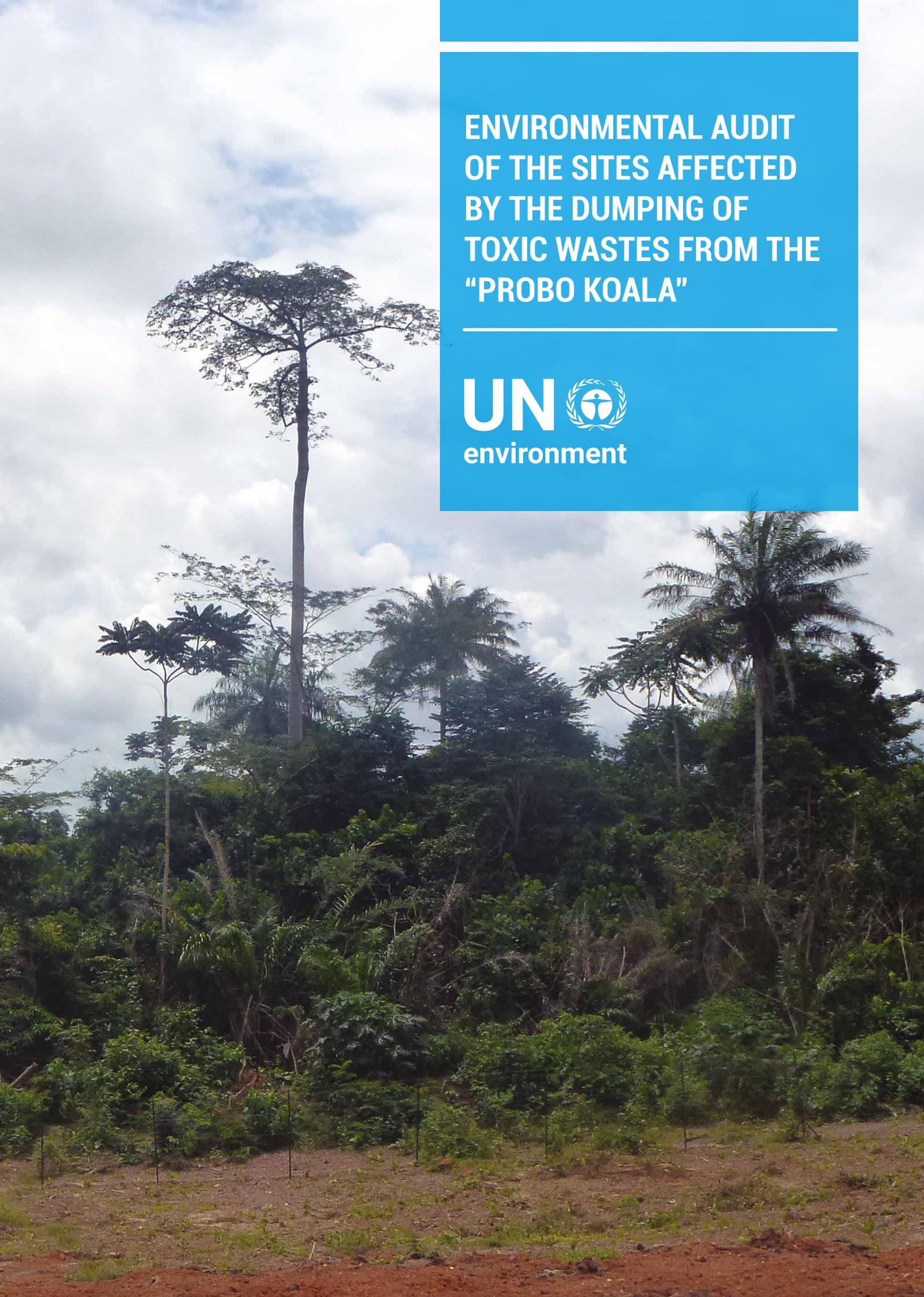


**ENVIRONMENTAL AUDIT  
OF THE SITES AFFECTED  
BY THE DUMPING OF  
TOXIC WASTES FROM THE  
“PROBO KOALA”**

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## Executive Summary

### Background

On 19 August 2006, the Probo Koala, a Panamanian-registered ship chartered by the shipping company Trafigura, off-loaded 528 cubic meters of liquid wastes in the port of Abidjan, Côte d'Ivoire. The wastes were reportedly generated as the by-product of an industrial process known as "caustic washing" of coker naphtha, an unrefined gasoline typically containing high levels of sulfur. The material was transferred onto tanker trucks operated by a local contractor, and dumped in twelve different locations around the city.

Within hours of the dumping, local residents, alerted by an overwhelmingly strong smell, reported experiencing a series of detrimental health effects, such as respiratory difficulties and eye and skin irritations. In the following weeks, over 100,000 people sought medical assistance from public health facilities for similar issues, as well as nosebleeds, digestive problems, nausea and vomiting, and other symptoms.

As a precautionary measure, the Government ordered schools in the affected areas to be closed, and for fruit and vegetables crops grown on or near dumping areas to be destroyed. Livestock raised in proximity to some dumping sites was culled, and fishing was banned in the bays of Ébrié Lagoon. Furthermore, anxiety and anger over the situation generated protests, road-blocks and violent demonstrations in various parts of the city.

A first phase of clean-up – during which the dumping sites were excavated and the excavated material was shipped to France to be incinerated – was carried out by the French company Trédi, starting in September 2006. In the ten years that followed the dumping, a number of additional clean-up and remediation activities were carried out by various actors, including by the Government of Côte d'Ivoire, which was still performing environmental monitoring of the sites at the time of writing. In spite of these initiatives, however, local populations have continued to express concern over the potential health and environmental impacts of the toxic waste dumping.

It is in this context that in June 2012, UN Environment received a formal request from the Government of Côte d'Ivoire to undertake an independent and scientific environmental audit of the sites that were impacted by the dumping of wastes from the Probo Koala. The Government wished for UN Environment to determine whether the sites continued to pose risks for the environment or for public health, and to make recommendations about additional or corrective clean-up measures that would need to be carried out in case contamination was detected.

### The UN Environment Audit

Following several scoping missions to gather background information and examine the practicalities of undertaking such an audit, a UN Environment team of four international experts was deployed to Abidjan in July 2016 to undertake sampling of soil, water, air, sediment, molluscs, fruit and vegetables at 18 sites considered to have been affected by the dumping of toxic wastes, as well as at three control sites. The samples were meticulously prepared, packed and shipped to three internationally accredited European laboratories for analysis.

A second mission was conducted in January 2017 to identify additional control sites, and carry out complementary sampling to fill specific analytical gaps and corroborate initial findings from the laboratory analysis. In both cases, the international experts were joined in the field by three experts from the Ivorian Anti-Pollution Center (CIAPOL), who had first-hand knowledge of the original dumping event and the subsequent clean-up and environmental monitoring initiatives.

Based on the different analyses of the chemical composition of the wastes carried out in 2006, UN Environment considered the following groups as the key contaminants of interest for the audit: (i) petroleum hydrocarbons; (ii) sulfur compounds; and (iii) heavy metals. In addition, the impact of high levels of sodium hydroxide was measured through the pH value of the soil.

## Conclusions

The results of the laboratory analysis that was undertaken on the 130 samples of soil, water, air, sediment, molluscs, fruit and vegetables that were collected by UN Environment clearly indicate the following for the different types of sites affected by the dumping of toxic wastes from the Probo Koala:

### Toxic wastes dumping sites

- None of the sites where wastes from the Probo Koala were actually dumped show contamination exceeding the limits set by the Government of Côte d'Ivoire for remediation. As a result, none of these sites require additional intervention, even when gauged against Dutch intervention values, which are among the most commonly used guidelines for contaminated site management and remediation worldwide.

### Dumping sites presenting other types of pollution

- Elevated levels of air and groundwater pollution parameters are found at Site 4 (Koumassi) as compared to the control sites. This reflects the lack of adequate environmental monitoring of the numerous small to medium-scale industrial plants in the area. While concentrations do not reach levels requiring emergency intervention, the results show Koumassi to be something of an "environmental hotspot" requiring Government attention and follow-up.
- As compared to the control sites, the municipal waste disposal site at Akouédo unsurprisingly shows elevated levels of several pollutants, including slightly elevated levels of cadmium in some vegetables grown on Site 12 (Akouédo 2).

### Other sites of interest

- The silos that stored the suspected contaminated maize within the autonomous port of Abidjan are free of any of the pollutants linked to the Probo Koala wastes.
- Site 8 (Agboville), where maize that was potentially indirectly impacted by Probo Koala wastes was composted, shows elevated levels of chromium. These levels are above both the standards used to monitor the composting process, and Dutch intervention values.

## Recommendations

Based on the conclusions above, the following specific recommendations can be made to the Government of Côte d'Ivoire:

- **Remediation of the Agboville maize composting site:** As two rounds of sampling have indicated that the site has elevated levels of chromium and that chromium is leaching into the drainage collection system, this site should be closely monitored. Access to the site should continue to be restricted, and sign boards should be put up warning people not to enter or harvest grass or vegetables from the site. Leachate from this site should be appropriately disposed of in a dedicated facility following comprehensive chemical analyses. Furthermore, the Government should review its contract and address the situation with the contractor. Additional sampling and risk assessment using a "source-pathway-receptor" model will be needed to determine what interventions are required at the site.
- **Due diligence needed for decommissioning of Akouédo municipal waste disposal site:** The Government has informed UN Environment that the municipal waste disposal site at Akouédo has been earmarked for closure for a long time. Once a closure date is selected, a comprehensive environmental due diligence survey should be conducted, including establishing systems for leachate collection and landfill gas monitoring. Land use restrictions, including on farming on the site, may also have to be put in place.
- **Environmental assessment of the Koumassi area:** Based on the contamination levels found in air and groundwater samples taken at Site 4, it is strongly recommended that the Government: (i) ensure that workers are provided with personal protection equipment and training on occupational health; (ii) establish guidelines on emissions controls and waste management for small and medium-scale industries; and (iii) undertake a comprehensive environmental assessment of the Koumassi area, comprising soil, water and air quality, as a basis for developing an action plan for mitigating impacts on public health.

More generally, while the environmental audit concludes that none of the sites where wastes from the Probo Koala were dumped show contamination exceeding the limits set by the Government or acceptable international standards, the following issues should be highlighted:

- Tens of thousands of people were impacted by the dumping of the toxic wastes from the Probo Koala in 2006. UN Environment's study focuses on whether the dumping sites continue to pose environmental and health risks to the populations living on or near them, and its conclusions on this count are reassuring. The findings, however, do not preclude that health impacts from their original exposure to the wastes in 2006 are still affecting communities. While it cannot be addressed through an environmental survey, the question of whether those who were impacted at the time of the dumping continue to suffer physiological or psychosomatic impacts is a critical one, particularly as systematic monitoring of affected populations has not taken place over the last decade. It is strongly recommended that the Government of Côte d'Ivoire undertake to review a representative selection of original cases and consider the need to establish a monitoring programme of the health of these communities.
- Although a number of measures have been taken by the Government to improve the monitoring and management of liquid wastes from ships in the ports, access controls to the municipal waste disposal site at Akouédo, which was the original target of the waste dumping, remain somewhat weak. The Government should undertake to further review its operating procedures for hazardous waste management and to ensure that adequate chain of custody procedures are enforced to prevent such events from occurring again.

- Moreover, the environmental monitoring systems and capacity built by UN Environment within CIAPOL in the aftermath of the toxic waste dumping event – which included the provision of state-of-the-art laboratory equipment – were lost during the post-electoral violence of 2010-2011, which devastated the institution. As a result, CIAPOL is no longer able to execute its mandate to its full extent. An assessment of CIAPOL was conducted in 2012 by the UNEP-DHI Centre on Water and Environment. The Government should draw on the recommendations of this assessment to restructure CIAPOL and provide it with additional resources to ensure that it can respond to current environmental challenges.

As evidenced in Koumassi, environmental “hotspots” are developing in Abidjan in the absence of effective surveillance. While these may not yet have major environmental and public health impacts, the consequences of this pollution may be rapidly felt in a fast-growing metropolis such as Abidjan.



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