Environmental Protection
Administration Executive
Yuan, R.O.C. (Taiwan)

Utilization & Achievement of Pollution Remediation Fund

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Soil and Groundwater Pollution Remediation Fund Management Board

Report

May 2013

Presentation Overview

- Brief Introduction of PRF
- Utilization of PRF
- Major Utilization of PRF
- Value Assessment of Remediation Sites
- Economic Impact Analysis of PRF
- Concluding Remarks
- Future Prospects

Brief Introduction of Pollution Remediation Fund

Brief Introduction of PRF (1)

Background

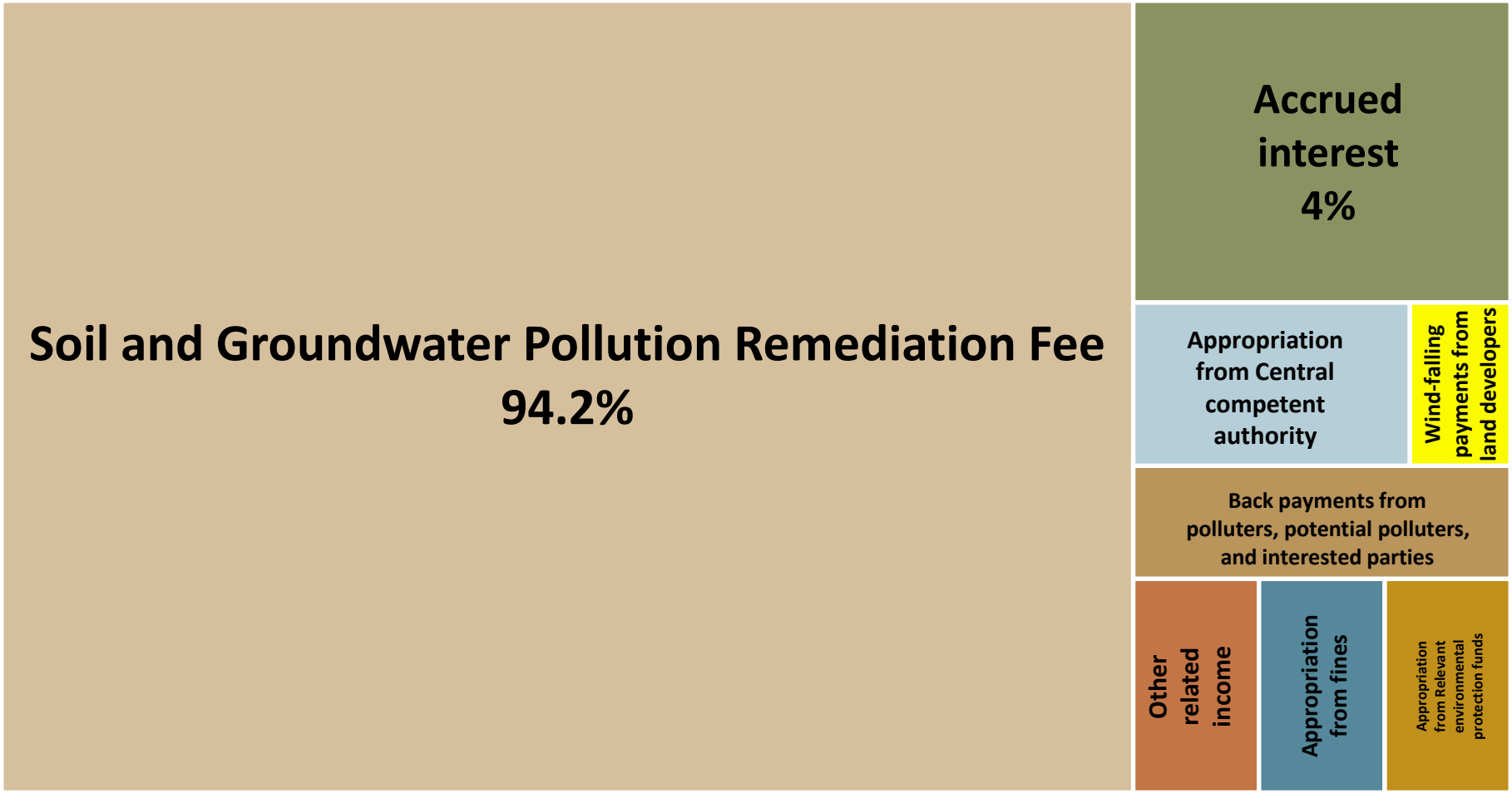
- Severe soil and groundwater pollution from improper industrial wastes disposal threatens human health and the environment
- Necessary for timely dealing with severe pollution to protect human health

Purposes

- Enhance pollution control and respond to emergency damage
- Remediate orphan sites
- Prevent future severe contamination

Brief Introduction of PRF (2)

The Components of PRF

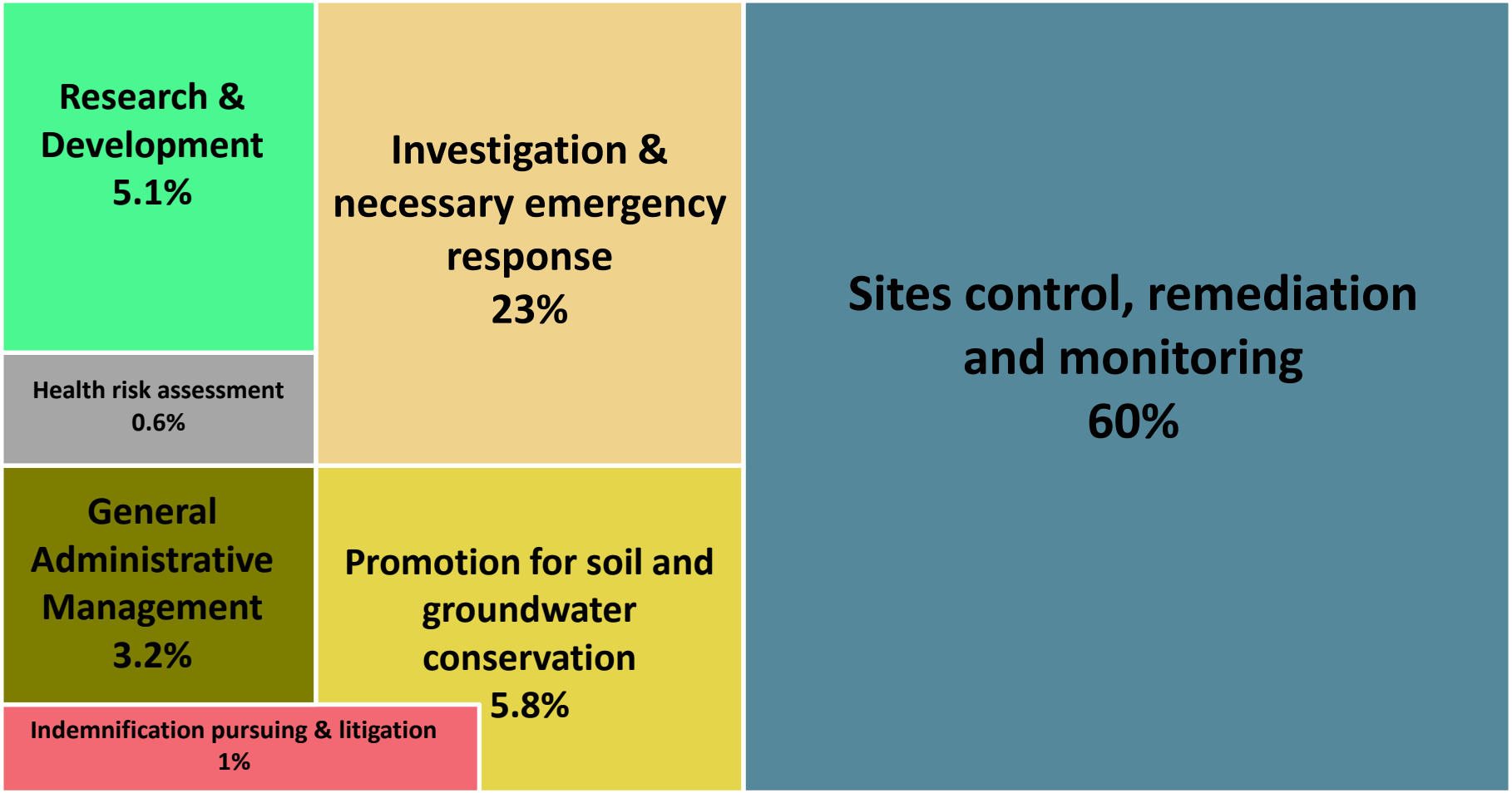


Source: Soil and Groundwater Pollution Remediation Fund Management Board, 2011

Utilization of Pollution Remediation Fund

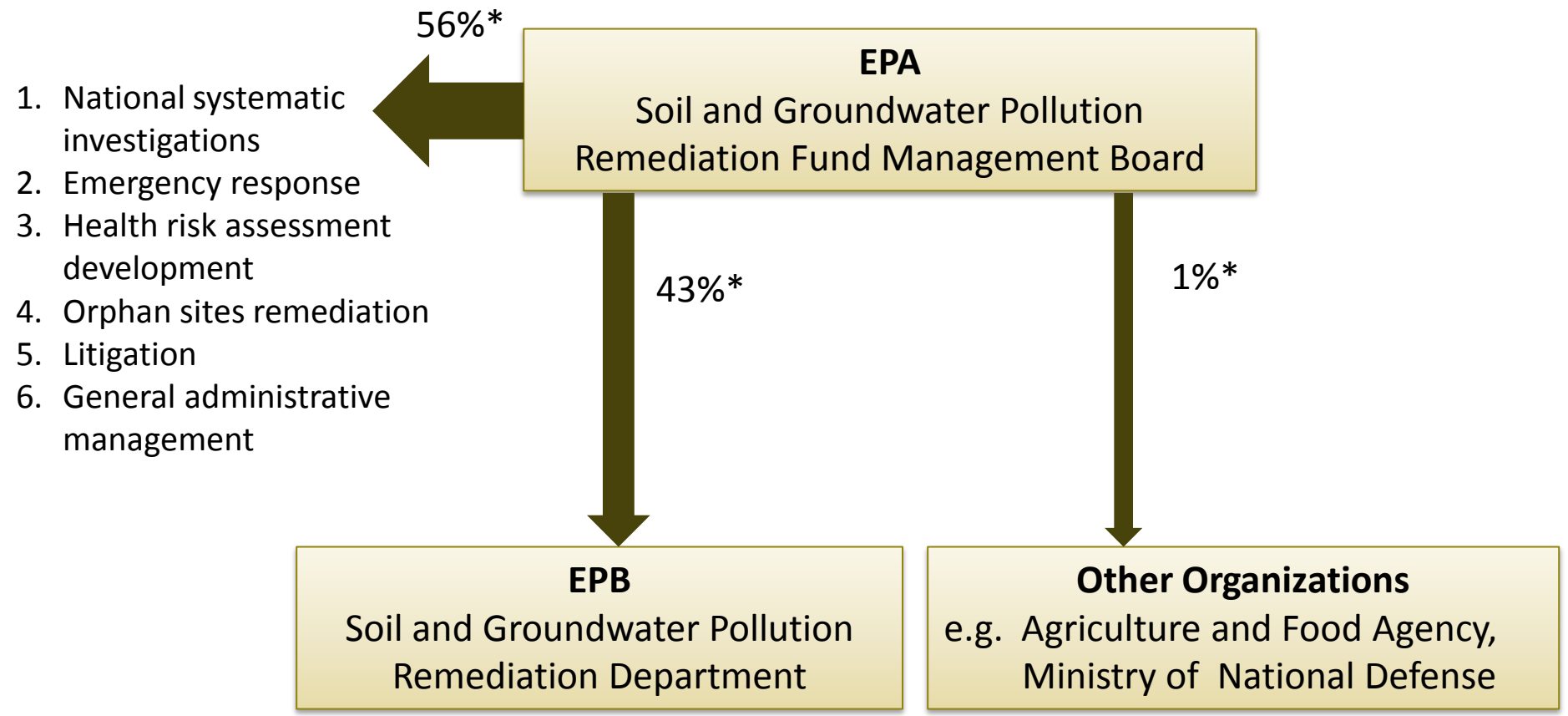
Utilization of PRF (1)

The Percentage for Different Utilization



Source: Soil and Groundwater Pollution Remediation Fund Management Board, 2011

Utilization of PRF (2)



Major Utilization of Pollution Remediation Fund

Investigation & Remediation for Contaminated Farmland (1)

Background

- Small-scale factories inappropriately located nearby agricultural area with improper waste-water disposal and fallout dust
- Waste-water with heavy metal mixed irrigation water to farmlands causes severe contamination on soil, and then on crops
- Accumulating fallout dust with heavy metal acidifies farmlands and causes soil contamination

Purpose

- Actively investigate potential contaminated farmlands and then remediate
- Effectively strengthen management
- Absolutely assure food safety

Investigation & Remediation for Contaminated Farmland (1)

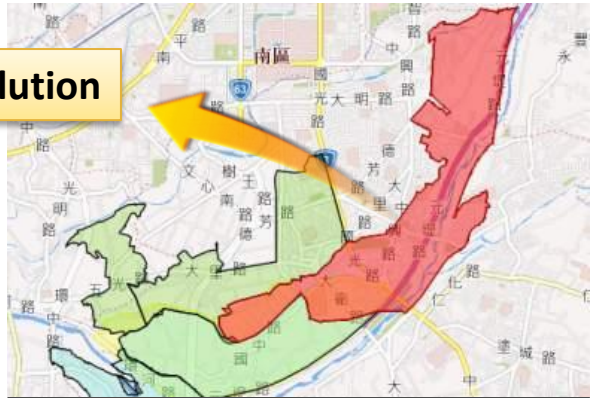
Traditional Investigation Method: Grid Survey Method

- Pros: easily identify the contaminated farmlands
- Cons: leaping and random

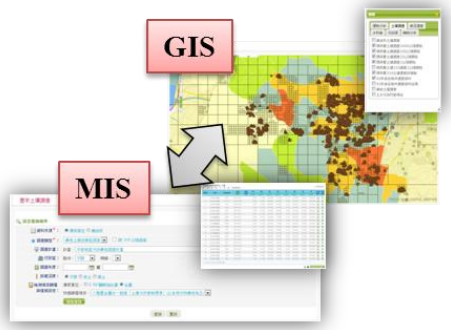
Additional Investigation Reference: Irrigation System Data

- Pros: greatly assist investigate pollution source
- Achievement: integrate investigation data to successfully identify highly potential contaminated farmlands, in order to prevent further irreversible health damage

High Potential of Heavy Metal Pollution

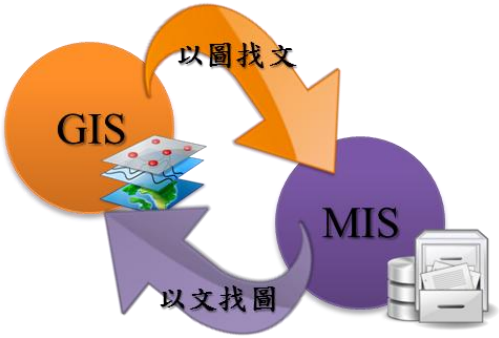


Quality Information Mechanism



Build the soil and groundwater information web system

Completeness of the soil and groundwater investigation and background database



The development of mobile devices

Combined pollution simulation system, And use GIS to assist the contamination potential assessment.

Information Management

Decision Support System

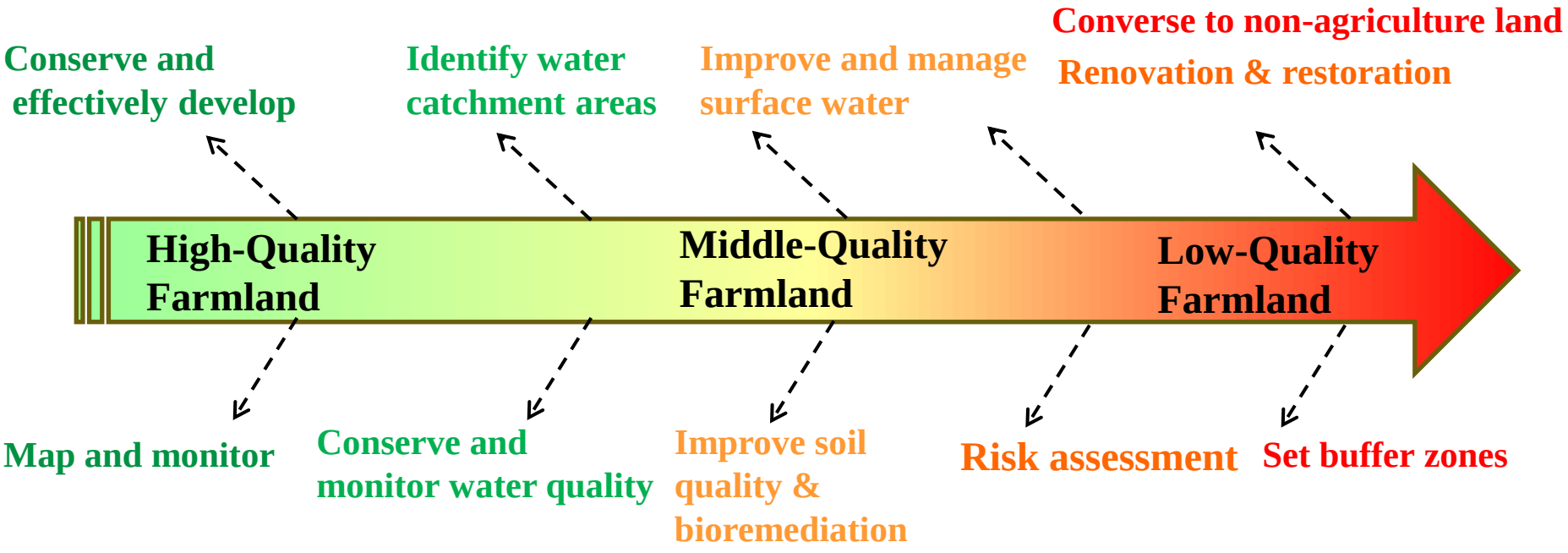
Improve soil and groundwater information to speed up efficiency and make decisions.

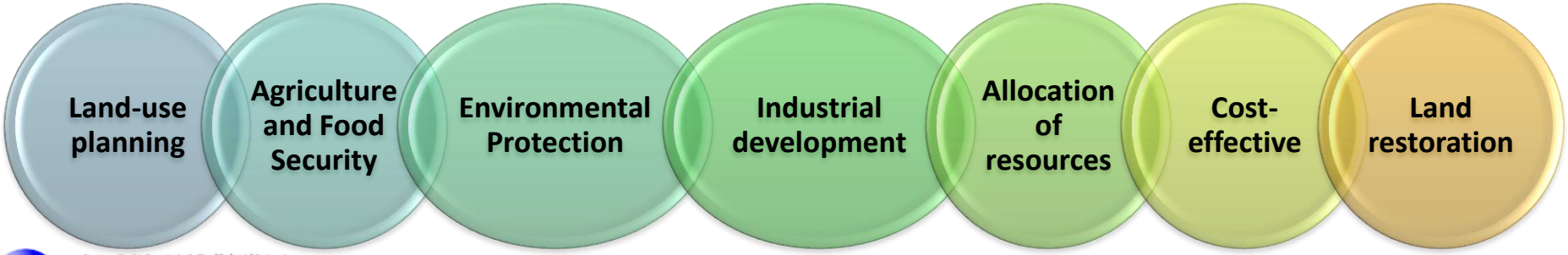
Build cloud database

Complete soil and groundwater, sediment data , improve administrative efficiency.

Investigation & Remediation for Contaminated Farmland (3)

Quality-based Management Strategy





Investigation & Remediation for Contaminated Farmland (4)

Achievement

No.	county	pollution control site		post removal site control		total	
		Quantity	area Ha	Quantity	area Ha	Quantity	area Ha
1	Taipei	-	-	22	4.9	22	4.9
2	New Taipei	-	-	13	3.7	13	3.7
3	Taichung	423	39.1	181	35.9	604	75
4	Tainan	40	4	60	14.2	100	18.2
5	Kaohsiung	19	2.9	30	5.6	49	8.5
6	Keelung	-	-	-	-	-	-
7	Hsinchu(city)	-	-	200	35.9	200	35.9
8	Chiayi(city)	5	1.1	9	2.3	14	3.4
9	Taoyuan	1,192	196.6	96	21.8	1,288	218.4
10	Hsinchu	-	-	-	-	-	-
11	Miaoli	11	1.2	11	1.2	22	2.3
12	Nantou	10	0.5	1	-	11	0.5
13	Changhua	31	5.9	1,154	273.2	1,185	279.1
14	Yunlin	3	0.6	15	3.5	18	4.1
15	Chiayi	-	-	-	-	-	-
16	Pingtung	-	-	2	7.4	2	7.4
17	Yilan	1	0.3	4	0.9	5	1.2
18	Hualien	-	-	-	-	-	-
19	Taitung	-	-	-	-	-	-
20	Kinmen	-	-	-	-	-	-
21	Penghu	-	-	-	-	-	-
22	Lienchiang	-	-	-	-	-	-
total		1,735	252.2	1,798	411	3,533	663

Source: Management system on May 12, 2013

Contingency Measures (1)

Background

- Severe and acute contamination seriously causes health threats
- Without timely control, easily movable pollutants worsen the situation

Purpose

- Timely control contamination
- Completely assure nationals' safety
- Prevent damage enlargement

Contingency Measures (2)

- **Project Name (area)**:

  The 1413 etc. 36 cadastral in Yongkang City, Tainan County (40,390 m^2)

- **Classification in Taiwan**:

  The contaminated groundwater restricted areas

- **Pollutants**:

  PCE, TCE, Cis-1,2 DCE, Anti-1,2 DCE, 1,1 DCE, VC

- **Investigation Results**:

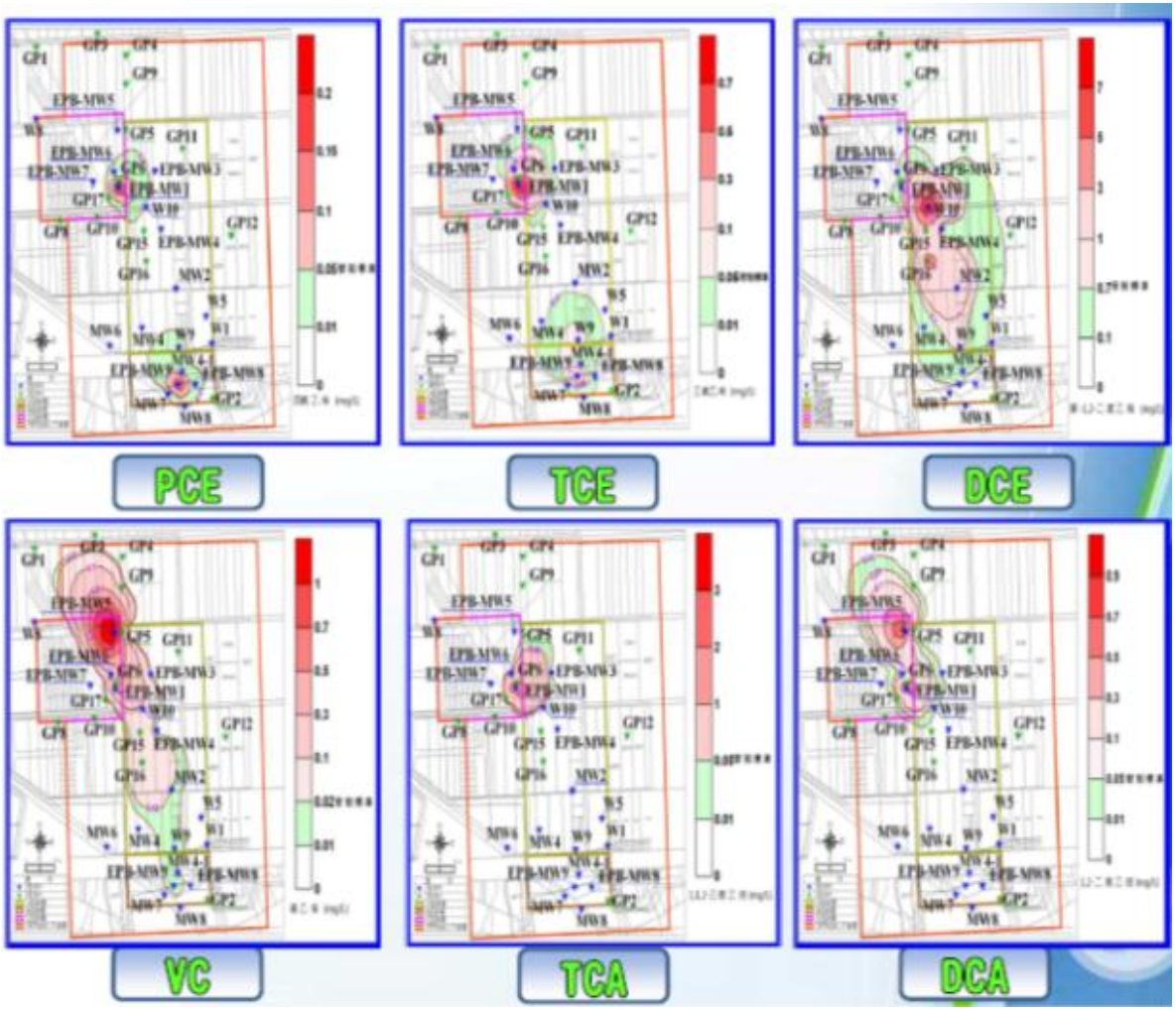
  TCE and DCE concentration above the groundwater standards

- **Land Use**:

  The site is divided into A, B, C districts, including commercial and residential areas

Contingency Measures (3)

Scope of Contamination



Contingency Measures (4)

Well Surveys and Inspections

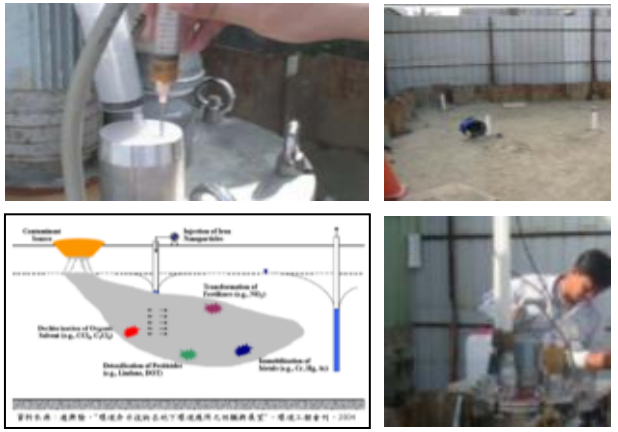




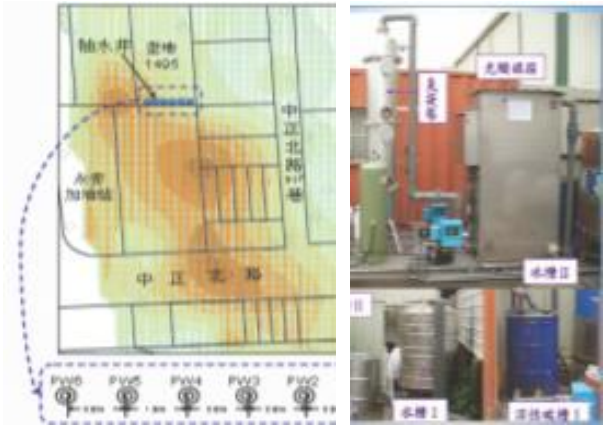

Contingency Measures (5)

Remediation

SVE Pilot Test



The Nzvi Pilot Test



The P&T Pollution Arresting System

In SitU Bioremediation Pilot Test

Contingency Measures (6)

The bio-PRB and Biostimulation Remediation

Value Assessment of Remediation Sites

Value Assessment of Remediation Sites (1)

Background

- Soil and Groundwater Pollution Remediation Act, Article 51
- If land developers contemporarily summit development plan with pollution remediation plan after remediation of the authority, then land developers shall pay 30% of the post-remediation current assessed land value to PRF as a feedback
- The pre-remediation current assessed land value times 1.4 equals the post-remediation current assessed land value

Purpose

- Financially support Pollution Remediation Fund

Value Assessment of Remediation Sites (2)

Steps to Evaluate Feedback Amounts

- **Step 1 Get pre-remediation current assessed land value**

  Current assessed land value database (update each year)

  http://www.land.moi.gov.tw/chhtml/index.asp

- **Step 2 Use equation to get post-remediation current assessed land value**

  Pre-remediation land value x 1.4= post-remediation land value

- **Step 3 Use equation to get feedback amounts**

  Post-remediation land value x 0.30= feedback amounts

Value Assessment of Remediation Sites (3)

Alternative to Evaluate Market Value of Post-remediation land

- Take time effects on price and stigma effects into account
- With 4 key assumptions:
  - ✓ Assumed that assessed value announced by the authority has reflected the effects of contamination on price
  - ✓ Assumed that contaminated sites' market value moves in line over time with uncontaminated sites' one
  - ✓ Assumed that it would be no difference between the post-remediation land and the uncontaminated land for buyers and sellers
  - ✓ Assumed that the utilization of post-remediation land is as the same as it is not contaminated

Value Assessment of Remediation Sites (4)

Alternative to Evaluate Market Value of Post-remediation land

- Assessed tax value in n years =
  current assessed tax value
  $\times$ (1+ the average increase rate of assessed tax value over past m years)^n
- Estimated market value of contaminated sites in n years =

$$\frac{\text{Assessed tax value in n years}}{\text{current assessed tax value as a percentage of market value}}$$

- Estimated market value of remediated sites in n years =

$$\frac{\text{Estimated market value of contaminated sites in n years}}{(1-\text{price discount of contaminated sites})}$$

Assumed that price of remediated sites will return to its level as if uncontaminated

Economic Impact Analysis of Pollution Remediation Fund

Economic Impact Analysis of PRF (1)

Background

- Environmental protection activities do not contradict the economic development
- Remediation and investigation not only improve nationals' non-monetary life quality but also affect our domestic production and employment situation

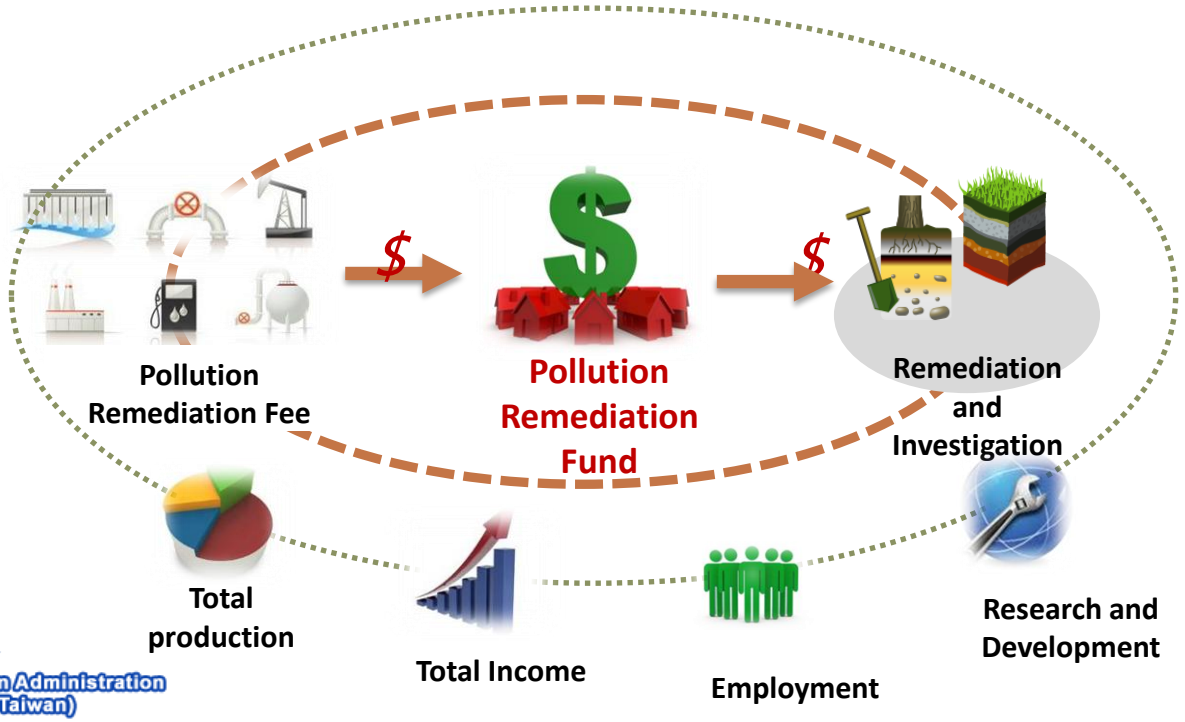
Purpose

- Assess the economic impact on macro-economy of PRF
- Apply the analysis results to future policy review and correction

Economic Impact Analysis of PRF (2)

Analytic Method: Input-output Model

- Pros: capture **whole transactions and activities** in the society coming from collection and expenditure of Pollution Remediation Fund
- Cons: non-monetary effects excluded (e.g. environment effects, life quality)
- Internal: 2006-2011



Economic Impact Analysis of PRF (3)

Results and Implication

- Averagely, expending NT$1 from Pollution Remediation Fund induces NT$1.43 real production transactions in the economy
- Generally, Pollution Remediation Fund increases 271 employment

Items	2006	2007	2008	2009	2010	2011
Production Effects (NTD thousand)	281,170	290,330	406,860	650,930	744,070	1287,740
GDP Effects (NTD thousand)	171,670	180,780	248,130	350,210	460,450	792,540
Employment Effects (person)	129.82	126.18	180.12	280.63	303.02	604.01

Concluding Remarks

Concluding Remarks (1)

Pollution Remediation Fund

- PRF is established to enhance soil and groundwater pollution control, to respond emergency, and to prevent future contamination
- Pollution Remediation Fund Management Board of EPA is the main executor of PRF
- In addition to EPA, EPB and other ministries could apply for subsidies
- Pollution Remediation Fee is the major component of PRF
- Site control, remediation and monitoring is the main expense of PRF

Concluding Remarks (2)

Investigation & Remediation for Contaminated Farmland

- In order to assure food safety, PRF devotes to investigation of potential contaminated farmlands and then to remediation
- Traditional grid survey method plus additional irrigation system data make successful identification for potential contaminated farmlands
- It is cost-effective to manage soil quality in farmlands with quality-based management strategy

Contingency Measures

- In order to timely control contamination and protect nationals' safety, PRF devotes to contingency measures and remediation

Concluding Remarks (3)

Value Assessment of Remediation Sites

- If land developers contemporarily summit development plan with pollution remediation plan after remediation of the authority, then land developers shall pay 30% of the post-remediation current assessed land value to PRF as a feedback
- There are two ways to evaluate post-remediation current assessed land value: (1) estimating with public announced land value (2) assessing with consideration of time effects on price and stigma effects

Economic Impact Analysis of Pollution Remediation Fund

- Input-output model captures whole transactions and activities in the society coming from collection and expenditure of PRF
- Averagely, expending NT$1 from PRF induces NT$1.43 real production transactions in the economy

Future Prospects

Future Prospects

Introduce Economic Instruments

- In order to encourage factories to actively dispose pollution in a well-manner, there would be **low-interest loans** for pollution prevention equipments in the near future
- In order to spread factories' risks and burden of remediation, there would be soil and groundwater pollution **liability insurance** in the near future

Turn passive remediation to aggressive reuse

- In order to allocate resources effectively, the quality-based management and reutilization strategy of contaminated lands would be strongly applied in the near future

Thanks for your attention!

Environmental Protection Administration Executive Yuan, R.O.C. (Taiwan)