

# Chapter 4: Groundwater Quality

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## GROUNDWATER QUALITY MONITORING

Groundwater quality monitoring was carried out at 81 monitoring wells in Peninsular Malaysia, 16 wells in Sarawak and 15 wells in Sabah (**Table 4.1**) as part of the National Groundwater Monitoring Programme that was initiated in 1997. The sites selected were according to the land use such as agricultural, urban/suburban, rural and industrial and special interests sites such as solid waste landfills, golf courses, resorts, animal burial areas, municipal water supply and ex-mining (gold mine).

## GROUNDWATER QUALITY STATUS

In 2009, 335 water samples were taken from these monitoring wells and analysed for volatile organic compounds (VOCs), pesticides, heavy metals, anions, bacteria (coliform), phenolic compounds, radioactivity (Gross Alpha and Beta), total hardness, total dissolved solids (TDS), pH, temperature, conductivity and dissolved oxygen (DO). The results were then compared with the National Guidelines For Raw Drinking Water Quality established by the Ministry of Health (Revised December 2000) (**Table 4.2**) to determine the status of its quality.



Green agricultural practices

From the monitoring results it was found that arsenic (As), iron (Fe), manganese (Mn), total coliform and phenol recorded the most number of samples in all categories of land use exceeding the guideline values. The least number of samples exceeding the guideline values were mercury (Hg), and chromium (Cr), cadmium (Cd), nitrate (NO<sub>3</sub>) and sulphate (SO<sub>4</sub>). There was no exceedance of copper (Cu) and zinc (Zn) recorded in all samples monitored. **Figure 4.1** shows the percentage of the samples exceeding the guideline values for all the parameters monitored.

Table 4.1 Malaysia : Distribution of Groundwater Monitoring Wells, 2009

Category	Number of Wells
Agricultural Areas	12
Urban/Suburban Areas	11
Industrial Sites	18
Solid Waste Landfills	25
Golf Courses	7
Radioactive Landfill	1
Rural Areas	5
Ex-mining Areas (Gold Mine)	3
Municipal Water Supply	9
Animal Burial Areas	14
Aquaculture Farms	6
Resorts	1
<b>Total</b>	<b>112</b>

Table 4.2 Malaysia : National Guidelines for Raw Drinking Water Quality (Revised December 2000)

Parameter	Symbol	Benchmark
Sulphate	SO <sub>4</sub>	250 mg/l
Hardness	CaCO <sub>3</sub>	500 mg/l
Nitrate	NO <sub>3</sub>	10 mg/l
Coliform	-	Must not be detected in any 100 ml sample
Manganese	Mn	0.1 mg/l
Chromium	Cr	0.05 mg/l
Zinc	Zn	3 mg/l
Arsenic	As	0.01 mg/l
Selenium	Se	0.01 mg/l
Chloride	Cl	250 mg/l
Phenolics	-	0.002 mg/l
TDS	-	1000 mg/l
Iron	Fe	0.3 mg/l
Copper	Cu	1.0 mg/l
Lead	Pb	0.01 mg/l
Cadmium	Cd	0.003 mg/l
Mercury	Hg	0.001 mg/l

Source:  
Ministry of Health,  
Malaysia

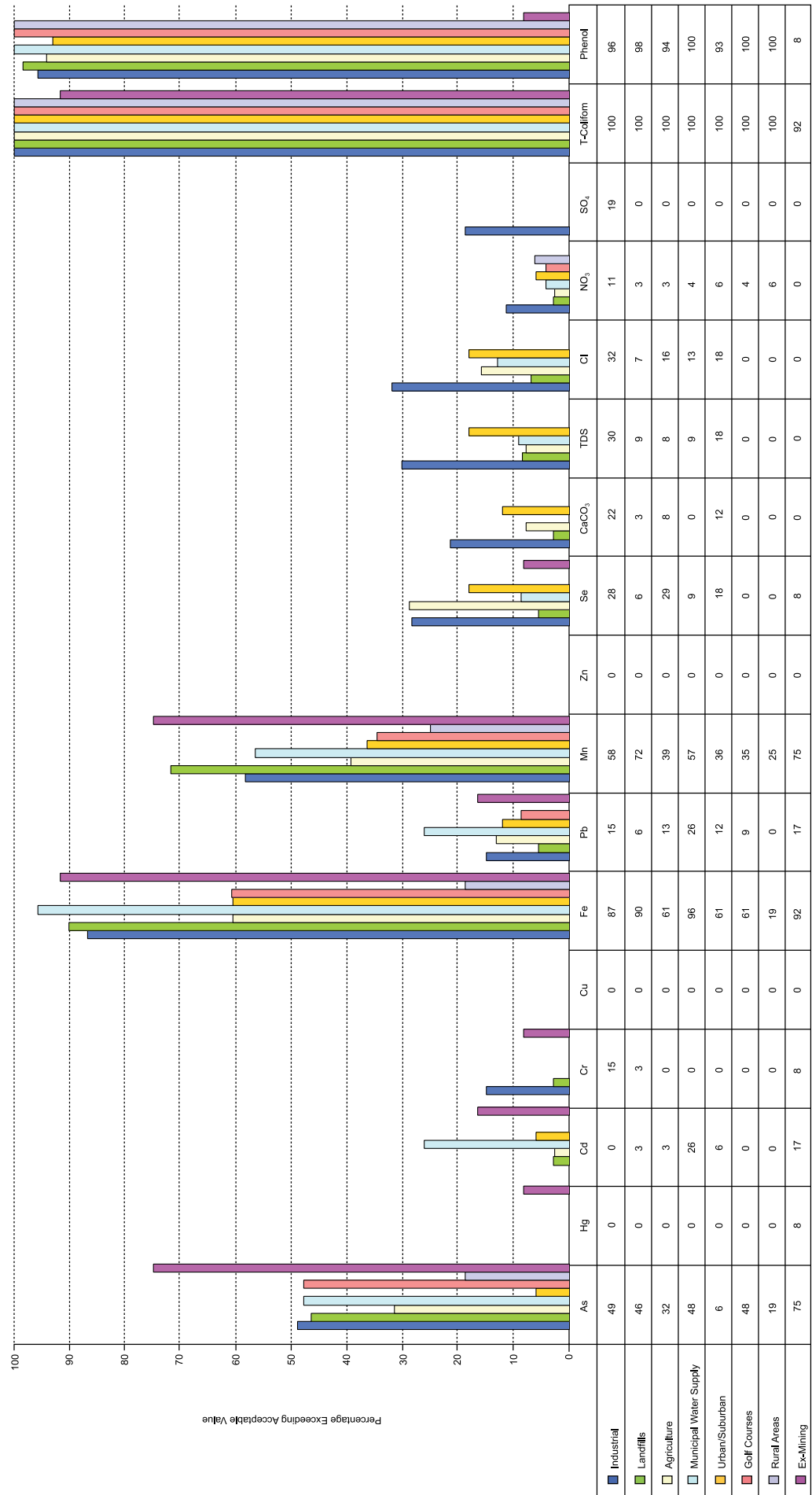


Figure 4.1 Malaysia : Percentage of Non-Compliance of Selected Contaminants by Land Use, 2009