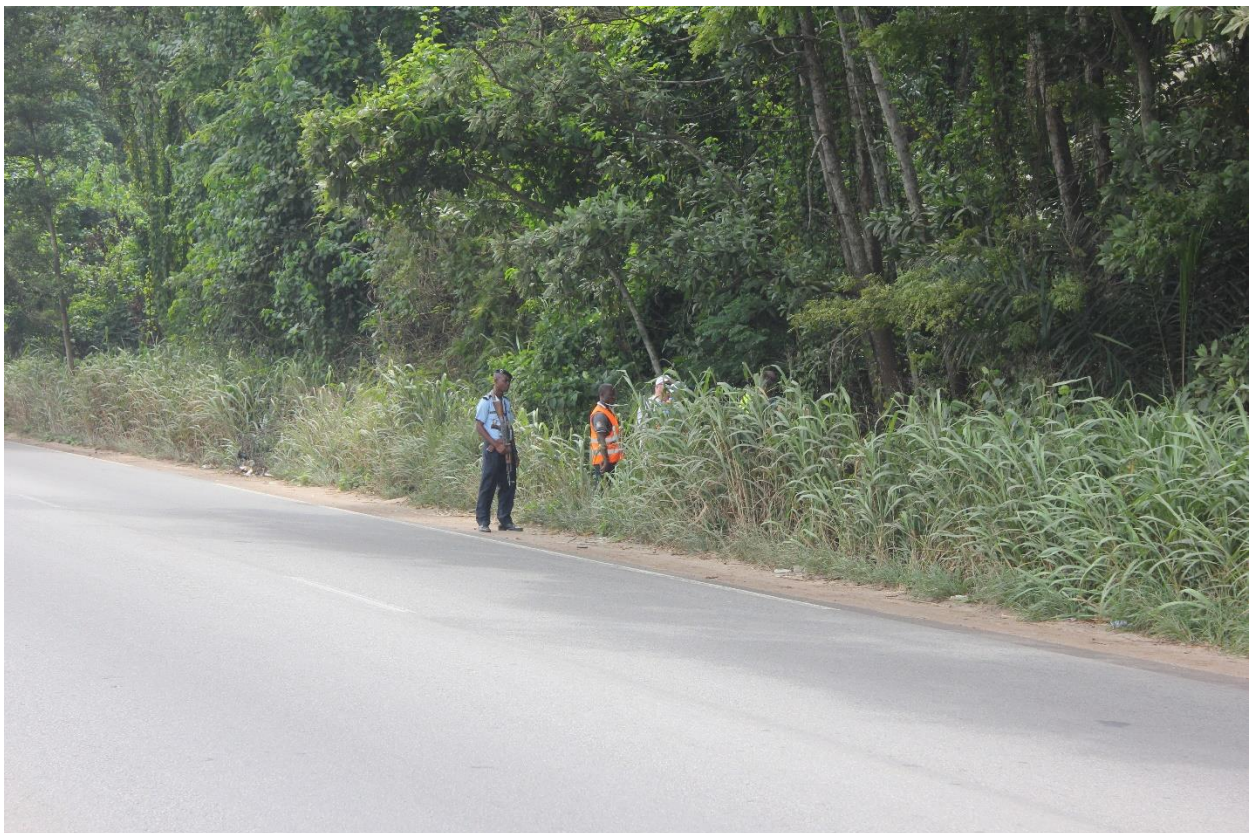


ENVIRONMENTAL AUDIT OF THE SITES IMPACTED BY THE "PROBO KOALA" TOXIC WASTE DUMPING IN ABIDJAN, CÔTE D'IVOIRE



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 6: MACA 2

Site Description

Site name: MACA 2

UN Environment site reference no: 6



Spill History

Wastes from the Probo Koala are reported to have been dumped onto the roadside at this site located some 3 km from Site 5 (MACA 1) on the busy Yopougon-Agboville road. The liquid wastes flowed down the steep, heavily vegetated, embankment into the Banco Forest, a national park. Partially remediated by Trédi following the dumping, this site was included on the list of sites requiring additional clean-up measures undertaken by Biogénie starting in 2010. In the course of these different clean-up phases, potentially contaminated material was excavated for off-site treatment, and the resulting void back-filled with clean soil.

Approach

Four soil samples were taken at this small site, including two composite surface (0-20 cm) soil samples; and two 1 m-depth samples.

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.

Laboratory Analysis Findings

Soil Parameters (mg/kg)	Site 6 MACA 2				Government standard (mg/kg)
	0-20 cm	0-20 cm	1 m	1 m	
Total Hy C5-C44	32.5	34.4	0.783	0.254	1,000
Benzene	< 0.009	< 0.009	< 0.009	< 0.009	1
Ethylbenzene	< 0.003	< 0.003	< 0.003	< 0.003	25
Toluene	< 0.002	< 0.002	< 0.002	< 0.002	5
Xylene	< 0.009	< 0.009	< 0.009	< 0.009	5
Total sulfur (%)	< 0.02	0.0235	< 0.02	< 0.02	10
Pb	11	12	8.6	8.9	400
Cd	0.15	0.11	0.17	0.16	20
As	3.7	3.2	3.9	3.8	37
Cr	52	41	53	54	130
Ni	3.9	3.3	3.9	3.8	140
Co	0.8	0.79	0.84	0.75	240
Hg	0.059	0.053	0.068	0.073	7
Cu	5.8	4.8	5.5	5.1	190
Zn	27	23	12	11	9,000
pH	4.26	3.64	4.01	3.95	

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 impacts of the 2006 toxic waste dumping from the Probo Koala.

Site Photos



Source: UN Environment



Source: UN Environment



Source: UN Environment