

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

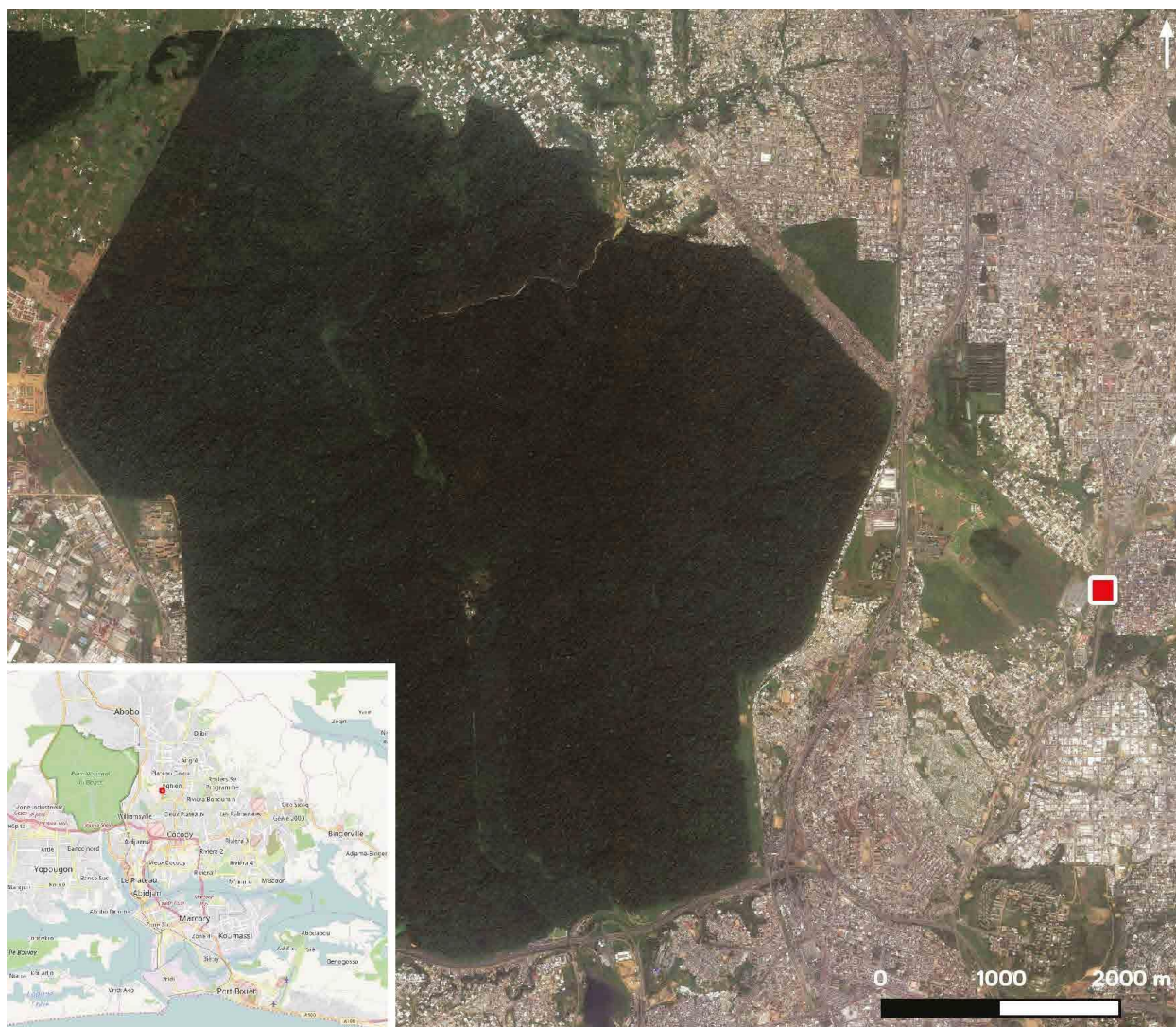


This series of fact sheets was prepared as part of UN Environment's environmental audit of the sites impacted by the “Probo Koala” toxic waste dumping in Abidjan, Côte d'Ivoire. The fact sheets provide complete analysis results, observations and the recommendations for each of the sampling sites. They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

SITE 16 : PLATEAU DOKOUI 1

Site Description

Site name: Plateau Dokoui 1
UN Environment site reference no: 16



Spill History

The spill site is located off the express way linking Adjamé and Abobo, and consists of a rainwater holding basin that has been completely re-engineered since the time of the dumping, and recently provided with a concrete dam, base and drainage channels. Wastes from the Probo Koala were reported to have been dumped directly into the basin. Remediation work conducted by Trédi in 2006-2007 included pumping contaminated water and excavating sediments from the basin for off-site treatment. At the time of sampling the water within the basin was almost completely covered with a thick layer of predominantly plastic waste, comprising mainly of soft-drink bottles and plastic bags.

Approach

Three sets of surface (0-20 cm) and 1 m-depth soil samples (6 samples in total) were taken from around the basin:

- The first was collected on the east side of the basin towards the north;
- The second set was taken towards the south-eastern end of the basin; and
- The third set was taken on the opposite side of the dam.

In addition, one air sample was taken and two surface water samples were taken from the rainwater holding basin.

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.

It was not possible to compare **surface water** results, however, 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 16 Plateau Dokoui 1						Government standard (mg/kg)
	0-20 cm	1 m	0-20 cm	1 m	0-20 cm	1 m	
Total Hy C5-C44	305	3.55	324	7.63	36.2	6.12	1,000
Benzene	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009	1
Ethylbenzene	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	25
Toluene	0.0023	< 0.002	0.00488	< 0.002	< 0.002	< 0.002	5
Xylene	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009	< 0.009	5
Total sulfur (%)	0.0278	0.0587	0.0925	0.0747	< 0.02	< 0.02	10
Pb	62	11	47	12	18	15	400
Cd	0.33	0.14	0.27	0.11	0.14	0.14	20
As	7.6	4.4	6.4	4.5	4	5.3	37
Cr	120	59	93	60	51	60	130
Ni	14	5.8	11	5.6	4.9	5.3	140
Co	3.1	0.94	2.4	1	0.87	0.89	240
Hg	0.21	0.069	0.16	0.065	0.044	0.056	7
Cu	28	5.5	21	5.7	6.3	5.6	190
Zn	180	13	140	23	19	15	9,000
pH	6.61	4.89	7.12	5.75	6.08	5.56	

SITE 16 : PLATEAU DOKOUI 1

Air		Site 16	Control site 21
Parameters/units		Plateau Dokoui 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	7.5	ND
Ethylbenzene	µg/m3	15	ND
Xylene	µg/m3	ND	ND
Naphthalene	µg/m3	ND	ND
TPH (C4-C6)	µg/m3	4.4	10
TPH (C6-C8)	µg/m3	21	20
TPH (C8-C10)	µg/m3	52	35
TPH (C10-C12)	µg/m3	56	53
TPH (C4-C12)	µg/m3	ND	120
Aliphatic (C4-C6)	µg/m3	130	ND
Aliphatic (C6-C8)	µg/m3	21	17
Aliphatic (C8-C10)	µg/m3	41	31
Aliphatic (C10-C12)	µg/m3	ND	53
Aromatic (EC5-EC7)	µg/m3	ND	ND
Aromatic (EC7-EC8)	µg/m3	ND	ND
Aromatic (EC8-EC10)	µg/m3	7.5	ND
Aromatic (EC10-EC12)	µg/m3	67	ND

Surface water Parameters (µg/l)	Site 16 Plateau Dokoui 1	
	Basin	Basin
Total Hy C5-35	422	-
Benzene	< 7	< 7
Ethylbenzene	< 5	< 5
Toluene	211	480
Xylene	< 11	< 11
Free sulfur	216	-
Pb	7	3
Cd	< 0.25	0.33
As	4.7	3.8
Cr	9.2	6.7
Ni	1.7	< 0.25
Co	1.2	1.9
Hg	0.52	5.4
Cu	12	5.3
Zn	49	29

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 well below Dutch intervention values. Furthermore, the 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. No further action is therefore needed on this site to remediate the soil impacts of the 2006 toxic waste dumping from the Probo Koala.

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

- Mercaptans, hydrogen sulfide and related components cannot be detected in 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 do not indicate high levels of hydrocarbons, nor significant heavy metal pollution.

Site Photos



Source: UN Environment



Source: UN Environment



Source: UN Environment



Source : UN Environment



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