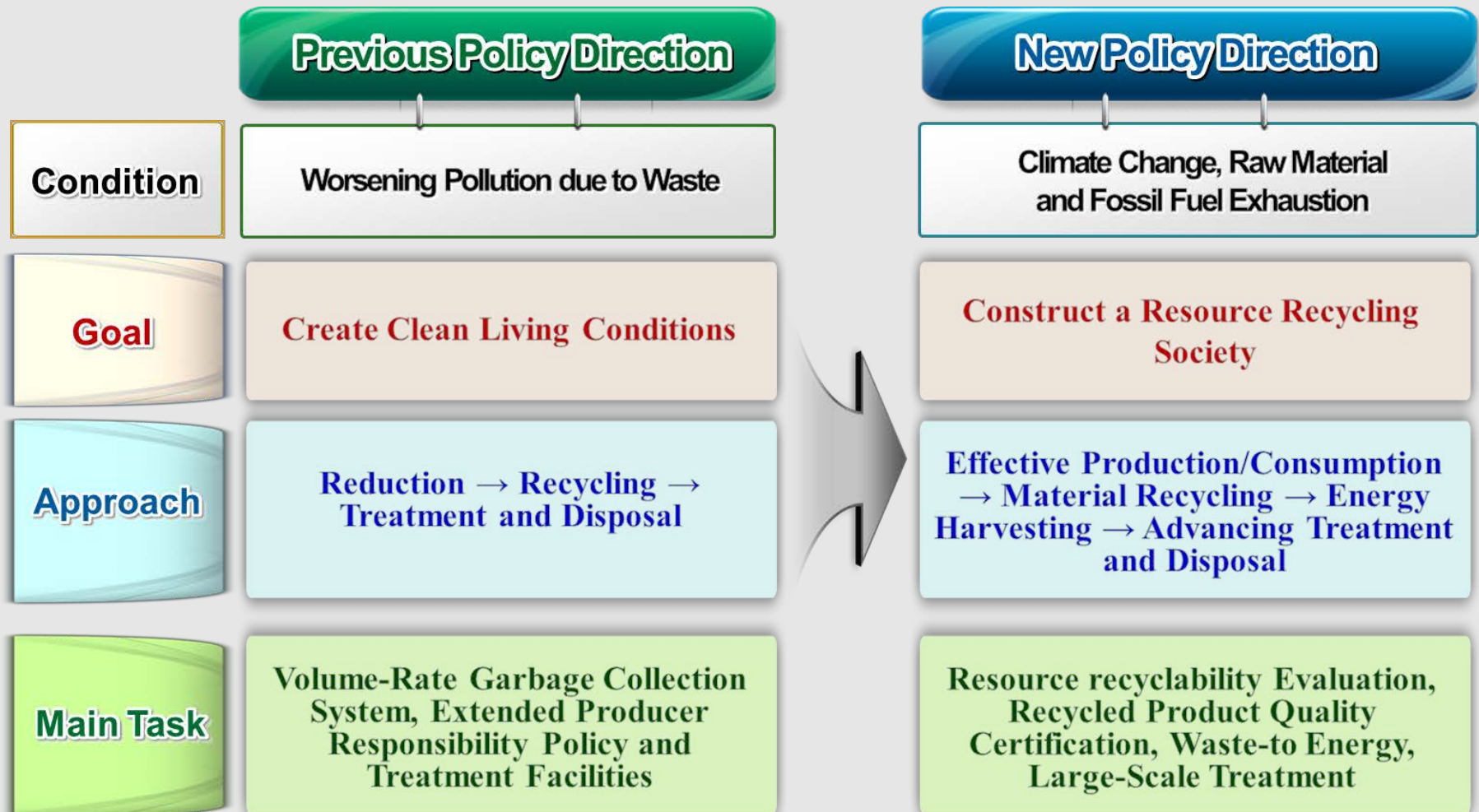
Reduction rate of World's GDP 5~20% per year under the current GHG emission industry structure (Possible threat to the 2nd Great Depression)

Stern Review(G.B. Gov.)

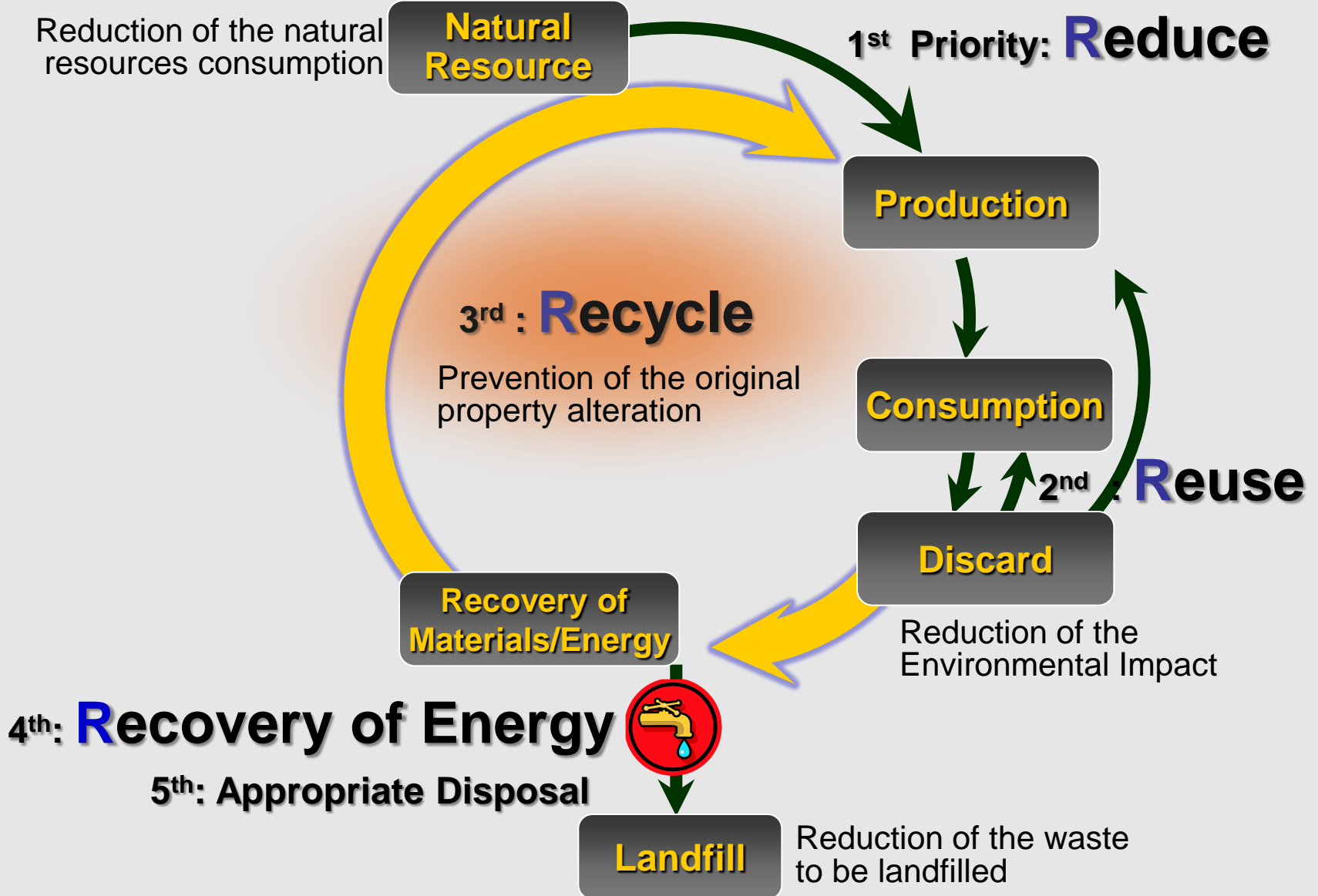


1-2. New Waste Policy Direction

● From 'Waste Management' to 'Promotion of Resource Recycling'



1-3. Promotion of 3R→4R Initiative by Government



1-4. Recycling and Environmental Safety

Promotion of recycling

- **Reduce** the Consumption of Natural Resources and Landfill Capacity
- **Control** of nature disruption by natural resources collection

Recycling

Restriction of recycling

- Should be satisfied with Environmental Standards
- They might not have adverse impact in environment

Human and Environmental safety

Balance Is Necessary and Important !

2

1. Background and Overview
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2-1. History of Cooperative Projects

2009

- The 6th TPM in Seoul
 - Agreement for performing the cooperative project on **Risk management of Recycling product**
 - NIER(Lee Dong Jin), CRAES(Huang Ze Chun), NIES(Sakanakura Hirofumi)

2010

- 8.30~9.02 : NIER visited NIES to share the information on cooperative research and planed the project
- 9.12~9.17 : 7th TPM in China

2011~13

- 9 Times meeting between NIER and NIES (3 times/year)
 - Discussion of Risk Assessment on Recycling Waste & New project
- NIER and NIES performed the project between two institutes

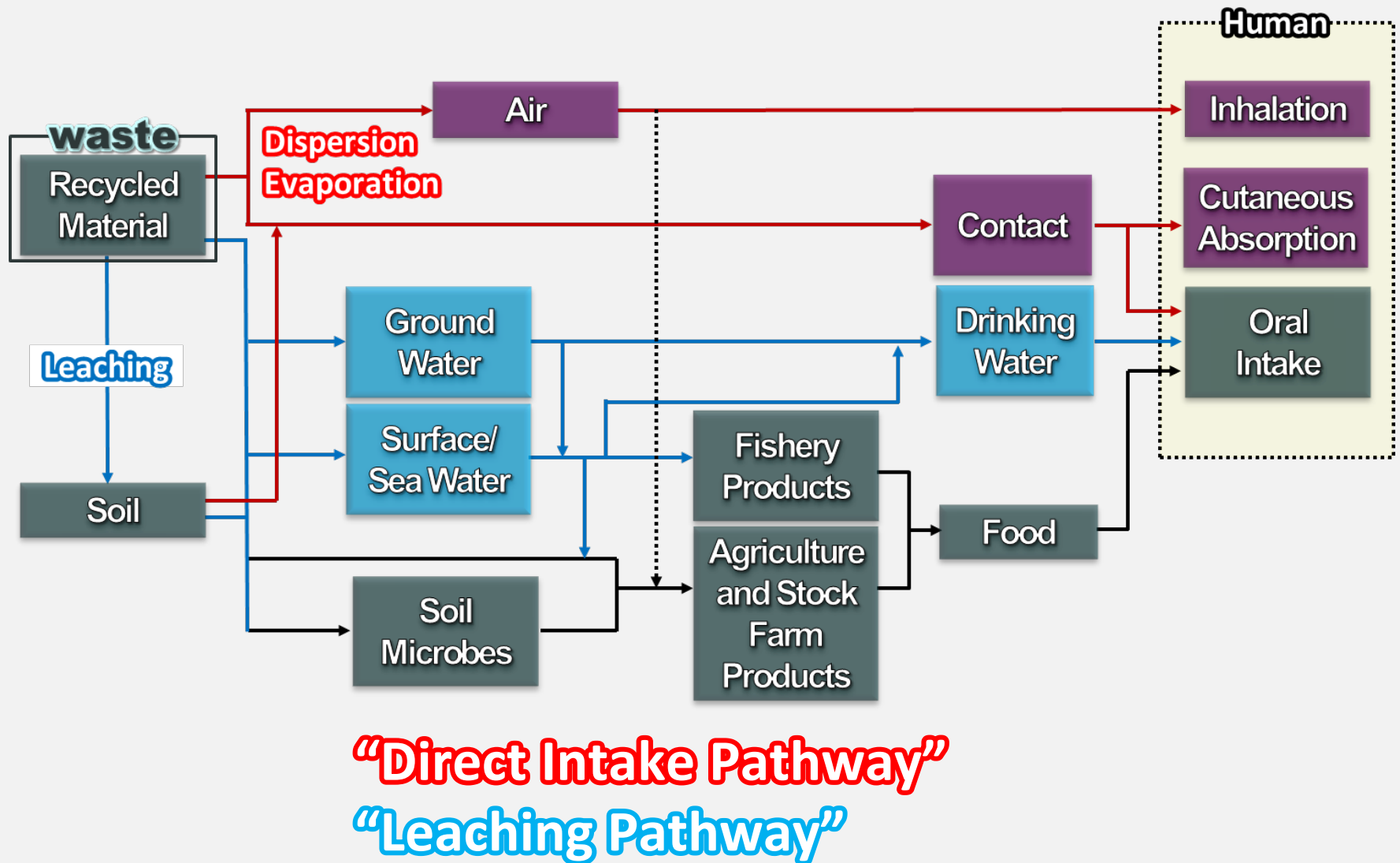
2014

- 2.18 in NIER and 4.30 in NIES
 - Environmental Safety Evaluation Methods for Recycled Material and Waste
- **9.24 ~9.25 in NIER : Tripartite(NIER, NIES and CRAES) Meeting**
 - Solid Waste Management Workshop on Environmental Sound Management for TPM

● Tripartite Workshop on Solid Waste Management at NIER, KOREA



2-2. Environmental Impact Pathway



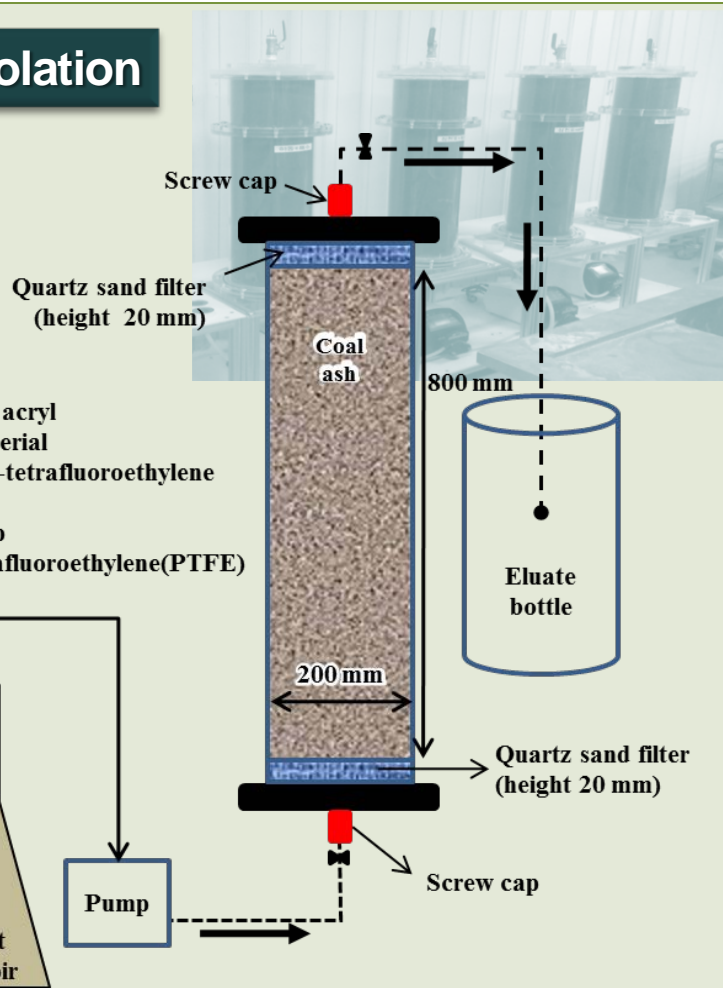
2-3. Summary of Tripartite Co-operative Projects

Item	Korea (NIER)	Japan (NIES)	China (CRAES)
Project Topic	Study on Environmental Recyclability and Expanding Recycle Purpose of Coal Ash	Development of Environment Safety Evaluation Method for Soil, Recycled Material & Waste	Management on Solid Wastes Recycling & Standard for Pollution Control on Cement Produced with Solid Waste
Object	Recyclability of Coal Ash as Horizontal and Vertical Drainage Layer	Environment Safety Evaluation of Concrete Structure and Road base aggregates	Concrete road surface scene-aimed to protect the groundwater
Experiments	<ul style="list-style-type: none"> • Leaching & Content Analysis • Up-flow percolation test (DIN 19528) <ul style="list-style-type: none"> - Batch test for concrete performed in 2009 • Numerical Modeling 	<ul style="list-style-type: none"> • Leaching & Content Analysis • Up-flow percolation test (ISO/TS 21268-3) • Serial Batch Test • Numerical Modeling 	<ul style="list-style-type: none"> • Leaching Analysis • Serial Batch Test (EA NEN 7375) • Numerical Modeling
Applied Matrix	Sea water, fresh water, Rainwater (pH 4.5)	Sea water, fresh water	Water controlled pH 3.2
Test duration	4~5 weeks	4 weeks	64 days

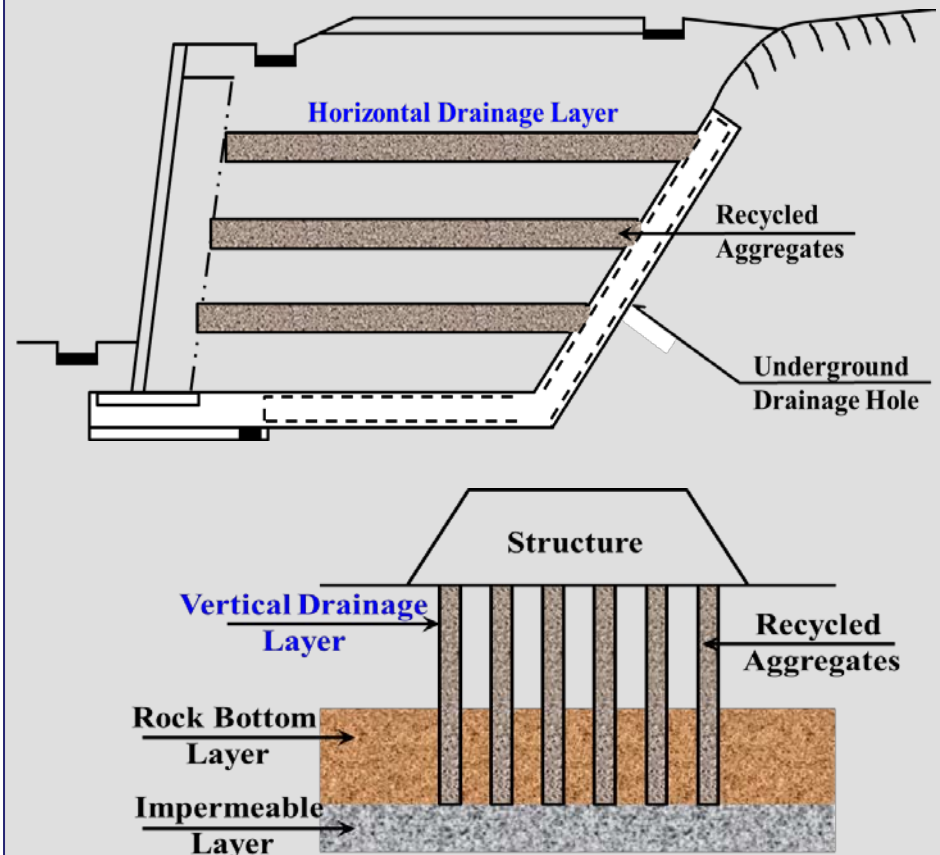
2-4. Present Research in NIER of Korea

● Study on Recyclability and Expanding Recycling Purposes of Coal Ash

Percolation



Usage



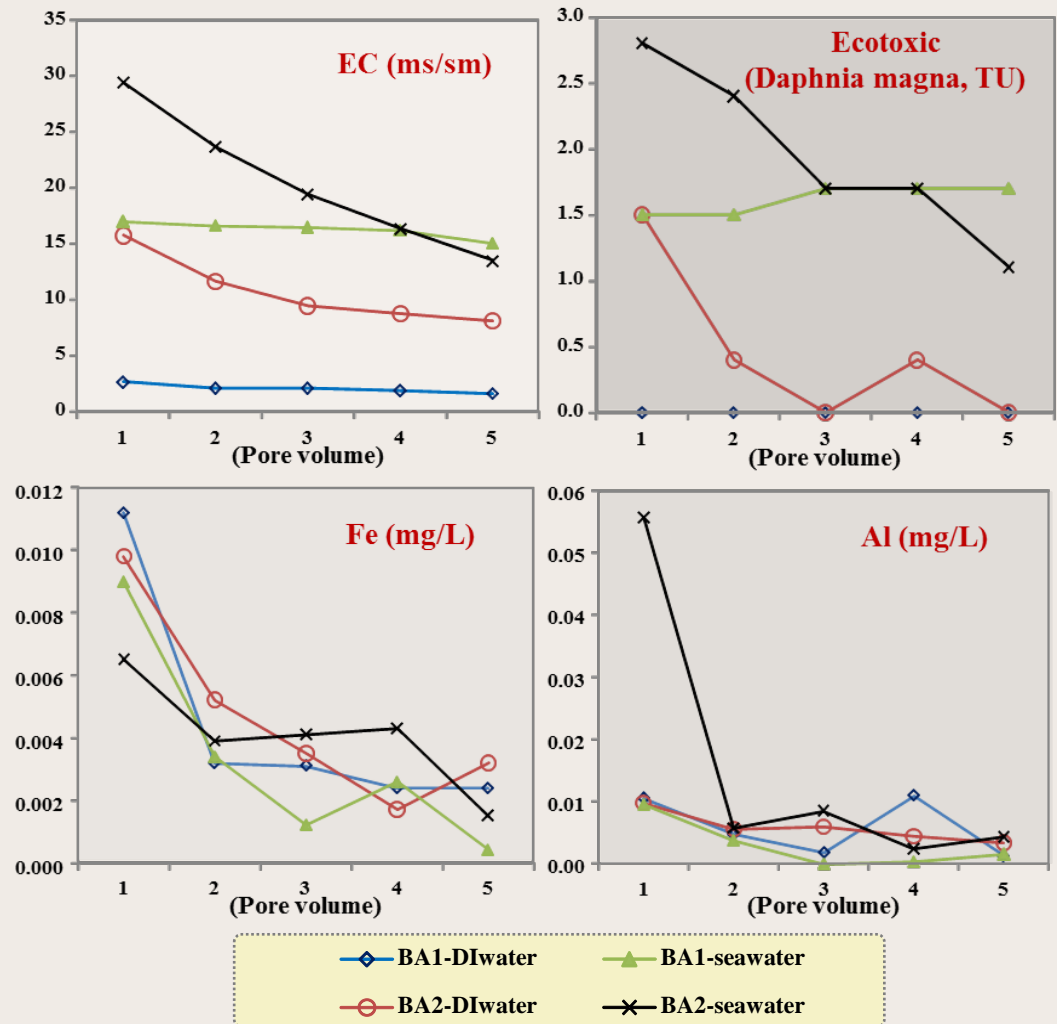
2-5. Environmental Impact Assessment in NIER

Step 1. Leaching & Contents

Leaching (mg/kg)	Criteria (waste)	BA1	BA2
Pb	3	ND.	ND.
Cu	3	ND.	ND.
As	1.5	ND.	ND.
Hg	0.005	ND.	ND.
Cd	0.3	ND.	ND.
CN	1	ND.	ND.
Fe	-	0.016	0.015
Al	-	0.337	0.024

Leaching (mg/kg)	Criteria (waste)	BA1	BA2
Pb	400	3.01	2.03
Cu	500	5.02	8.32
As	50	2.38	4.90
Hg	10	0.005	0.126
Cd	10	8.055	2154
Cr ⁶⁺	15	ND.	ND.
CN	2	-	-

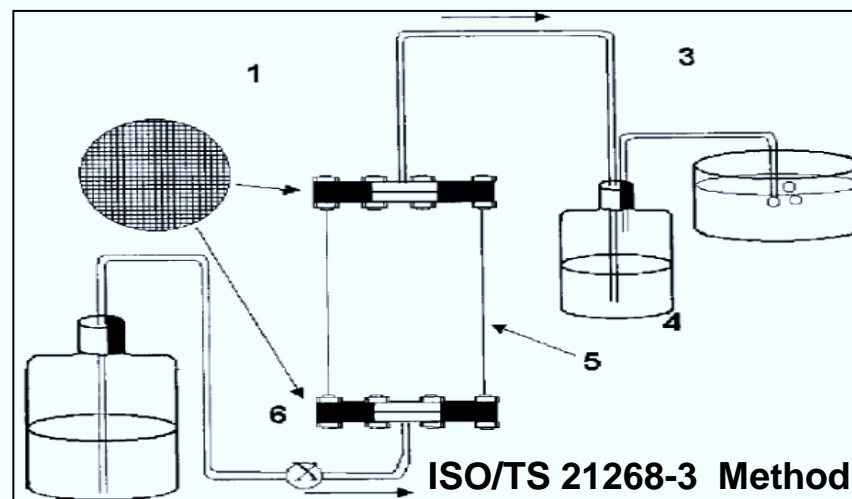
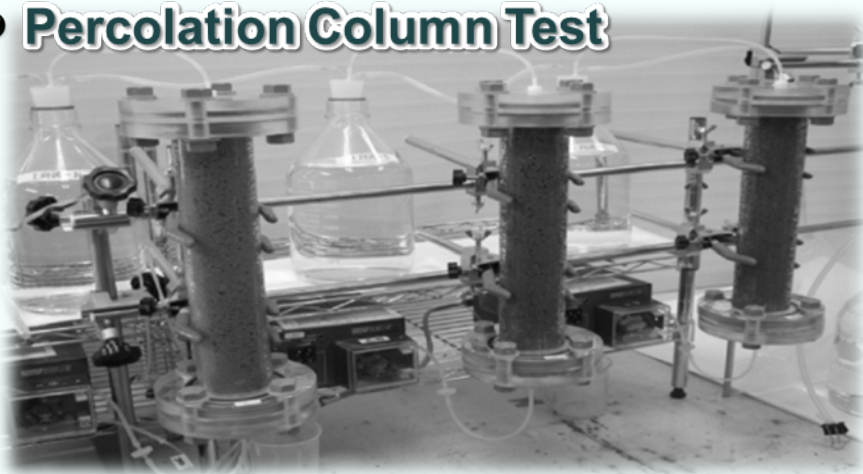
Step 2. Percolation Column Test



2-6. Present Research in **NIES** of Japan

Development of Environmental Safety Evaluation Method for Soil and Recycled Material

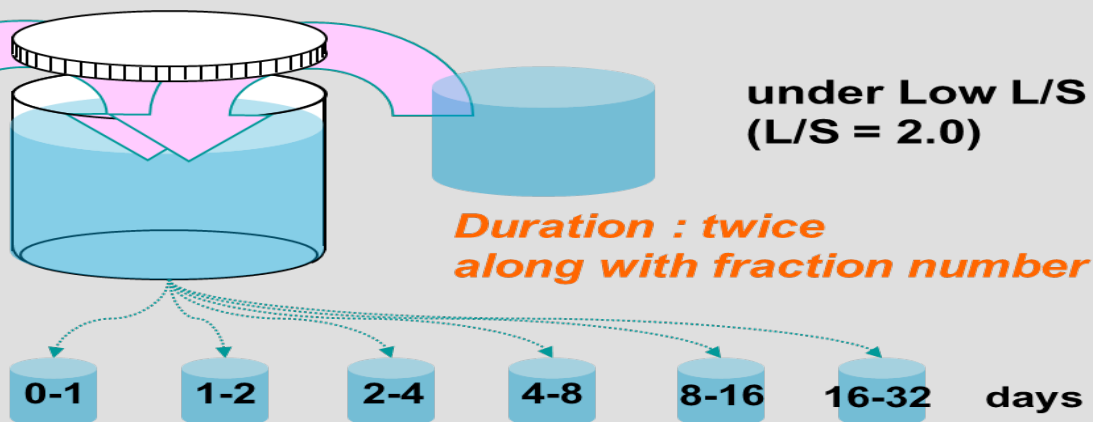
● Percolation Column Test



● Serial Batch Test



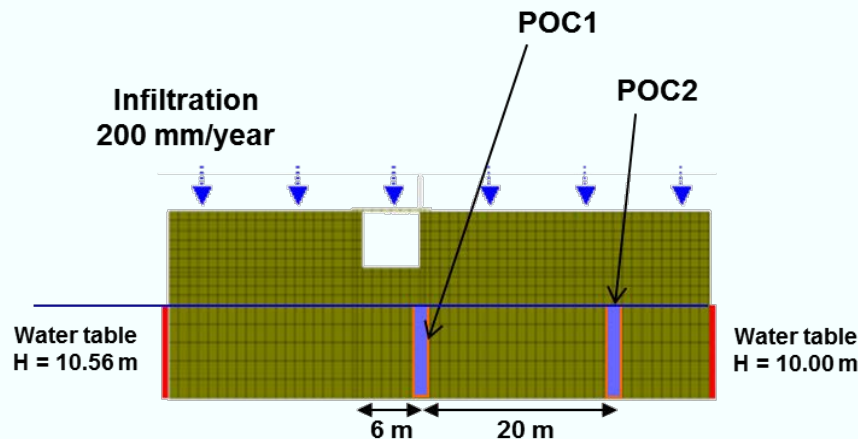
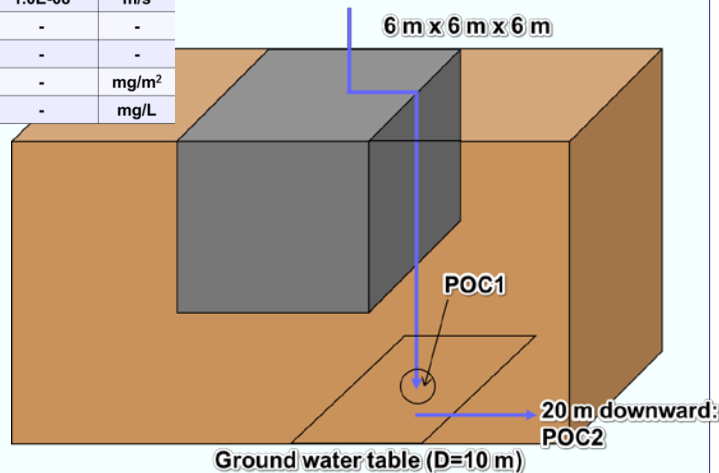
Fraction



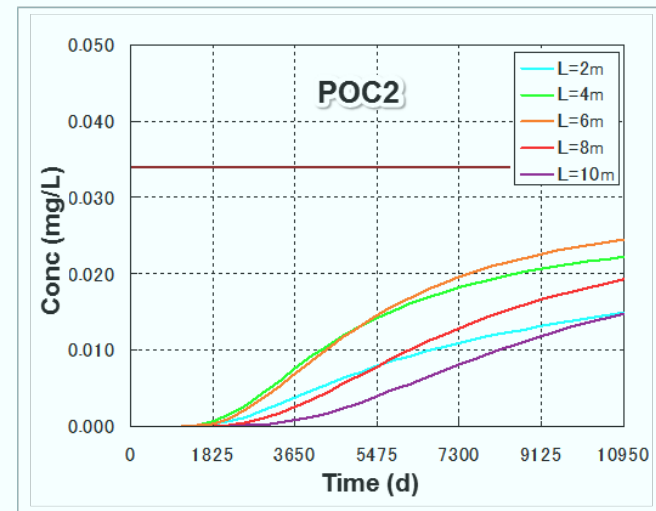
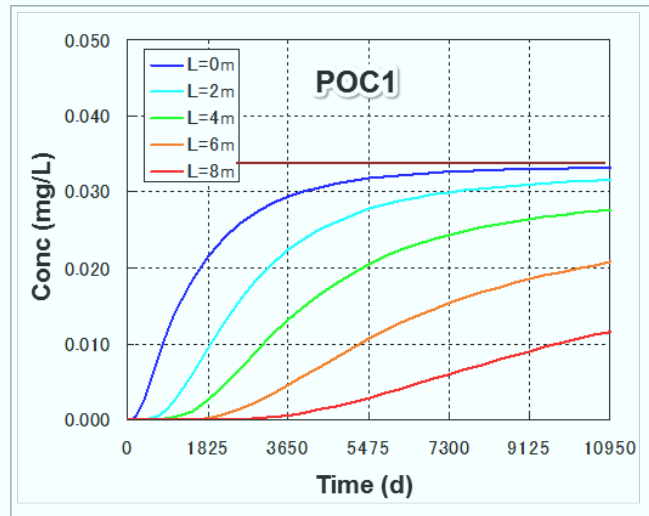
2-7. Environmental Safe Evaluation Method in Japan

Scenario 1 : Concrete structure

item	Concrete	Ambit soil	unit
Dry density	2.27	2.08	t/m ³
Porosity	0.081	0.20	-
Permeability	3.6E-13	1.0E-08	m/s
K	0.456	-	-
A	-0.452	-	-
M _{max}	55,200	-	mg/m ²
C _{max}	0.034	-	mg/L

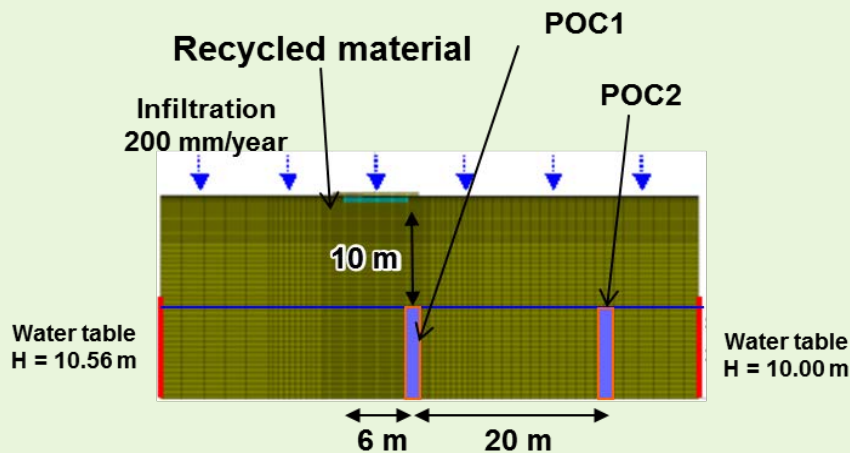
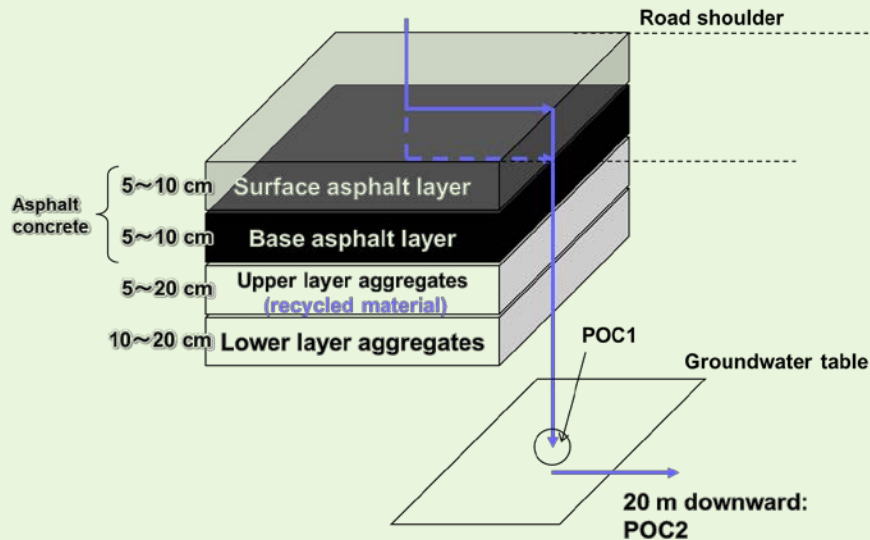


Results (Scenario 1)

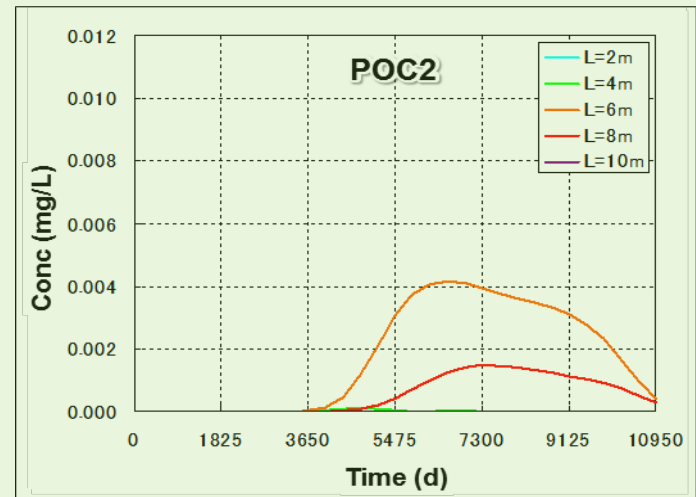
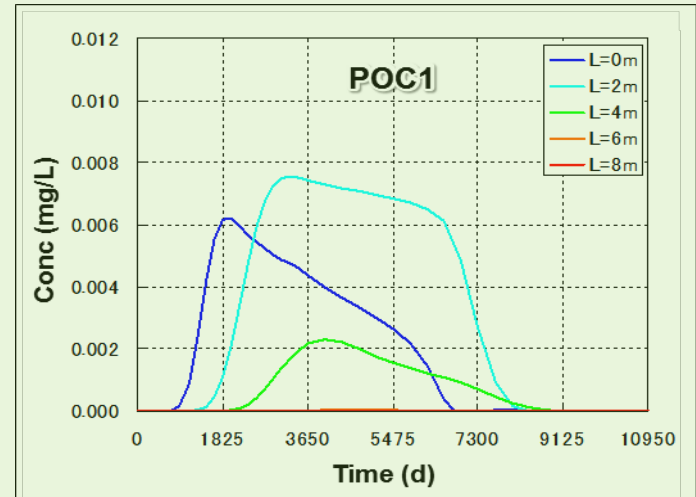


2-8. Environmental Safe Evaluation Method in Japan

Scenario 2 : Road base aggregates



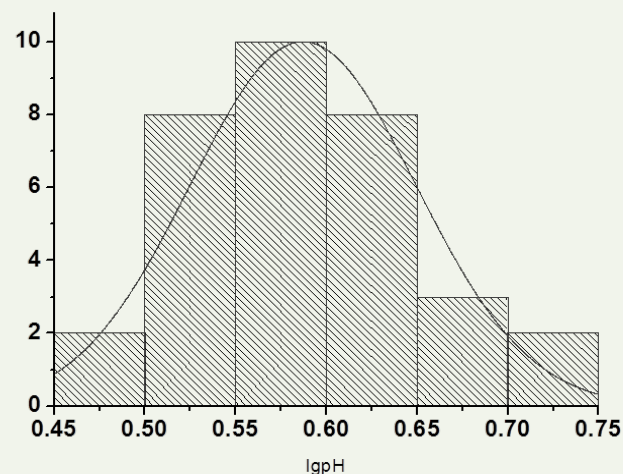
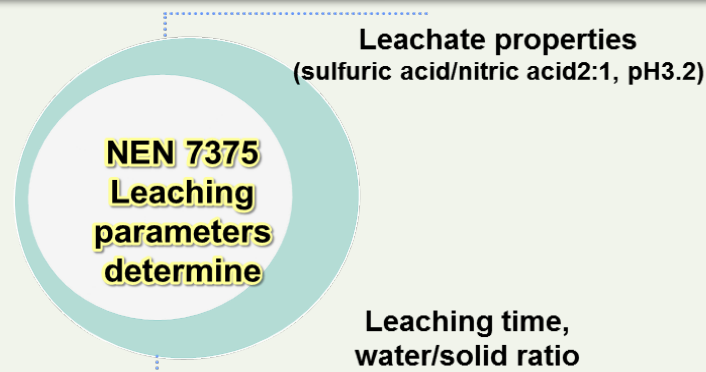
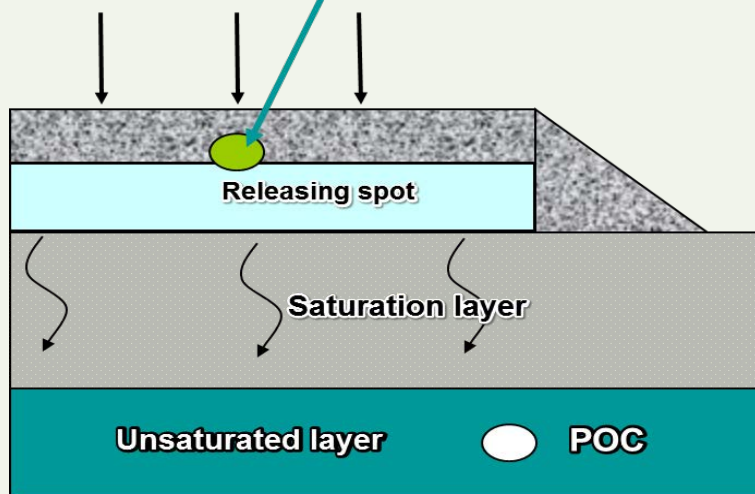
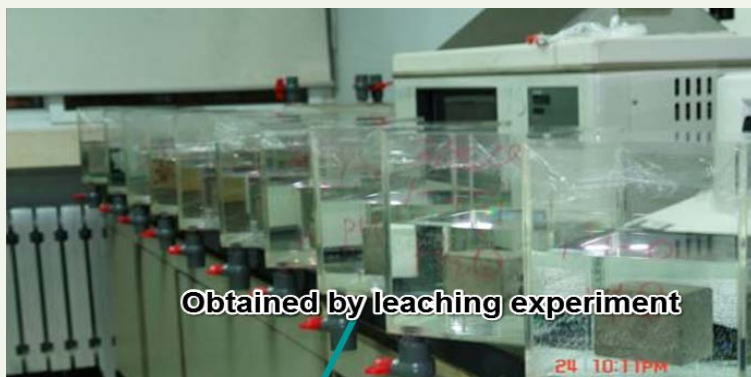
Results (Scenario 2)



2-9. Present Research in **CRAES** of China

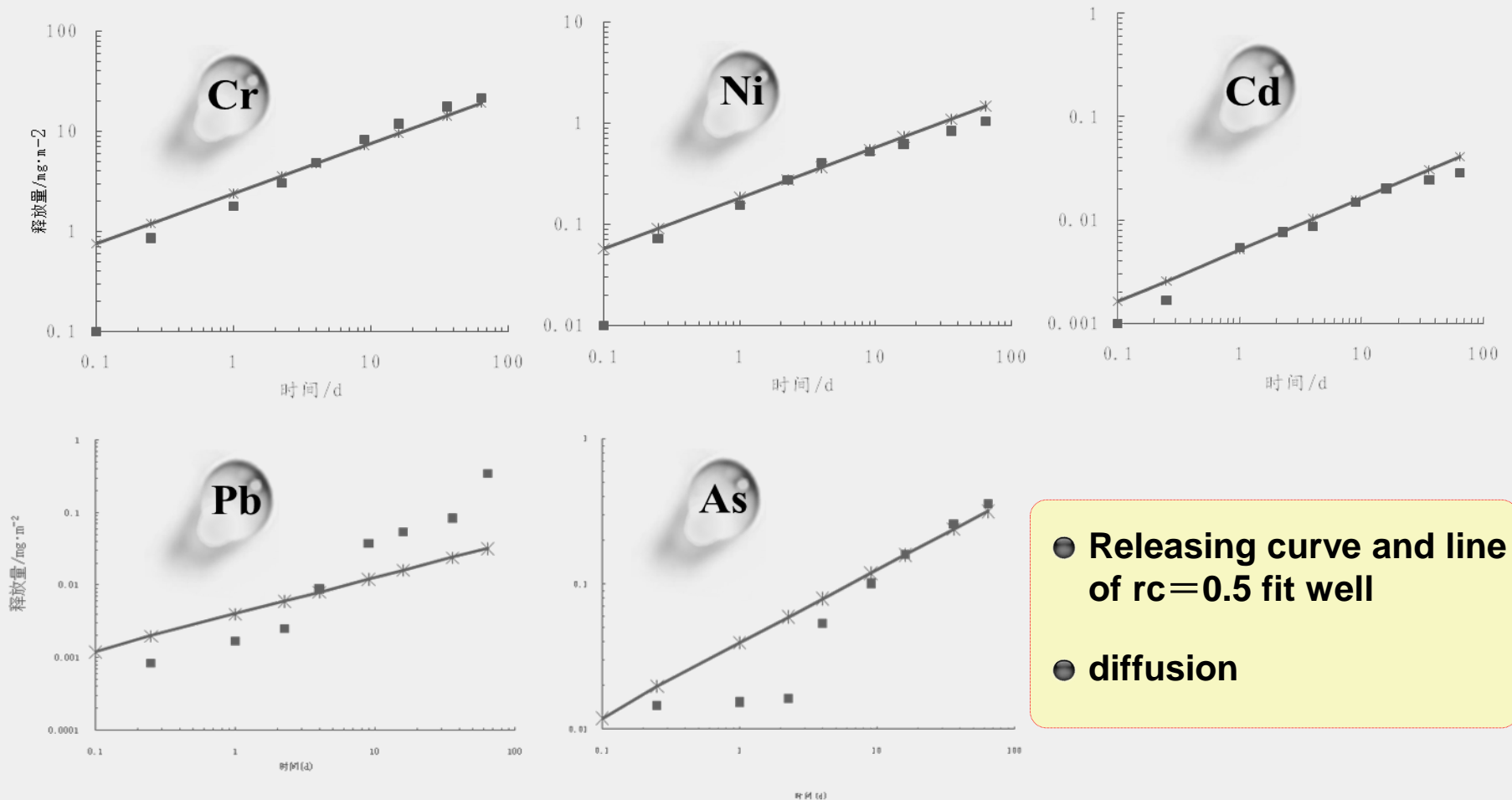
Management on Solid Waste Recycling & Standard for Pollution Control on Cement Produced with Solid Waste

Concrete road surface scene-aimed to protect the groundwater



2-10. Environmental Impact Analysis in China

Contaminants concentration at releasing point-releasing mechanism



2-11. Synergies of Cooperative Project Performance

Sharing the Research Results of Various Recycled Materials

- Can be Shared the Research Results of Applying the Various Approaches Used different types of Recycled Materials

Improving the Recyclability and Availability of Recycled Materials

- Can be Expanded the recycling Purposes by considering the various results of Environmental Safety Evaluation




Development of the Environmental Safety Assessment Method

- By developing of characterization leaching test such as Serial Batch Test, Percolation Test for Granular Materials, Tank Test for Monolith Materials, and Environmental Availability Test(Soil, Groundwater etc.)

3

1. Background and Overview
2. Current Status of Cooperative Project
3. **Future Our Challenge**

Future Our Challenge

Nation	2011	2012	2013	2014	2015	2016
	Risk Assessment for Hazardous Substance Contained in Recycling Products (Standardization of analytical method)			Study on Environmental Availability and Recyclability of Coal Ash(Recycled Waste)		
	<div> <div>↑</div> <div>Cooperative among NIER & NIES(2011~)</div> <div>↓</div> </div>			<div> <div>★</div> <div>Cooperative NIER & NIES & CRAES (2014~)</div> </div>		
	Environmentally sound quality of chemicals for the promotion of recycling of waste and By-products (3 Subtitle)			Development of Environment Safety Evaluation System <ul style="list-style-type: none"> - Recycled Material, etc. - Characterization Leaching Test - Interpretation of Test Result 		
				Management on Solid Wastes Recycling & Standard for Pollution Control on Cement Produced with Solid Waste		



Thank you !!!

