

General Introduction on pollution Status of Korea

1. Soil Pollution

A. Introduction

- a. Soil Environment Conservation Act installs the nationwide soil monitoring network
- b. The monitoring network consists of 1,521 sites as of 2010
- c. Monitoring sites are classified into 15 groups based on land-use, such as forest, paddy, upland, orchard, pasture, building, industries, school, park, sports parks, recreation, roads, railway, riversides and others
- d. Seven Regional Environment Offices are in charge of monitoring (sampling and analyses)
- e. Analyze total seventeen substances or parameters on which to base the land uses as below Table
- f. Ministry of Environment (MOE) publishes the annual report and all data are archived in the Soil and Groundwater Information System (SGIS)

Land uses	Analytical Parameters	
Paddy, upland, orchard, forest, pastures, parks, recreation, sports parks, riverside, school	Heavy metals	Cd, Cu, As, Hg, Cr(VI), Pb, Zn, Ni
	General substances	CN, Organic-P compounds
	Acidity	pH
Building, road, industries, railroad, others	Heavy metals	Cd, Cu, As, Hg, Cr(VI), Pb, Zn, Ni
	General substances	PCB, CN, Phenol, Gasoline (BTEX, TPH), F, TCE, PCE
	Acidity	pH

B. General statements on soil pollution

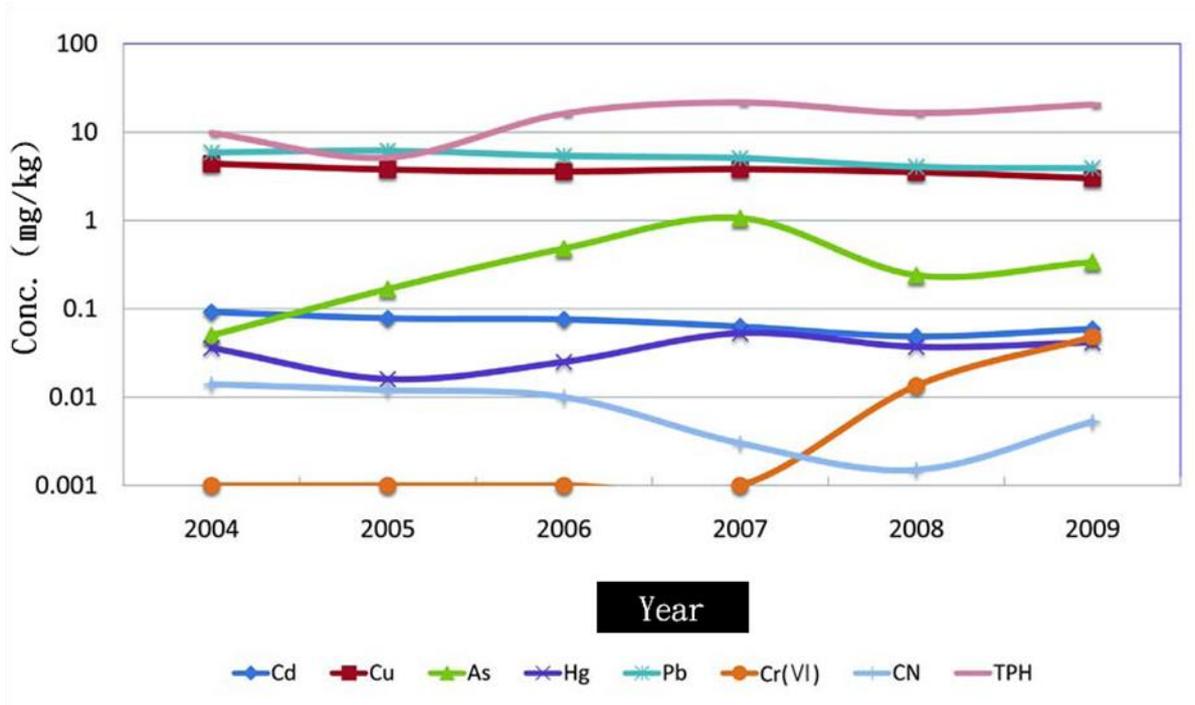
- a. In 2009, most of the analytical parameters in 1,521 sites were within the danger threshold standards

	2009		2008		Standards
	Average (mg/kg)	%@	Average (mg/kg)	%@	
Cd	0.059	3.9	0.049	3.3	1.5
Cu	2.994	6.0	3.521	7.0	50
As	0.338	5.6	0.241	4.0	6
Hg	0.042	1.0	0.037	0.9	4
Pb	3.903	3.9	4.042	4.0	100
Cr(VI)	0.048	1.2	0.013	0.3	4
Zn	73.197	24.4	32.662	27.6	300
Ni	8.624	21.6	9.150	22.9	40
F	193.519	48.4	215.473	53.9	400
Organ. P Compounds	0.000	0.0	0.000	0.0	10
PCB	0.000	0.0	0.000	0.0	12
CN	0.005	0.3	0.001	0.1	2
Phenol	0.000	0.0	0.000	0.0	4
BTEX	0.007	0.0	0.000	0.0	80
TPH	20.489	4.1	16.449	3.3	500
TCE	0.000	0.0	0.000	0.0	8
PCE	0.000	0.0	0.000	0.0	4

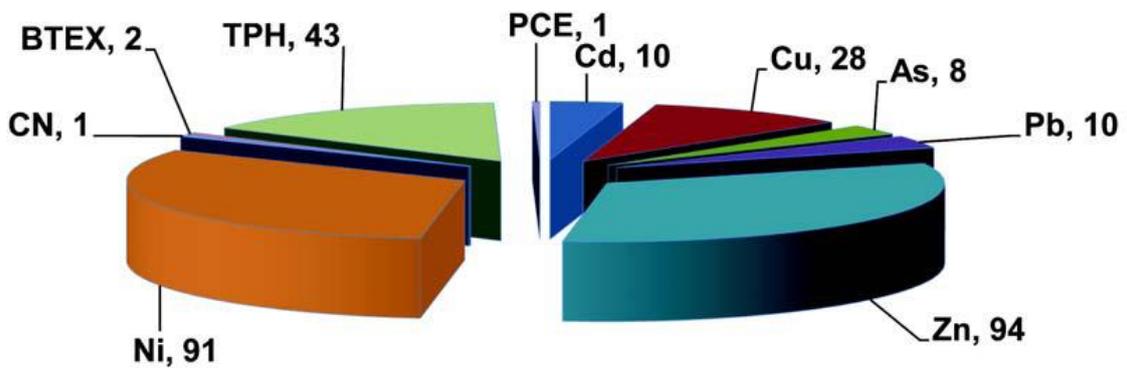
@ (average/standards)*100

- b. Concentrations of harmful substances varied with land used; metal contents in industrial and roads sites were generally higher than average
- c. Concentrations of harmful substances were slightly changed with years but no general trend was shown

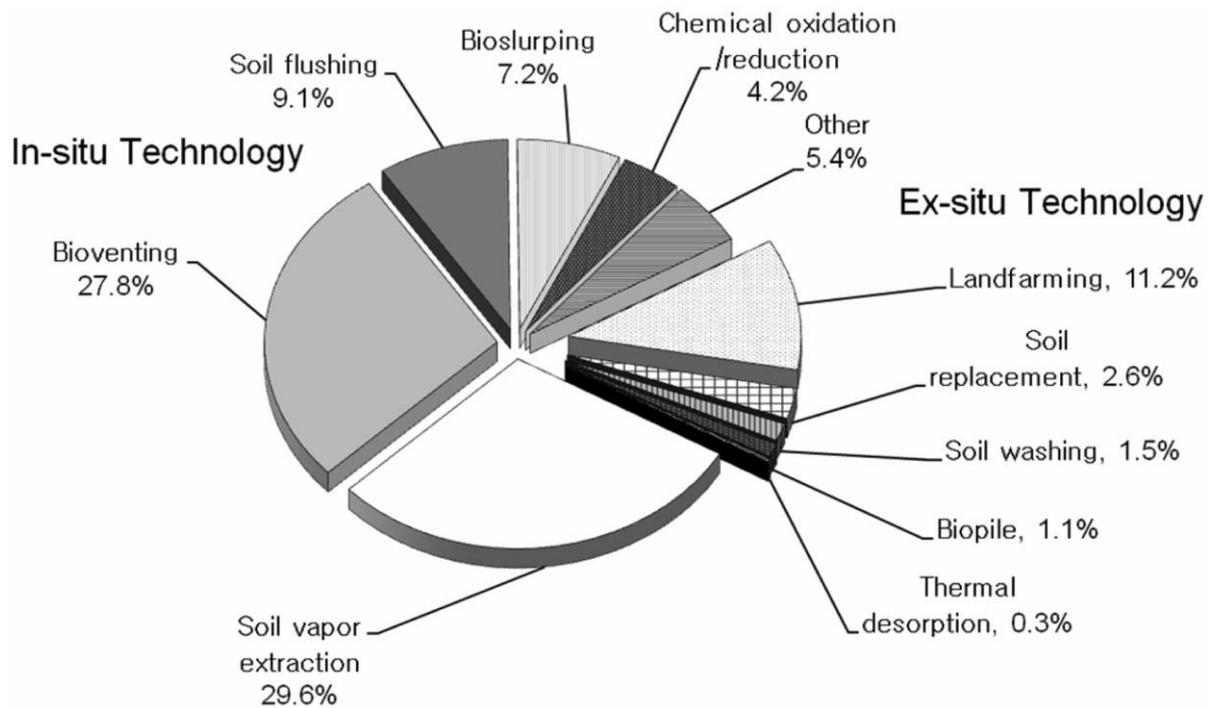
	Years				
	2005	2006	2007	2008	2009
Cd (mg/kg)	0.078	0.076	0.063	0.049	0.059
Cu	3.768	3.587	3.799	3.521	2.994
As	0.167	0.481	1.064	0.241	0.338
Hg	0.016	0.025	0.053	0.037	0.042
Pb	6.162	5.395	5.068	4.042	3.903
Cr(VI)	0.000	0.000	0.000	0.013	0.048
CN	0.012	0.010	0.003	0.001	0.005
TPH	5.153	16.207	21.557	16.449	20.489
Zn	77.317	82.318	83.324	82.662	73.197
Ni	9.587	10.222	11.052	9.150	8.624
F	260.665	280.109	209.941	215.473	193.519



d. The below shows the number of samples exceeding the standards



C. Remediation Technologies being employed during 2000-2006 in Korea to remediate the polluted soils



Yang and Lee (2007), Korean Chem. Eng. Res. 45:311-318.

2. Groundwater Pollution

A. Introduction

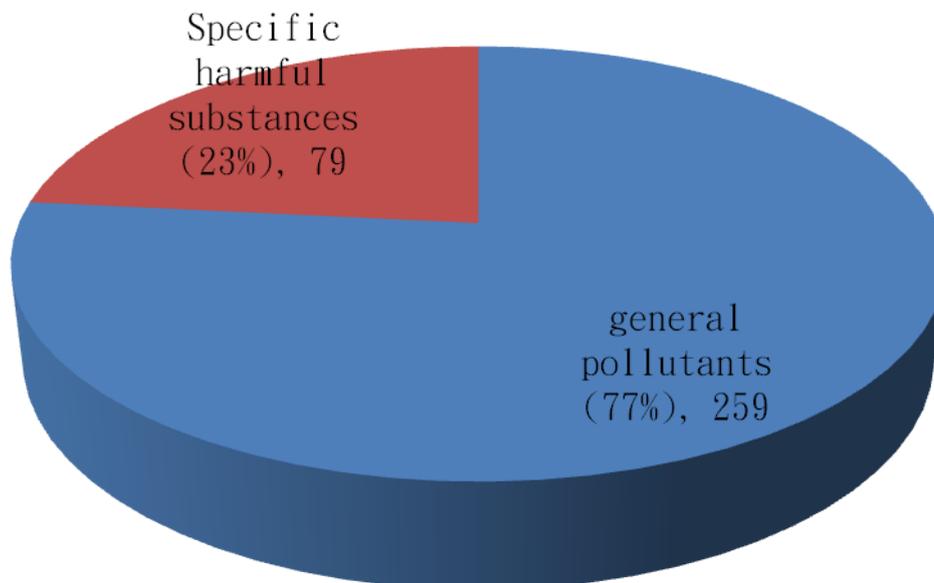
- a. Groundwater Act designates 2,499 monitoring sites (781 sites by Regional Environment Offices; 1,240 by Provincial Governments, and 478 by K-Water Co. as a National Monitoring Systems) from 2007
- b. Monitoring sites are grouped into pollution worrisome area (industrial sites, UST areas, landfill areas, abandoned mine areas, rivers areas etc), general areas (municipal areas, agricultural and forestry areas and natural sites, etc) and national monitoring sites.
- c. Total 20 analytical items have been monitored for groundwater quality
- d. Two times per year, groundwater qualities were monitored (first half Apr- May; second half Sept. – Oct)
- e. Regional Environment Offices analyze samples taken from pollution worrisome areas, Provincial Governments from general areas, and K-Water from national monitoring sites.

B. General Statements on Groundwater Pollution

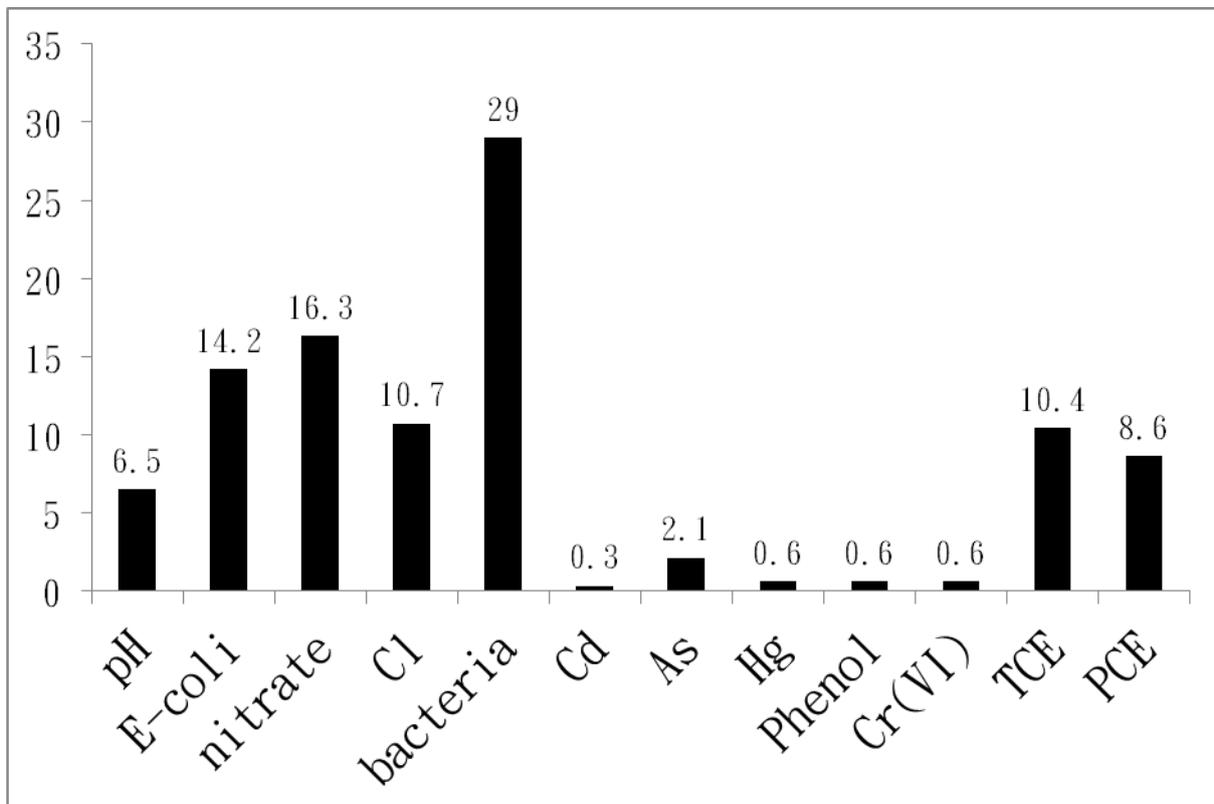
- a. Overall, 6.1% of total samples were exceeded the groundwater quality standards in 2009 (296 samples out of 4,847 samples)

	Overall	Pollution worrisome Areas	General Areas	National monitoring areas
2009 Rates of Exceeding Standards	6.1% (296/4,847)	10.5% (154/1,461)	3.5% (86/2,430)	5.9% (56/956)
2008 Rates of Exceeding Standards	6.9% (335/4,827)	9.7% (140/1,450)	5.4% (131/2,421)	6.7% (64/956)

- b. In 2009, samples exceeding standards for nitrate and bacteria were sharply decreased
- c. Rates of exceeding standards were higher in drinking groundwater samples than non-drinking groundwater
- d. Groundwater for industrial uses had higher rates (7.3%) to exceed the standards, followed by living (6.0%) and irrigation (4.4%) uses
- e. Groundwater is more contaminated by general pollutants (bacteria, nitrate, E-coli, Cl and pH) than the specific harmful substances (TCE, PCE, As, Hg, phenol, others)



f. Rates of samples exceeding the standards are shown below



g. Samples exceeding standards were 177, 99 and 62 from pollution worrisome areas, general areas, and national monitoring sites, respectively.

C. Management Strategies

- a. Groundwater exceeding standards is prohibited for general uses or ordered for remediation.
- b. Contaminated sites will be closed and substituted by another sites for monitoring
- c. Further education for analysts
- d. Systematic and scientific management strategies will be further implicated
- e. Special cares for sites where subjected to pollution with various substances
- f. All data are archived in the SGIS
- g. Extend the monitoring sites