

ENVIRONMENTAL AUDIT OF THE SITES IMPACTED BY THE “PROBO KOALA” TOXIC WASTE DUMPING IN ABIDJAN, CÔTE D’IVOIRE



This series of fact sheets was prepared as part of UN Environment's environmental audit of the sites impacted by the "Probo Koala" toxic waste dumping in Abidjan, Côte d'Ivoire. The fact sheets provide complete analysis results, observations and the recommendations for each of the sampling sites. They should be read in conjunction with the full assessment report, available at: www.unep.org/CotedIvoire

SITE 2: VRIDI CANAL 1 (CAP LOGISTICS)

Site Description

Site name: Vridi Canal 1 (Cap Logistics)
UN Environment site reference no: 2



Spill History

The site is located along the edge of a warehouse complex, within the large industrial zone along the Vridi Canal. Wastes from the Probo Koala were reportedly dumped into a partly open and partly culverted roadside drain, causing overflow from the drain onto the surrounding area a few meters away. In addition, some leakage is thought to have occurred as the waste flowed through the pipe, as it was not fully sealed. Clean-up efforts undertaken by Trédi in 2006-2007 included the replacement of the pipework, and the excavation of the surrounding soil. A company named EMEB-CI was contracted to carry out additional clean-up of the sites between October 2010 and June 2011, which comprised the replacement of the internal sanitation network and the cleaning of the manholes and pipes connected to the main network. There is now a high concrete-block wall along the road, separating the location where the wastes overflowed from the point where they were dumped.

Approach

Three soil samples were taken at this site: one from the existing drain and two from the overflow point on the warehouse grounds, including one surface (0-20 cm) sample and one 1 m-depth sample.

In addition, one air sample and one surface water sample were collected on this site.

Assessment Criteria

Based on the different analyses of the chemical composition of the samples taken onboard the Probo Koala in 2006, as well as those undertaken on samples collected on the dumping sites, UN Environment considered the following groups as the key contaminants of interest for the audit:

- Petroleum hydrocarbons;
- Sulfur compounds; and
- Heavy metals.

The speciation of contaminants to be analyzed within the above three groups was primarily determined by what was present in the Probo Koala waste as well as the environmental standards set by the Government of Côte d'Ivoire for clean-up. In addition, the impact of high levels of sodium hydroxide was measured through the pH value of the soil.

The results obtained from the analyses of **soil** samples were screened according to the following process:

1. Findings were first compared with relevant national standards. In this case, results for soil from all the sites where Probo Koala wastes were dumped and which had undergone remediation were compared with the environmental standards set by the Government of Côte d'Ivoire for clean-up operations conducted by Biogénie at Alépé. If the values obtained were lower than the standards set by the Government, UN Environment considered that no additional clean-up intervention was necessary on the site.

2. If laboratory results for a given parameter showed values exceeding the clean-up standards set by the Government or contractor, results were then compared with the internationally recognized Dutch soil remediation standards (intervention values) to see if further immediate action was needed from an environmental point of view. Dutch standards have been in existence for over 30 years and are used as a basis for contaminated site assessment and clean-up in many parts of the world, when local standards are not available. For most parameters of analysis, however, the Government's clean-up standard was more stringent than the Dutch values.
3. Results were also compared with the control sites to see if the observed pollution was also present in the background.

For **air** quality analysis, for which no national standards exist in Côte d'Ivoire, the approach taken was to compare air quality results from the affected sites with Control Site 21, some 69 km away from Abidjan near Agboville, where the impact of urban pollution was expected not to be felt.

It was not possible to compare **surface water** results as Côte d'Ivoire does not have a national standard for surface water quality, and surface water was not sampled at any of the control sites.

Laboratory Analysis Findings

Soil Parameters (mg/kg)	Site 2 Vidri Canal 1			Government standard (mg/kg)
	0-20 cm	1 m	0-20 cm	
Total Hy C5-C44	233	1.89	301	1,000
Benzene	< 0.009	< 0.009	< 0.009	1
Ethylbenzene	< 0.003	< 0.003	< 0.003	25
Toluene	< 0.002	< 0.002	0.00205	5
Xylene	< 0.009	< 0.009	< 0.00908	5
Total sulfur (%)	< 0.02	< 0.02	0.0395	10
Pb	40	4.6	150	400
Cd	0.17	< 0.1	0.21	20
As	20	2.4	7.6	37
Cr	76	11	59	130
Ni	24	3.3	23	140
Co	9.6	1.2	5.1	240
Hg	0.032	0.007	0.024	7
Cu	27	3	42	190
Zn	46	6	190	9,000
pH	7.57	7.3	7.03	

SITE 2: VRIDI CANAL 1 (CAP LOGISTICS)

Air		Site 2	Control site 21
Parameters/units		Vidri Canal 1	Agboville
Dimethyl sulfide	ppm v/v	< 0.1	< 0.1
Ethyl mercaptan	ppm v/v	< 0.1	< 0.1
Methyl ethyl sulfide	ppm v/v	< 0.1	< 0.1
Carbonyl sulfide	ppm v/v	< 0.1	< 0.1
Tertiary butyl mercaptan	ppm v/v	< 0.1	< 0.1
Hydrogen sulfide	ppm v/v	< 0.1	< 0.1
Methyl tert-butyl ether	µg/m3	ND	ND
Benzene	µg/m3	ND	ND
Toluene	µg/m3	54	ND
Ethylbenzene	µg/m3	ND	ND
m,p-Xylene	µg/m3	9.4	ND
o-Xylene	µg/m3	ND	ND
Naphthalene	µg/m3	ND	ND
TPH (C4-C6)	µg/m3	12	10
TPH (C6-C8)	µg/m3	100	20
TPH (C8-C10)	µg/m3	45	35
TPH (C10-C12)	µg/m3	75	53
TPH (C4-C12)	µg/m3	240	120
Aliphatic (C4-C6)	µg/m3	ND	ND
Aliphatic (C6-C8)	µg/m3	45	17
Aliphatic (C8-C10)	µg/m3	ND	31
Aliphatic (C10-C12)	µg/m3	73	53
Aromatic (EC5-EC7)	µg/m3	ND	ND
Aromatic (EC7-EC8)	µg/m3	54	ND
Aromatic (EC8-EC10)	µg/m3	43	ND
Aromatic (EC10-EC12)	µg/m3	ND	ND

Surface water Parameters (µg/l)	Site 2 Vridi Canal 1
	Surface water drain
Total Hy C5-35	23,700
Benzene	< 7
Ethylbenzene	< 5
Toluene	< 4
Xylene	< 11
Free sulfur	77.3
Pb	1,000
Cd	32.2
As	40
Cr	240
Ni	82
Co	17
Hg	2.3
Cu	280
Zn	1,800

Conclusions and Recommendations

The laboratory results show that the current concentrations of the contaminants of concern in soil are all below the standards set by the Government of Côte d'Ivoire for clean-up. Likewise, hydrocarbon levels in the sample analysed are all well below Dutch intervention values. Furthermore, pH values are not in the caustic range (9 or above), demonstrating that the impact of the disposal of caustic substances can no longer be detected.

The results of the air quality analysis can be summarized as follows:

- Mercaptans, hydrogen sulfide and related components cannot be detected for this site, nor the control site. This is significant considering that the key odorants in the Probo Koala wastes were most likely hydrogen sulfide and mercaptans.
- Concentrations of the various analytes at the affected site are comparable to the concentrations found at the control site.

Surface water quality results for Site 2 show high levels of hydrocarbons, which is indicative of industrial pollution from local sources. In addition, heavy metal pollution is observed in the surface water samples, which is also to be expected in urban industrial areas.

The following recommendation can be made to address these issues: while no further action is needed on this site to remediate the impacts of the 2006 toxic waste dumping from the Probo Koala, the Government should establish environmental monitoring systems for the Vridi industrial zone, based on sound environmental standards, to ensure that pollution is not draining into and further contaminating Ébrié Lagoon.

Site Photos



Source: UN Environment



Source: UN Environment



Source : UN Environment