

Scientists from Central Pollution Control Board (CPCB) and Centre for Science and Environment (CSE)-Pollution Monitoring Laboratory jointly collected soil samples from inside the former Union Carbide plant at Bhopal on October 29, 2009. In addition both institutions collected ground water samples from around the Union Carbide plant but these were collected separately. Samples were collected with a view to check contamination of the plant area and neighbouring localities for presence of heavy metals, pesticides, organochlorine and chlorinated benzene compounds. Collection of soil samples was done at eight locations mostly jointly by CPCB and CSE.

Results: In soil in Union Carbide factory

Heavy Metals: CSE found heavy metals namely arsenic, mercury, lead and chromium in varying concentrations in the soil. CPCB findings corroborate this and in fact **find higher amounts** (See table). Arsenic and chromium were detected in all the samples by both CSE and CPCB. Mercury was found in all the samples of CPCB. Heavy metal mercury was used as a sealant in the pesticide plant and chromium was used as a coolant in the cooling plant.

Pesticides: Presence of carbaryl was detected by CPCB in 75 per cent of samples. CSE detected it in 25 per cent of the soil samples tested. Aldicarb was detected by both CPCB and CSE in varying quantities. It must be mentioned that the only source of these pesticides in the area is the factory. Both are moderately persistent, highly toxic; highly water soluble and mobile in soils.

Organochlorines: Organochlorine compounds (alpha, beta, gamma and delta HCH) were detected in fairly large amounts by both CSE and CPCB in all the soil samples. HCH and its isomers are highly persistent and toxic organochlorine pesticides and presence of different isomers of HCH is because of its processing in the plant.

Chlorinated Benzene: In soil samples 1,3 Di chlorobenzene was detected by CPCB as well as CSE in all the samples. Chlorinated benzene compounds are highly persistent and were either used by Union Carbide as solvents or are degradation products of HCH.

Results: In ground water samples around Union Carbide factory

The results of the tests performed on 14 ground water samples by CPCB around Union Carbide factory in Bhopal show evidence of contamination by heavy metals, organochlorine and chlorinated benzene compounds. CSE also collected ground water samples but separately and found these compounds. CPCB found zinc, copper, a-HCH, g-HCH and d-HCH at a number of places in varying concentrations. A large number of the above compounds along with volatile organic compounds were detected in the ground water in Indira Nagar which is situated at a distance of 2.4 kilometers from factory site.

The following table reveals the extent to which some of the toxic compounds have permeated the soil.

Compound	Sample Location	CPCB (ppm)
a-HCH	Outside pond in dump site	14679.77
b-HCH	Outside pond in dump site	543.04
g-HCH	Outside pond in dump site	2030.14
d-HCH	Outside pond in dump site	1157.70
Mercury	Sevin plant	7995.83
Chromium	Sevin plant	451
Lead	Sevin plant	95

Conclusion: Findings of both CPCB and CSE confirm the high levels of contamination at the UCIL site and that it has spread far beyond the boundaries of the factory. Both the studies show very similar trends and pattern on the presence of various contaminants that were tested. Both studies corroborate that only source of contamination is the factory site and the waste stored there. Therefore a comprehensive clean up effort is needed to decontaminate the site and the affected areas.