CÔTE D'IVOIRE

A. Regulation on sources

Source of lead	Relevant legislation/regulation	Government agencies	Data source
1. Lead in paint	1. As of July 2020, Côte d'Ivoire has draft laws on lead in paint.	a. Government of Côte d'Ivoire	1. Overview of Lead Paint Laws in Africa, EPA
	No other standards found at this time for lead.		

B. International Agreements

Agreement	Year Ratified
1. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1994 (a)[1]
2. Rotterdam Convention on the Prior Informed Consent Procedure for certain hazardous Chemicals and Pesticides in international trade	2004
3. Minamata Convention on Mercury	2019
4. Stockholm Convention on Persistent Organic Pollutants	2004

[1] Accession (a)

C. Blood lead-level monitoring programs

Details	Data source
1. No details of a national or regional level structured program for blood lead level testing found. However, published studies point to some presence of testing programs at the local level.	1. Refer to section E on scientific papers that perform blood lead-level sampling 2. National Report: Lead in Enamel Decorative Paints in Côte d'Ivoire, 2015, JVE, UNEP, GEF, IPEN

D. Inventory of toxic sites (Toxic Sites Identification Program (TSIP), Pure Earth)

No sites identified at this time.

E. Scientific papers on lead exposure (Please contact info@gahp.net for information on studies not in the public domain)

Topic	Authors	Year	Title	Abstract/ description
Lead concentration	Kouakou, Adjoumani; Kouassi, N'guessan; Kouassi, Edmond; Trokourey, Albert; Yao, Benjamin; Adouby, Kopoin	2021	Lead concentrations in sediments and mollusc gastropod from Vridi Canal, Côte d'Ivoire	**Abstract:** Lead (Pb) is one of the most frequent and toxic contaminant in the environment. It can be bioaccumulated by marine organisms through contaminated sediments as well as their food chains. The current study aimed at investigating Pb occurrence in the sediments and gastropod P. haemastostoma from Vridi Canal. Sediment samples were taken using a Van Veen steel grab of 0.02 m2 area, sealed in plastic bags and transported to the laboratory at 4 °C. Gastropod P. haemastostoma species were collected manually using gloves, and then placed in polyethylene plastic bags. The different concentrations were determined using atomic absorption spectrometer Varian AA 20. The results showed seasonal variability of Pb concentrations in sediments and P. haemastostoma. In the both matrices, Pb exhibited the same trend in the distribution between the seasons. This study also mentioned that sediments were highly contaminated by Pb (54.27-134.71 mg/kg). Vridi Canal was found to be one of the most contaminated seaport area. Pb levels (49.55-104.19 mg/kg) in P.

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				haemastostoma exceeding the maximum permitted levels according to the United Nations Food and Agriculture Organization (FAO). This research demonstrated that sediments having lower ecological risk may be resulting in lower tissue Pb of P. haemastostoma.
Lead contamination	Marcellin, Yao; Bernard, Soro; Trokourey, Albert; Yobou, Bokra	2009	Assessment of Sediments Contamination by Heavy Metals in a Tropical Lagoon Urban Area (Ebrié Lagoon, Côte d'Ivoire)	**Abstract:** The metal contamination of the Ebrié lagoon sediments (Côte d'Ivoire) was assessed using lead, copper and zinc. The study was about three stations far from the urban direct thrusts: station st4 (4°04 W, 5°15 N), R1 (3°42 W, 5°16 N) and R2 (3°43 W, 5°13 N) and 6 stations left in the most polluted lagoon bays. The average contents (in mg/kg dry weight of sediment) were from 63,95 ± 34,82 to 188,63 ± 23,96 for lead, 18,01 ± 1,55 to 104,14 ± 13,42 for copper and 37,35 ± 16,71 to 490,53 ± 30,45 for zinc. The comparison of the values to those of the former studies revealed that the contents have been increasing in 19 years of a factor about 1,92 for lead, 1,44 for copper and 1,12 for zinc; what was allotted to the impact of the human activities which have not ceased intensifying these last decades. The seasonal variations of metals differ according to the station, in relation to the physicochemical conditions, the hydro dynamism and the nature of the contributions, which prevail in the area. The enrichment degrees calculated by means of the metal contamination index reveal that the sediments receiving the urban and industrial wastes are moderately to significantly contaminated, while those which are far from the rejections are less contaminated. The follow-up of metal pollution in bays of the Ebrié lagoon has become a necessity.
Lead in soil	Guety, Thierry; Kone, Brahima; Yao, Guy; Kouakou, Nestor; Kouame, Albert	2015	Concentrations of Cadmium, Copper, Lead and Zinc in Soils and Vegetable Organs from Periurban Agriculture Areas of	**Abstract:** Production quality in periurban agriculture is question mark regarding to soil potential contamination affecting yields. The level of contaminations of soils and vegetables by copper (Cu), zinc (Cu), cadmium (Cd) and lead (Pb) around Abidjan city were assessed. Survey was conducted in 2013 within cultivated areas of sweet potato and Hibiscus locally named "Dah" as encountered in three locations of Abidjan district (Port-Bouët, Yopougon and Bingerville) according to the intensities of industrial and commercial activities of which, Bingerville was the control site with lowest

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			Abidjan in Cote d'Ivoire	activities. Soil (0 – 20 cm) samples associated to that of plants (leaf, stem and root) were taken randomly for laboratory analysis. Toxic levels (> 8 mgkg-1) of Pb were significantly (p< .0001) determined in plant organs from Port-Bouët site indifferently to crops while, lower soil content of Pb (35.5 mgkg-1) than that of Yopougon (39.8 mgkg-1) was observed, however. Except the synergisms observed between leave concentration of Pb and soil contents of Cd, Cu and Zn, non of soil parameters were relevant for this while, the proximity of inland waters was suspected. The partitioning of Pb in plant organs pointed out phytoremediation potential of Hibiscus with lowest risk of toxicity (2.92 – 9.72 mgkg-1) in edible leave against an average of 8.08 mgPbkg-1 in the tuber of sweet potato. For strengthening consistence of knowledge, studies of Pb and Zn interaction as well as Pb translocation in tuber plants of tropical ecosystems were suggested.
	Koffi, Mathias; Saki, Justin; Kouadio, Ahou; Atse, Boua; Biego, Godi	2014	Accumulation of Cadmium, Lead, and Mercury in Different Organs of Three Tuna Fish Species from Coastal Zone of Cote d'Ivoire	**Abstract:** Heavy metals are dangerous to aquatic organisms and it can be bioaccumulated in the food chain leading to diseases in humans. Cumulative effects of metals or chronic poisoning may occur as a result of long term expose even to low concentrations. The accumulation of heavy metals conditions depending upon the species, environmental conditions and inhibitory processes. Considering the human health risk due to the consumption of fish, the concentration of three heavy metals lead (Pb), cadmium (Cd), and mercury (Hg) are investigated in six organs (muscle, kidney, liver, gonads, brain, and gills) of tuna fish species (Katsuwonus pelamis, Thunnus albacores, Thunnus obesus) samples collected from the coast zone of Cote d'Ivoire. The results showed that the highest concentrations of the three metals (Cd, Pb, Hg) were observed in the gills and the liver. The organ less contaminated was the gonads. The mercury was accumulated preferentially in the gills, kidney, and muscle, while the cadmium and the lead were accumulated respectively in the liver and the brain. These metal concentrations were below the limits set by the world health organization (WHO).

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Lead in water	Coulibaly, Safiatou; Atse, Boua; Koffi, Kouame; Sylla, Soumaila; Konan, Kouadio; Kouassi, N'Guessan	2012	Seasonal Accumulations of Some Heavy Metal in Water, Sediment and Tissues of Black-Chinned Tilapia Sarotherodon melanotheron from Biétri Bay in Ebrié Lagoon, Ivory Coast	**Abstract:** The seasonal accumulation of cadmium, copper, lead, mercury and zinc was determined in sediments, water, and black-chinned tilapia (Sarotherodon melanotheron; muscle, brain, kidney and liver tissues) collected monthly from Biétri Bay. The mean water concentration of metals (in mg L−1) ranged from 0.01 to 0.30 (mercury), 0.02–0.26 (cadmium), 2.40–4.80 (lead), 9.05–9.68 (copper), and 12.05–19.87 (zinc). The seasonal variations showed a significant difference in the levels of mercury, cadmium and lead among season. The highest mercury (0.30 ± 0.02 µg L−1), cadmium (0.26 ± 0.02 mg L−1) and lead (4.80 ± 1.03 mg L−1) levels were observed during dry season, while the lowest levels (0.21 ± 0.01, 0.02 ± 0.01 and 2.40 ± 0.02 mg L−1, respectively mercury, cadmium and lead) were measured during rainy season. The average cadmium (0.58 ± 0.36 mg L−1), copper (42.15 ± 19.40 mg L−1), lead (58.47 ± 38.10 mg kg−1), mercury (0.79 ± 0.47 µg kg−1) and zinc (187.58 ± 76.99 mg kg−1) concentrations determined in Biétri Bay sediments showed a similar trend as in water. The seasonal variations of mercury, cadmium and lead in tissues revealed that these metals were higher concentrated during dry and swelling seasons. The levels of zinc and copper followed by lead were higher in the tissues. The order of tissues metals concentrations was: kidney > liver > brain > muscle.

Papers in French

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Lead contamination	Traore, A; Soro, G; Ahoussi, KE; Bamba, BS; Soro, N; Biemi, J	2014	Niveau de contamination en métaux lourds des sédiments d'une lagune tropicale : la lagune Aghien (Sud-Est de la Côte d'Ivoire)	**Abstract:** Les besoins en eau du District d'Abidjan sont de plus en plus croissants à cause d'une démographie galopante, d'une urbanisation accélérée et de la pollution des eaux souterraines. La lagune Aghien qui est une lagune rurale non influencée par les rejets industriels pourrait servir comme une source alternative d'approvisionnement en eau potable des populations. Les sédiments sont des réservoirs de polluants susceptibles d'être relargués dans l'eau. L'objet de cette étude est d'évaluer le niveau de pollution des sédiments de cette lagune en métaux lourds tels que le cuivre, le cadmium, le fer, le zinc, l'aluminium, le mercure et le plomb. Ces éléments

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				ont été dosés par la méthode de la Spectrométrie d'Absorption Atomique (SAA). La méthode du calcul des facteurs d'enrichissement et l'analyse statistique multivariée ont permis de déterminer les origines de la contamination des sédiments et les facteurs qui engendrent son évolution spatio-temporelle. Les concentrations moyennes (en mg.k-1 poids sec) en métaux lourds dans les sédiments sont de 1,41 pour le plomb, 24182,05 pour l'aluminium, 646,32 pour le fer, 29,25 pour le zinc, 0,03 pour le cadmium, 0,54 pour le mercure et 145,71 pour le cuivre. Les concentrations de mercure et de cuivre sont supérieures à celles des sédiments non pollués qui sont respectivement de 0,3 mg.kg-1 et 33 mg.kg-1. Les sédiments de la lagune Aghien sont donc pollués par ces deux métaux lourds. Les facteurs d'enrichissement calculés à chaque station pour Cu, Zn, Cd, Al et Hg sont majoritairement supérieurs à 10. Ils mettent en évidence une prédominance des sources anthropiques de l'enrichissement de ces métaux dans les sédiments. Les sources anthropiques sont notamment les fertilisants utilisés dans les plantations situées sur les berges de la lagune, les déchets domestiques issus des villages riverains et les fermes d'élevages environnantes. Ces résultats sont soutenus par l'analyse en composantes principales qui montre que Cu, Zn, Cd et Al ont une origine anthropique et Fe, Pb et Hg , une origine terrigène.
Lead pollution	Kedi, Atole; Kouassi, Seka; Coulibaly, Vamoussa; Sei, Joseph	2021	Elimination de polluants des déchets liquides d'une unité de production de sucre par des argiles naturelles de Côte d'Ivoire	Abstract: L'impact des déchets liquides industriels sur l'environnement demeure une réalité et une menace pour la qualité des eaux souterraines et de surfaces. Parmi les méthodes de dépollution existantes, l'adsorption des polluants par les argiles naturelles reste une méthode moins couteuse, disponible et facilement utilisable. La plupart des études sur l'aptitude des argiles à éliminer les polluants est faite avec des déchets liquides artificiels dont les concentrations sont maitrisées. L'objectif de cette étude était d'éliminer les polluants dans les déchets liquides d'une unité industrielle agronomique (UIA) de production de sucre par deux argiles naturelles de Côte d'Ivoire. Trois sources de déchets liquides provenant des activités de laboratoire d'analyse des sols, de jus de canne et de canne à sucre de l'UIA. Le traitement aux argiles a montré des taux d'élimination à divers degrés des polluants. Les paramètres suivants ont été mesuré avant et après le traitement aux argiles : pH, conductivité, turbidité, phosphore total, azote total, cuivre, zinc, plomb et mercure. L'argile de Katiola présente des

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				aptitudes plus élevées à éliminer les polluants, comparée à l'argile d'Anyama. Cette étude confirme l'intérêt de l'utilisation des argiles pour la depollution.
Lead waste	Tape, Antoine; Coulibaly, Aboubakar; Anoh, Paul; Aloko, Jerome	2019	Production des Déchets et Santé des Travailleurs:Cas de la Mine d'or de Tongon (Côte d'Ivoire)	**Abstract:** Cette étude porte sur la production des déchets dans l'exploitation aurifère de Tongon en Côte d'Ivoire. L'objectif visé est d'évaluer l'incidence des déchets produits dans la mine d'or de Tongon sur la santé des travailleurs. La méthodologie de collectes de données était basée sur la recherche documentaire et la réalisation d'une enquête faite à partir d'un questionnaire. Sur la base d'un sondage stratifié, 297 travailleurs ont été retenus pour cette étude. Elle a permis de mettre en évidence les différents types de déchets miniers (ou industriels) produits et les pathologies qui seraient susceptibles d'y être liées. Ces déchets miniers sont constitués de roches stériles (résidus miniers) (82%), de terres contaminées (1%) et de boues (17%) renfermant du cyanure, de l'acide chlorhydrique, de l'arsenic, du plomb, du fer, du nitrate, du peroxyde d'hydrogène qui sont très néfastes pour la santé.L'étude révèle aussi que, les pathologies et les signes cliniques tels que les irritations oculaires (8%), digestives (14%), respiratoires (11%) et auditives (4%), les céphalées fréquentes (24%) et les lésions caustiques (17%) observées chez les travailleurs de cette zone d'étude pourraient être liées à l'exposition de ceux-ci et à la manipulation des intrants chimiques.

F. Blood testing in National Health Surveys

National Health Survey	Non-Communicable Diseases Risk-Factors Surveillance	Source
Purpose	Update demographic and health indicators and that of HIV/AIDS; to collect data on the knowledge and attitudes of women and men about STIs, AIDS and to assess recent changes in behavior, and to	Enquête Démographique et de Santé et à Indicateurs Multiples, 2011-2012, Ministère de la Santé et de la Lutte contre le Sida

	estimate the prevalence of HIV in the adult reproductive population.	
Sample size	Women aged 15-49 and men aged 15-59.	
Blood sample testing	To determine the existence of HIV/AIDS in blood.	
Latest round	2011-12	
Next round	-	