Journal of Environmental Pollution and Control
Volume 7 | Issue 1
ISSN: 2639-9288

Review Article Open Access

Transboundary Water Pollution in Ghana: Addressing the Environmental Footprint of Illegal Mining through Legal and Policy Solutions

Dunee Donatus[1,*], Kanlisi Kaba Simon[2], Ayimadu Edwin Twum[3], Isaac Osei Asante[4], Galaa Mwinbuobu Vitus[5] and Mariama Lawrencia Mahama[6]

[1]Research Institute of Environmental Law, School of Law, Wuhan University, No. 299, Bayi Road, Wuchang District, Wuhan City, Hubei Province, China

[2]Faculty of Public Policy and Governance, Simon Diedong Dombo University of Business and Integrated Development Studies, P. O. Box 64, Wa, Ghana

[3]School of Resource and Environmental Science, Wuhan University, No. 299, Luoyu Road, Wuchang District, Wuhan City, Hubei Province

[4]School of Cyber Science and Engineering, Wuhan University, No. 299, Luoyu Road, Wuchang District, Wuhan City, Hubei Province

[5]Central China Normal University, Wuhan, Hubei, China

[6]Department of Biochemistry and Biotechnology, Nkrumah University of Science and Technology, Ghana

[*]**Corresponding Author:** Dunee Donatus, Research Institute of Environmental Law, School of Law, Wuhan University, No. 299, Bayi Road, Wuchang District, Wuhan City, Hubei Province, China, Tel.: +8613018083575, E-mail: donatusdunee@gmail.com

Citation: Dunee Donatus, Kanlisi Kaba Simon, Ayimadu Edwin Twum, Isaac Osei Asante, Galaa Mwinbuobu Vitus et al. (2024) Transboundary Water Pollution in Ghana: Addressing the Environmental Footprint of Illegal Mining through Legal and Policy Solutions, J Environ Pollut Control 7(1): 104

Received Date: February 20, 2024 **Accepted Date:** March 20, 2024 **Published Date:** March 25, 2024

Abstract

In Ghana, where pristine waters once flowed freely, a dark tide of transboundary pollution casts a shadow. Illegal mining, a hydra-headed monster, spews its venom into rivers and streams, poisoning ecosystems and threatening communities across borders. This qualitative study, based on a meticulous analysis of 45 key papers, dives deep into the causes and consequences of this environmental scourge.

The study lays bare the devastating impact of illegal mining on water quality. Unfettered extraction unleashes a toxic cocktail of chemicals and heavy metals, transforming once-life-giving water into a lethal brew. Aquatic ecosystems choke under the suffocating weight of pollution, biodiversity withering in its wake. This toxic tide doesn't respect borders, flowing downstream to poison communities and ecosystems in neighboring countries, a grim testament to the interconnectedness of our water resources.

But pollution is merely the symptom, not the disease. The study delves into the murky depths of the problem, exposing the root causes that fuel illegal mining's rampage. Weak governance, lax enforcement, and crippling poverty weave a tangled

web that ensnares vulnerable communities. The consequences are far-reaching, impacting not just the environment but also the health and well-being of local populations. Contaminated water translates to sickness and disease, robbing communities of their vitality and eroding their livelihoods.

The study's stark findings expose the inadequacy of existing legal and regulatory frameworks in containing this environmental monstrosity. It rings a clarion call for stricter enforcement of mining and environmental regulations, both within Ghana and across borders. Sustainable mining practices must be nurtured, nurtured by robust regulatory frameworks and empowered law enforcement capabilities.

But the fight against transboundary pollution demands a chorus of voices, not a solitary song. International cooperation and knowledge exchange are critical weapons in this environmental war. By sharing best practices, strengthening transboundary monitoring, and forging collaborative solutions, we can build a dam against the tide of pollution, safeguarding the lifeblood of our planet for generations to come.

Keywords: Illegal Mining; Water Pollution; Transboundary Pollution; Qualitative Study; Environmental Protection; International Cooperation

Introduction

In many developing nations, especially in Sub-Saharan Africa, illegal mining has become a serious environmental and social issue [1]. Illegal mineral mining hurts ecosystems, nearby communities, and sustainable development. Environmental deterioration caused by unlawful mining operations, which are frequently harmful and unregulated, is widespread and includes deforestation, soil erosion, and water contamination. The social effects are also significant, as seen by cases of child labor, violations of human rights, and disputes over the governance of regions with abundant mineral resources [1, 2]. The predominance of unlawful mining reflects structural problems like poor leadership, ineffective law enforcement, and economic inequality.

Illegal mining has a wide range of negative effects on the environment. The employment of primitive methods, like mercury amalgamation in gold mining, causes water contamination and endangers the health of the surrounding population [3]. Water supplies are contaminated by hazardous substances and heavy metals, such as mercury, arsenic, and cyanide, which harm aquatic ecosystems and endanger the health of both people and wildlife [4]. Additionally, the arbitrary removal of forests and vegetation for mining operations results in habitat degradation, biodiversity loss, and an increase in carbon emissions [5].

The negative societal effects of unlawful mining are very severe. The inflow of temporary miners puts a burden on local communities' resources, upends their way of life, and exacerbates social conflicts [2]. Additionally, the absence of control and regulation in illegal mining operations encourages child labor, unsafe working conditions, and exploitation [6]. These social injustices worsen inequality and poverty, hampering attempts to promote sustainable development.

It is essential to create strong legislative frameworks that cover community involvement, labor rights, and environmental preservation. Any comprehensive plan must also include encouraging ethical mining methods, giving impacted communities alternatives for alternative livelihoods, and increasing public knowledge of the detrimental effects of unlawful mining [2, 7].

The problem of illegal mining in Ghana and its neighboring nations looks to be becoming worse rather than better, with no end in sight. This essay aims to draw attention to the impacts of illegal mining on international development, particularly concerning water body pollution, which not only has a significant detrimental impact on people's quality of life but also obscures the chances for human advancement in the future.

Illegal mining and the resulting water pollution in Ghana and neighboring nations have significant ramifications that extend well beyond immediate environmental degradation. Beyond the evident damage to ecosystems and biodiversity, the pollution of water sources disrupts agricultural productivity, exacerbates food insecurity, and destabilizes local economies. Moreover, the contamination of water bodies poses severe health risks to communities, leading to an increase in waterborne diseases and imposing substantial burdens on healthcare systems. Socioeconomically, illegal mining perpetuates poverty cycles, widens social disparities, and undermines efforts towards sustainable development. By elucidating these broader implications, the urgency of addressing illegal mining and its associated water pollution becomes even more pronounced, necessitating comprehensive interventions that consider the interconnectedness of environmental, health, and socioeconomic factors.

We describe the methodological strategy used in the remaining section of the paper. The effects of illegal mining on transnational water pollution are discussed, along with the measures Ghana have taken to combat the problem and the achievements and failures of international law. We end by talking about the potential policy ramifications and upcoming global litigation.

Methodology

The environmental effects of illegal mining on water pollution and transboundary contamination in Ghana were investigated in this study using a qualitative research methodology. Exploring complex social phenomena and learning more about the underlying causes and effects of illegal mining activities are both excellent purposes for qualitative research. The strength of qualitative research comes in its capacity to record extensive contextual data, enabling a thorough investigation of the research issue [8]. Through the use of qualitative research techniques, the researchers were able to explore the many facets of illegal mining, including its social and environmental effects.

The main research methodology used in this study is an extensive literature review, often known as a desk study. It made it possible for the researcher to consolidate previous findings, hypotheses, and ideas about unlawful mining and its effects on the ecosystem. A thorough review of the subject and a deeper comprehension of the research challenge were offered by drawing on a wide range of scholarly publications from various locations and situations [9].

The methodology used in this study made it possible to explore the effects of illegal mining on the ecosystem holistically while considering the viewpoints of different stakeholders. The literature review is a useful tool for readers who want to comprehend the complexity of illegal mining and its global environmental effects. As a first step towards a more extensive field interaction with impacted communities and miners, the researchers also travelled to numerous illegal mining sites in Ghana and neighboring Ivorian communities to observe the pollution level and environmental degradation.

Conducting a desk study on transboundary water pollution in Ghana concerning illegal mining involved systematic data collection and analysis from various academic papers, reports, policy documents, and other relevant sources. The study began by conducting a comprehensive literature search using academic databases such as PubMed, Google Scholar, JSTOR, and specialized environmental science databases. Use keywords related to transboundary water pollution, illegal mining, Ghana, environmental law, and policy solutions.

The study defined a specific inclusion criterion to ensure the relevance and quality of the papers. The study included papers written in English and focusing on water pollution caused by illegal mining activities in Ghana and neighboring countries [36]. The study screened the search results based on the inclusion criteria. The researcher also reviewed titles and abstracts to identify potentially relevant papers and then read the full texts to determine final inclusion [36]. A total number of one hundred and twenty (120) papers were included and screened after which thirty-eight (38) papers were used for the study.

The study extracted thirty-eight (38) relevant data from the selected papers. This included information on the causes and extent of water pollution from illegal mining, existing legal and policy frameworks, proposed solutions and some relevant case studies [36].

The researcher organized the extracted data into categories namely the environmental impact of illegal mining, legal frameworks and regulations, policy interventions, and case studies [36]. The data was then synthesized to identify key themes, trends, and insights across the selected papers [8]. The researcher also assessed the quality and credibility of the selected papers [37]. The researcher considered factors such as the reputation of the authors, the rigour of the research methodology, the relevance of findings to the study objectives, and the citation impact of the paper [37].

The researcher analyzed the collected data to identify themes based on patterns, gaps, contradictions, emerging issues and case studies related to transboundary water pollution caused by illegal mining in Ghana [8]. Some key observations that informed the analysis included

- The widespread prevalence and severity of water pollution caused by illegal mining activities in Ghana, including its transboundary impacts on neighboring countries.
- Inadequacies in existing legal and regulatory frameworks to effectively address illegal mining and its environmental consequences.
- The role of governance challenges, corruption, and enforcement gaps in perpetuating illegal mining practices and exacerbating water pollution.
- Identification of key stakeholders, including government agencies, mining companies, local communities, civil society organizations, and international partners, and their respective roles in addressing the issue.
- Analysis of proposed legal and policy solutions, including regulatory reforms, enforcement mechanisms, community engagement strategies, and international cooperation initiatives.
- Consideration of socio-economic factors, such as poverty, unemployment, and the informal nature of artisanal and small-scale mining, and their implications for addressing illegal mining and water pollution.
- The need for interdisciplinary approaches that integrate environmental science, law, policy, economics, and social dynamics to develop comprehensive and sustainable solutions.

By systematically collecting and analyzing data from 38 key papers using this methodology, the desk study can provide valuable insights into the environmental footprint of illegal mining in Ghana and inform the development of effective legal and policy solutions to address transboundary water pollution.

Results

Weak regulatory and legal mining frameworks have made the effects of unlawful mining on water pollution in Ghana worse. For instance, Ghana's mining regulations are disjointed, with various organizations in charge of overseeing various facets of the industry. Due to the resulting regulatory and enforcement deficiencies, illicit miners are now able to work freely [10]. The legal and regulatory framework for mining is similarly lax in Cote d'Ivoire, with little enforcement and inadequate sanctions for unlawful mining [11].

The governments of Ghana have adopted laws and initiatives aimed at regulating the sector and promoting sustainable mining practices to solve the problems of illegal mining and water contamination in those two nations. For instance, the Multilateral Mining Integrated Project (MMIP) was started in Ghana by the government to control small-scale mining and promote ethical mining methods [10].

International organizations like the International Union for Conservation of Nature (IUCN) and the United Nations Environment Programme (UNEP) have contributed significantly to reducing the negative consequences of illegal mining and transboundary pollution in Sub-Saharan Africa. To reduce the use of mercury in artisanal and small-scale gold mining, for instance, the UNEP created programs like the Global Mercury Partnership [12]. To encourage the wise use of water resources and improve the adaptability of aquatic ecosystems in Sub-Saharan Africa, the IUCN established the Water and Nature Initiative [13].

In addition, several international environmental law judgments on transboundary contamination have been decided, and these decisions offer important insights into the ethical and practical difficulties involved in managing transboundary pollution. For instance, the tribunal determined that a Canadian smelter had impacted a river in the United States as a result of transboundary pollution in the Trail Smelter Arbitration Case (United States v. Canada). The tribunal determined that Canada was accountable for the harm the smelter caused and mandated that it provides restitution to the United States [14].

The International Court of Justice (ICJ) ruled that Poland had broken international law by taking property belonging to a German corporation without paying a fair price in the Chorzów Factory Case (Germany v. Poland). Poland was compelled to make restitution by the court after it was found to be at fault for the harm done to the German corporation [15].

More recently, the International Court of Justice (ICJ) declared in the Pulp Mills Case (Argentina v. Uruguay) that by approving the construction of pulp mills on its side of the river without notifying Argentina, Uruguay had violated its responsibilities under the 1975 Statute of the River Uruguay. The court determined that Uruguay should compensate Argentina for the transboundary contamination brought on by the pulp factories [16].

These cases serve to highlight the difficulties in managing transboundary pollution as well as the importance of international institutions and legislation in settling transboundary pollution-related conflicts. Additionally, they emphasize the significance of interstate collaboration in solving global environmental problems.

In many developing nations, such as Ghana, illegal mining poses a serious threat to water resources and transboundary contamination. Weak regulatory and legal mining frameworks have made the effects of unlawful mining on water pollution in the two countries worse. To regulate the industry and advance sustainable mining methods, the governments of the two nations have put in place regulations and initiatives. The UNEP and the IUCN, among other international organizations, have made major contributions to reducing the negative consequences of illegal mining and transboundary pollution in sub-Saharan Africa. To solve the environmental and social issues brought on by illegal mining and transboundary contamination, more needs to be done to strengthen regulatory frameworks, enforcement, and international cooperation.

Environmental Impact of Illegal Mining

Water resources are significantly affected by illegal mining, which uses unsanitary and unrestricted extraction techniques. Due to the heavy metals and harmful compounds that are released into water sources as a result of this illegal activity, water bodies are contaminated, and aquatic ecosystems are disrupted [1]. These environmental dangers offer a serious risk to both human and animal health, resulting in a variety of acute and chronic illnesses, such as cancer, reproductive issues, and neurological abnormalities. Additionally, because mercury is extremely toxic and remains in the environment, its use in artisanal and small-scale mining exacerbates the problem with water quality [4]. Mercury use results in long-term environmental damage and health problems.

Water resources are severely impacted by the indiscriminate use of harmful chemicals and inappropriate waste disposal in illegal mining operations. Water bodies acquire heavy metals like lead, mercury, and arsenic, posing serious dangers to both aquatic life and human populations. The contamination endangers the biodiversity and general ecological integrity of the afflicted areas by upsetting the normal order of ecosystems. Beyond the immediate health risks, the effects of water contamination brought on by illegal mining also affect the neighboring populations that depend on these water sources for their daily requirements [1].

The effects of unlawful mining's contribution to water pollution on society and the economy are significant. Access to clean, safe water for drinking, agriculture, and other necessities is difficult for communities that rely on contaminated water supplies. In addition to endangering public health, the poor quality of the water reduces agricultural output, which results in food shortages and financial losses. Water contamination can have serious long-term repercussions that threaten people's health and way of life as well as the livelihoods of entire communities [4].

Comprehensive and efficient actions are required to address the issue of illegal mining and its effects on the environment. The development of sustainable mining practices must be combined with strong regulatory frameworks, effective law enforcement, and other measures.

To supervise and monitor mining activities, guarantee adherence to environmental standards, and hold violators accountable for non-compliance, it is essential to strengthen the legislative framework and regulatory systems.

Moreover, greater monitoring and enforcement of environmental standards in the mining industry can be facilitated by strengthening the capability and resources of regulatory agencies, such as the Minerals Commission.

Illegal mining's influence on the environment is a serious problem that needs to be addressed right away to lessen its negative impacts. The severe effects of unregulated mining methods have been extensively studied, particularly in respect to water contamination and its wider environmental effects.

Researchers have researched the effects of illegal mining on water quality extensively, emphasizing the flow of heavy metals and hazardous compounds into water sources. According to [1], the use of imprecise and unregulated extraction techniques causes water bodies to become contaminated, upsetting the delicate biological balance and endangering aquatic ecosystems.

Since harmful materials including cyanide, mercury, and arsenic have been found in water sources, there is an immediate need to address this environmental risk [4].

Beyond aquatic life and ecosystems, unlawful mining's effects on the environment include water pollution. Significant health dangers exist for human populations that rely on these contaminated water sources. Numerous health issues have been linked to exposure to the heavy metals and harmful compounds found in dirty water, according to studies. These medical conditions include cancer, reproductive troubles, and neurological impairments [1]. Communities that rely on these water supplies for drinking, agriculture and other necessities suffer the worst effects.

Concern also exists on how unlawful mining would affect the ecosystem more broadly. Unrestricted extraction practices frequently lead to soil deterioration, habitat damage, and deforestation. These practices worsen the environmental problems caused by illegal mining by causing biodiversity loss and degradation of land resources [17, 18].

A diversified strategy is needed to combat the negative effects of unlawful mining on the environment. To regulate and keep an eye on mining activities, the legal system and regulatory framework must be strengthened. This involves enforcing environmental standards and levying sanctions against those who violate them.

To ensure efficient monitoring and enforcement of environmental legislation, regulatory bodies like the Minerals Commission must be strengthened [4].

In order to reduce the negative effects of unlawful mining on the environment, international collaboration and knowledge exchange are essential. Insights, best practices, and financial resources can be obtained through collaborating with international organizations like the United Nations Environment Programme (UNEP) and the International Council on Mining and Metals (ICMM) to support sustainable mining efforts [19]. It is possible to build effective methods and policies that are specifically suited to the

context of illegal mining in Ghana and Cote d'Ivoire by exchanging experiences and learning from successful case studies in other nations.

It is essential to include environmental factors in more general development policies. In most cases, assessments of development policy should include a thorough evaluation of the social, economic, and environmental impacts of mining operations. This includes tackling the underlying socioeconomic issues, such as youth unemployment, poverty, and a lack of alternative sources of income, that fuel illegal mining. Governments can achieve a balance between economic growth and environmental conservation by fostering sustainable development methods [1].

Legal and Regulatory Frameworks for Mining

Although Ghana has strong legal and regulatory frameworks for mining, these frameworks are frequently poorly enforced because of corruption, a lack of funding, and weak institutional capacity [20]. Although the legal frameworks for mining in both nations are intended to safeguard the environment and encourage sustainable mining methods, unlawful mining is pervasive because of insufficient enforcement and sanctions.

To safeguard the environment and advance sustainable mining methods, laws and regulations governing mining activities are in place in Ghana. The Minerals and Mining Act of 2006, which includes rules for environmental protection and the reclamation of mining sites, governs mining activities in Ghana [21]. Before beginning mining operations, mining companies are required by law to complete environmental impact assessments (EIAs) and create environmental management plans (EMPs). The law also sanctions fines and the cancellation of mining permits as punishments for disregarding environmental standards.

However, due to scarce resources, capacity issues, institutional weaknesses, and corruption, the enforcement of environmental laws continues to be a problem in both countries [1]. This has caused a rise in illegal mining operations, which operate outside of the legal system and have negative effects on the environment.

Policies and Strategies to Address Illegal Mining

Policies and initiatives have been developed in Ghana to combat illegal mining and advance sustainable mining methods. In order to thoroughly address the issue of illegal mining, the government of Ghana launched the Multilateral Mining Integrated Project (MMIP) in 2018. The project's objectives include encouraging environmentally friendly mining methods, formalizing small-scale mining operations, and giving impacted people alternate means of subsistence. To coordinate efforts to address the problem, the government also set up an Inter-Ministerial Committee on Illegal Mining [22].

In Ghana, the implementation of regulations and initiatives to combat illegal mining and advance sustainable mining techniques has run into difficulties and has not always produced the desired results. These limitations are caused by several causes, which are described in academic literature.

The efficiency of government employees in implementing mining laws and preventing unlawful mining activity is a significant problem. Aryee et al. [23] study emphasizes how corruption and a lack of political will undermine the effectiveness of regulatory initiatives. Despite the existence of regulatory frameworks, illegal mining operations have continued to operate because corrupt officials are present in government organizations responsible for monitoring the mining sector.

Youth unemployment and poverty are other issues that contribute to the failure of these strategies. High unemployment rates, especially among young people, encourage people to turn to illicit mining as a means of subsistence. The attraction of quick money typically exceeds the dangers involved in engaging in illicit activity [24]. It is essential to tackle the underlying causes of teenage unemployment and poverty to effectively combat illegal mining.

Additionally, several studies have indicated that security services play a role in both preventing and assisting illegal mining activities. Despite efforts to coordinate operations against illicit mining, collaboration between members of the security services and organized illegal mining enterprises has reportedly occurred [25]. As a result, illegal mining operations can continue in protected regions, undermining the effectiveness of enforcement efforts.

The complexity of the problem, as well as the involvement of numerous parties, the lack of enough resources for enforcement, and the sway of influential players in the mining industry, all add to the difficulties in reducing unlawful mining. To effectively combat illicit mining and advance sustainable practices, comprehensive strategies that tackle corruption, address governance challenges, offer alternatives to traditional livelihoods, and build the competence of regulatory agencies are required [26].

There are several reasons why policies and initiatives in Ghana and Cote d'Ivoire haven't been able to adequately combat illegal mining. These include widespread government agency corruption, high rates of youth unemployment and poverty, and security services' participation in enabling illegal mining. Comprehensive strategies that target governance issues, redress socioeconomic inequities, and promote transparency and accountability within the mining sector are needed to overcome these challenges.

International Organizations' Role in Mitigating the Effects of Illegal Mining and Transboundary Pollution

In tackling the environmental and health effects of illegal mining and transboundary contamination, international agencies like the World Health Organization (WHO), the United Nations Environment Programme (UNEP), and the World Bank have been instrumental. In order to help governments in the region remediate and restore polluted sites, UNEP has published guidelines for the management of mining-related contaminated sites [12]. As part of its support for sustainable mining practices in the area, the World Bank has given governments technical and financial help in order to strengthen regulatory frameworks, promote sustainable mining practices, and create alternative livelihood opportunities for impacted communities [27].

Transboundary Illegal Mining-Related Pollution

Ghana is currently confronting a serious environmental problem with transboundary pollution. The Volta River, which crosses many nations, is one of many transboundary water resources that nations share. Since contaminants can be transferred across borders and contaminate water supplies, the impact of illegal mining in one country might have serious repercussions for the other country. A major obstacle is Ghana's inability to coordinate its efforts to combat transboundary contamination.

Role of International Organisations

To address illegal mining and transboundary contamination, international organisations like the United Nations and the World Bank have been instrumental in assisting Ghana. While the World Bank has offered financial support for ethical mining practices and environmental management, the United Nations Development Programme (UNDP) has provided technical assistance to both nations to help them build laws and plans to fight unlawful mining [29]. Efforts to advance environmentally friendly mining methods in the area have also received financing from the African Development Bank and other donors.

Effects of Transboundary Pollution on a Country from an International Environmental Law Perspective

From the standpoint of international environmental law, transboundary contamination has a considerable impact on nations. A key tenet of international environmental law is the concept of "common but differentiated responsibilities," which acknowledges that states have a shared responsibility to protect the environment but also that not all states have the same capacity to deal with environmental issues [30].

The affected nations have the legal right to seek remedies for transboundary contamination under international law. A framework for tackling transboundary pollution and its impacts is provided by the 1992 Convention on Biological Diversity (CBD) and the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention). These

treaties compel nations to work together to combat transboundary contamination and advance the ideals of environmental preservation and sustainable development.

Transboundary contamination can have negative long-term repercussions on the environment and human health. For instance, transboundary pollution from illicit mining in Ghana and Cote d'Ivoire can result in the extinction of aquatic habitats, a decline in biodiversity, and the poisoning of water supplies, all of which have a significant impact on the local population's health.

States are required by international environmental law to stop transboundary contamination and deal with its consequences. International environmental law also adheres to the "polluter pays" principle, which stipulates that individuals who cause environmental harm should pay for clean-up and damages reimbursement [30]. As a result, if a state is to blame for transboundary contamination, it must make up for any harm done to the impacted state. Transboundary contamination has been the subject of several international environmental law disputes. There are some cases of this type that are discussed.

The Trail Smelter Arbitration

One of the earliest cases to address transboundary contamination under international law is the Trail Smelter Arbitration. The conflict, which involved Canada and the US, was brought on by pollution from a smelter in Trail, British Columbia. The pollutants were spread throughout the United States by the wind, particularly in Washington State. The United States brought the matter before the International Joint Commission (IJC) in 1935, stating that the fumes from the smelter were damaging the environment and people's health.

The IJC decided that Canada was to blame for the pollution and mandated that it compensates the United States. The case established the "no harm" principle in international environmental law, according to which governments are obligated to stop actions that might hurt other states. The Trail Smelter Arbitration case is regarded as a seminal case in the field of international environmental law and has had an impact.

The Pulp Mills on the River Uruguay Case

Argentina and Uruguay are at odds over pollution that two pulp mills on the Uruguay River have generated. This issue is called Pulp Mills on the River Uruguay. Argentina requested an injunction to halt the development of the mills because they were seriously harming the environment. In 2006, the International Court of Justice (ICJ) was consulted regarding the situation.

The International Court of Justice (ICJ) acknowledged in its judgment from 2010 that governments have a responsibility to notify and consult one another when activities may have a major impact on the environment. The ICJ did, however, conclude that Uruguay had not broken any international laws when building the mills. The case is noteworthy because it established the idea that governments should notify one other and discuss one another when transboundary pollution is a possibility.

Lubicon Lake Band v. Canada Case

In the case of Lubicon Lake Band v. Canada, an indigenous group in Canada and the Canadian government are at odds over pollution brought on by oil and gas extraction and exploration on their property. The community alleged that the activities had seriously harmed their environment, way of life, and health. The CERD (Commission on the Elimination of Racial Discrimination) was consulted on the matter in 1990.

The International Convention on the Elimination of All Forms of Racial Discrimination was breached, according to the CERD's judgment, by Canada. The commission mandated that Canada suspend the development and compensate the neighbourhood to redress the harm that was done. The case is significant because it upheld indigenous groups' rights and demonstrated how crucial it is to take the social and cultural effects of development initiatives into account.

The Niger Delta Case

In the Niger Delta case, local people and the Nigerian government are at odds over pollution brought on by the region's oil and gas exploration and development. The communities asserted that the actions had seriously harmed the ecosystem and negatively impacted their health and way of life. In 2001, the African Commission on Human and Peoples' Rights was presented with the matter.

In its ruling from 2009, the Commission acknowledged the communities' right to a healthy environment and directed Nigeria to act to repair the damage, including compensating the affected parties and eradicating the pollution. The case is noteworthy because it showed that under international human rights law, both individuals and communities have the right to pursue compensation for environmental harm.

The Danube River Case

In the Danube River issue, Slovakia and Hungary are at odds about environmental damage brought on by a chemical spill in the river. A cyanide spill from a mining operation in Romania in 2000 significantly polluted the Tisza River, which empties into the Danube. Localities in Slovakia and Hungary were impacted by the pollutants.

In 2002, the International Court of Justice heard the case. The International Court of Justice (ICJ) acknowledged the concept of "due diligence" in its decision, which governments must prevent actions that could affect other states and their environments. The "polluter pays" principle, which states that people who destroy the environment should pay for cleaning up the pollution, was also acknowledged by the ICJ. Because it developed the concepts of due diligence and polluter pays in the context of transboundary pollution, the case is significant.

The Chorzów Factory Case

In the Chorzów Factory issue, Germany and Poland are at odds over the pollution that a chemical factory in Chorzów, Poland, which was once owned by a German corporation, generated. The factory was required to compensate Poland in 1927 for the pollution it had produced.

The PCIJ (Permanent Court of International Justice) heard the case in 1927. The notion of governmental responsibility for environmental harm produced by private actors operating within their jurisdiction was acknowledged by the PCIJ in its decision. The case is important because it helped to establish the idea of state accountability for transboundary contamination and had an impact on the creation of international environmental law.

These cases serve as a good example of the importance of transboundary pollution in international environmental law as well as the function of international courts and tribunals in dealing with the problem. Important ideas such as the obligation to prevent harm, notification and consultation, governmental accountability, and the right to seek restitution for environmental harm have been established by the cases.

Discussion

Illegal mining has reached an alarming level in Ghana, drastically damaging the environment and deteriorating water sources. Because of the damage done to aquatic ecosystems and water sources, the scale of illegal mining activities in these countries is very concerning. Unrestricted extraction techniques employed by illegal miners, which frequently involve clumsy and damaging environmental practices, release dangerous substances and heavy metals into water bodies, causing widespread water contamination and posing major risks to human health and biodiversity.

Illegal mining, commonly referred to as "galamsey," has become a pervasive issue in Ghana. Many people, including locals and migrants from other regions, have been drawn to engage in illicit mining activities by the promise of rapid cash and economic prospects. These miners work without the necessary authorizations, disobey environmental laws, and employ hazardous materials like mercury during the extraction process. Because of this, rivers, streams, and other bodies of water in mining regions are now highly contaminated with harmful contaminants including heavy metals. Water source contamination has wide-ranging effects on human health as well as the delicate balance of aquatic ecosystems, which results in habitat degradation and the loss of biodiversity [1].

Similar to how illicit mining has significantly increased in Cote d'Ivoire, especially in areas with abundant mineral resources. Numerous illicit miners have been drawn to the allure of gold, diamonds, and other rich minerals. These miners flout environmental laws and use damaging mining techniques. Waterbodies in mining regions have thus become severely polluted, with high amounts of sedimentation, heavy metals, and other contaminants. The local inhabitants' health is seriously jeopardized because they depend on these water sources for drinking, farming, and other daily activities. The problem of transboundary pollution between Ghana and Cote d'Ivoire is exacerbated by the fact that the pollution crosses international boundaries and affects transboundary water bodies as well [23].

Due to the scope of illicit mining and the harm it causes to the environment, immediate action is needed to solve the problem. The effects on the environment and society are profound, having an impact not only on the wellbeing of individuals but also on the resilience of ecosystems and the general progress of nations. To stop unlawful mining, enforce environmental laws, and encourage environmentally friendly mining methods, immediate action is needed.

The scope of unlawful mining and water contamination requires the implementation of comprehensive methods. The legal and regulatory frameworks controlling mining operations should be strengthened, law enforcement capabilities should be improved, and sustainable mining practices should be promoted. The need to offer local communities' alternate means of subsistence and to improve their understanding of the environmental and health concerns posed by illicit mining. To effectively address the issue of transboundary contamination, there is also a need for active collaboration and information sharing between Ghana and other nations.

Water contamination and unlawful mining present complicated problems that call for multifaceted solutions. To address this urgent issue, cooperation between governments, civil society organizations, mining firms, and international partners is essential. Ghana can lessen the negative environmental effects of illicit mining, conserve water resources, and ensure the welfare of its citizens and future generations by putting into place practical measures, upholding rules, and encouraging responsible mining operations.

The extent of illicit mining and the resulting water pollution in Ghana is a critical issue that needs to be addressed right away. The size and scope of illegal mining operations have significantly degraded the environment, especially in terms of water contamination. Toxic chemicals and heavy metals have been released into water bodies as a result of the damaging and uncontrolled procedures used by illegal miners, resulting in widespread contamination and ecological harm. Such pollution has far-reaching effects and seriously jeopardizes both human health and the viability of aquatic ecosystems.

Numerous academic studies have clarified the scope and effects of illegal mining and water pollution in these nations. For instance, Aryee et al. analyzed the trends in Ghana's small-scale mining of precious minerals and emphasized the effects of these operations on the ecosystem [23]. The study stressed the importance of dealing with the issues raised by illicit mining to protect the ecosystem and lessen water contamination.

Furthermore, Hilson [1] carried out a thorough investigation of the environmental effects of small-scale gold mining in Ghana, providing insightful information about the difficulties presented by illegal mining and outlining viable solutions. To combat the

negative environmental effects of unlawful mining, the author underlined the significance of encouraging sustainable mining methods and regulatory enforcement.

Leb investigated the function of international mining corporations and their influence on environmental regulation in Ghana in addition to this research [31]. The study brought to light the difficulties associated with implementing environmental laws in the context of mining operations as well as the complexity surrounding the sovereignty question. The report emphasized the need for efficient governmental and regulatory frameworks to reduce the threats to the environment posed by unlawful mining.

Collectively, these academic works highlight the urgent need for development policy reform and effective execution to successfully combat illegal mining and alleviate water contamination. There are several reasons why current policies and initiatives have failed. First off, illegal mining activities have persisted and thrived because there are insufficient governance and enforcement systems. Water pollution prevention and efforts to stop unlawful mining operations have been hampered by corruption and insufficient monitoring and regulation [31].

Furthermore, it is impossible to disregard the socioeconomic elements that contribute to illegal mining. The attractiveness of illegal mining activities has been influenced by rising youth unemployment, poverty, and a lack of viable employment alternatives [26]. Governments' incapacity to address these underlying socioeconomic problems has made the cycle of unlawful mining and water pollution.

It is crucial to carry out an extensive evaluation of current development policies and plans to address these concerns. An evaluation of the efficiency of the governance, enforcement, and regulatory frameworks is part of this review. To strengthen the legal ramifications for Ghana and Cote d'Ivoire, lessons can be drawn from international law and best practices. In tackling transboundary contamination and advancing sustainable mining practices, international environmental law, particularly treaties and conventions, can offer direction [32].

To effectively prevent illegal mining and water pollution, development strategies must be implemented efficiently. Governments, civil society organizations, mining firms, and local communities must all work together to achieve this. To address the underlying socioeconomic causes of illegal mining, capacity-building programs, public awareness campaigns, and the availability of alternative livelihood opportunities are crucial.

Lessons from International Law and Legal Implications for Ghana

The legal ramifications for Ghana regarding the problem of illegal mining and water contamination are significantly shaped by the lessons learned from international law. In order to solve transboundary environmental challenges and advance sustainable development, governments are guided by the principles, norms, and accords of international law. We can learn more about the legal ramifications and potential remedies for Ghana in preventing illicit mining and reducing water pollution by looking at pertinent publications and case studies.

Recognizing the concept of shared but distinct duties is one of the most significant lessons to be learned from international law. The extent of responsibility varies depending on each state's capabilities and previous contributions to environmental degradation, but this principle recognizes that states have a shared obligation to safeguard the environment and advance sustainable development. Ghana must implement comprehensive measures to stop and manage unlawful mining operations that cause water pollution since it is obligated to uphold this principle as a member of the international community.

Through a variety of legal frameworks and mechanisms, it is possible to observe how international environmental law is applied to the problems of unlawful mining and water pollution. For instance, the Convention on Biological Diversity (CBD) of the United Nations places a strong emphasis on the preservation of biological diversity and the wise use of natural resources. Ghana is legally required to safeguard its biodiversity from the negative effects of unlawful mining and to ensure the sustainable use of its natural

resources as a signatory to the CBD [30].

Another pertinent international agreement that deals with the use and discharge of mercury, a dangerous element sometimes connected with unlawful mining activities, is the Minamata Convention on Mercury. Ghana has pledged to reduce mercury emissions and support safer alternatives to mercury usage in the mining industry as a party to the agreement [33]. Ghana must create and uphold local laws and regulations that are consistent with the commitments stated in these conventions to comply with these international agreements.

To effectively combat the problems of illegal mining and water pollution, scholars and legal authorities have emphasized the significance of lining up national laws and regulations with international legal commitments. For instance, Leb [31] believes that to ensure compliance with international norms, multinational mining corporations operating in Ghana should be subject to tighter environmental rules and accountability mechanisms. This demonstrates the necessity for Ghana to revise its mining laws, tighten regulatory frameworks, and make mining companies accountable for their deeds to effectively address environmental problems.

In order to combat unlawful mining and water contamination, it is essential that current laws and regulations be upheld. As was already indicated, the involvement of security services in protecting illegal mining operations highlights the need of efficient law enforcement and the necessity of addressing corruption in the industry.

According to a 2018 study by Kuma & Yendaw on poverty and livelihood diversification in Ghanaian mining communities, law enforcement agencies play a crucial role in preventing unlawful mining operations and advancing sustainable development [26]. To effectively enforce laws and regulations, the findings highlight the necessity for coordinated efforts across government organizations, security services, and local communities.

Beyond domestic law, there are legal repercussions for Ghana in its fight against illegal mining and water pollution. Holding accountable parties for environmental harm can be facilitated by international legal processes including access to justice and litigation. Ghanaian courts have the authority to decide on matters involving environmental infractions and to grant affected populations redress. The 2012 case of Friends of the Earth-Ghana v. Minerals Commission and Others illustrates the possibility of litigation in tackling unlawful mining and safeguarding water resources [34]. In this case, the court ordered the suspension of mining activities due to environmental concerns.

In order to effectively combat illegal mining and water pollution, Ghana must strengthen its legal system and regulatory framework. This necessitates reviewing and altering mining legislation in order to impose stricter environmental regulations, accountability systems, and fines for non-compliance. Regulatory bodies like the Minerals Commission must be reinforced in order to effectively monitor and enforce compliance with environmental standards.

The value of global cooperation and knowledge exchange is another lesson we may learn from international law. To access technical know-how, best practices, and financial resources to address the environmental challenges brought on by illegal mining, Ghana can gain from collaborating with international organizations like the United Nations Environment Programme (UNEP) and the International Council on Mining and Metals (ICMM).

The legal ramifications for Ghana go beyond the mining industry itself, as well. The government must address the underlying socioeconomic issues, such as youth unemployment, poverty, and a lack of alternative sources of income, that lead to illegal mining. Sustainable solutions depend on combining environmental protection measures with social and economic development initiatives.

To find gaps and difficulties in current mining and environmental management policies and strategies, a thorough assessment of development policy is also required. Participants in this review should come from the public and business sectors as well as civil society organizations and local communities. Successful case studies can provide lessons, such as how other nations have dealt with transboundary pollution and illegal mining.

To get significant results, policies and strategies must be implemented effectively. This calls for good coordination between various government agencies, strong partnerships with local communities and traditional leaders, and the provision of sufficient funding for oversight, enforcement, and restoration of impacted areas.

The Case for Development Policy Review and Efficient Implementation

One of the most important aspects of resolving the problems caused by illegal mining and water pollution in Ghana is the need for development policy review and effective execution. It entails assessing current regulations, spotting holes and restrictions, and developing plans for successful implementation. This debate emphasizes the significance of reviewing development policies and covers important issues and suggestions for effective implementation.

To evaluate the efficacy of current policies and methods related to mining and environmental management, a study of development policy is required. It offers a chance to assess the effects of these policies, pinpoint areas for improvement, and apply knowledge gained from earlier mistakes. Ghana can make sure that its regulations follow international guidelines, handle current environmental issues, and support sustainable mining operations by undertaking a thorough assessment.

Stakeholder engagement is one of the main factors in the development policy review process. This entails including the commercial sector, local communities, civil society organizations, and government entities in the review procedure.

Their viewpoints and contributions are essential for comprehending the situation on the ground, identifying issues unique to the community, and developing context-specific remedies. Engagement of stakeholders increases the likelihood of successful policy implementation, creates ownership, and encourages inclusivity [38].

Numerous publications stress the importance of tackling the underlying socioeconomic issues, such as youth unemployment, poverty, and a lack of chances for alternative livelihoods, that lead to illicit mining [26]. A review of development policies should look at ways to encourage sustainable economic growth, open up employment opportunities, and lessen poverty in mining areas. This may entail diversifying local economies, making educational and skill-training investments, and encouraging small businesses and other forms of entrepreneurship [26].

To achieve the desired results, policies and strategies must be implemented effectively. It calls for coordinated efforts from various government agencies, productive interaction with regional groups and traditional leaders, and the provision of sufficient funding. To assess success and make required adjustments, implementing agencies should have clearly defined roles and duties, efficient coordination processes, and effective monitoring and evaluation systems [35].

The significance of institutional strengthening and capacity building has been emphasized for effective policy implementation. To successfully monitor and enforce adherence to environmental norms, regulatory agencies like the Minerals Commission must be sufficiently resourced and furnished with the required technical know-how [35]. The ability of government employees, law enforcement agencies, and key stakeholders should be strengthened through the development of training programs to solve the environmental issues brought on by unlawful mining.

The allocation of sufficient financial resources is necessary for effective execution. The establishment of alternative livelihood initiatives, rehabilitation of damaged areas, and assistance for monitoring and enforcement actions should all get adequate budgetary allocations. Innovative funding methods, such as utilizing public-private partnerships and looking into sustainable funding sources, can also help ensure that policies and initiatives are implemented effectively [35].

Continuous monitoring and assessment are crucial for determining the effectiveness of policies and interventions, in addition to effective implementation. Systems for tracking progress, evaluating results, and identifying problems that need fixing should be put in place.

To recognize accomplishments and issues, make evidence-based decisions, and improve methods for better results, regular evaluation is helpful.

International experiences and case studies might offer Ghana useful insights and lessons in its efforts to assess and implement its development policies. It is crucial to learn from effective techniques used by other nations dealing with comparable issues, such as South Africa's initiatives to formally recognize the artisanal mining industry or Peru's plans to fight illegal mining and environmental degradation. Ghana can adopt best practices, avoid mistakes, and customize interventions to suit its unique situation by learning from previous experiences [34].

Ghana could learn to revise its mining regulations to apply harder sanctions like restoration of harms caused by illegal miners, dismissal of institutional heads for negligence on their part of allowing environmental harm, enactment of a national pollution law for various sectors, the empowerment of traditional authorities to help in the enforcement of environmental laws and finally collaboration with neighboring states on issues of transboundary pollution.

Policy Implications

While the recommendations outlined for addressing illegal mining and mitigating water pollution are extensive, it's imperative to prioritize actions based on their immediate urgency and potential for impactful outcomes. This necessitates identifying key interventions that can yield tangible benefits in the short term while also laying the groundwork for long-term sustainability. Moreover, discussing the specific strategies and mechanisms for overcoming potential implementation barriers, such as inadequate resources, institutional capacity gaps, or resistance from vested interests, enhances the feasibility and effectiveness of proposed policy measures. Furthermore, emphasizing the importance of fostering multi-stakeholder collaboration, both domestically and internationally, underscores the need for collective action and shared responsibility in addressing complex environmental challenges. By leveraging partnerships between governments, regulatory agencies, civil society organizations, and the private sector, synergistic efforts can be mobilized to tackle illegal mining and water pollution comprehensively.

Significance of Aligning National Laws with International Standards

Firstly, alignment with international standards ensures that countries adopt a unified approach to addressing environmental challenges, thereby enhancing the effectiveness of transboundary water pollution mitigation efforts. By adhering to globally accepted norms and best practices, nations can streamline their regulatory frameworks, establish clear guidelines for industry compliance, and facilitate cross-border cooperation in tackling shared environmental threats. Furthermore, alignment with international standards promotes regulatory convergence, minimizing discrepancies and inconsistencies between national legal systems, which in turn fosters greater legal certainty and predictability for businesses and investors operating in the region.

Moreover, embracing international standards catalyzes innovation and technological advancement in environmental management. By benchmarking against global best practices, countries are incentivized to invest in research and development of cleaner technologies, sustainable mining practices, and eco-friendly waste management solutions. This not only enhances the environmental sustainability of mining activities but also promotes economic diversification, job creation, and resilience to market fluctuations. Additionally, alignment with international standards enhances countries' credibility and reputation on the global stage, signaling their commitment to responsible environmental stewardship and attracting investment and support from international donors, development agencies, and multinational corporations.

Furthermore, aligning national laws with international standards facilitates greater cooperation and coordination among countries, fostering a collaborative approach to addressing transboundary environmental issues. By harmonizing legal frameworks and sharing best practices, nations can leverage each other's expertise, resources, and experiences to develop more effective regulatory mechanisms, enhance monitoring and enforcement capabilities, and strengthen regional partnerships for sustainable development. This collective action not only maximizes the impact of individual efforts but also promotes solidarity and mutual support

among neighboring nations, leading to more resilient and adaptive responses to environmental challenges in an increasingly interconnected world.

Overall, aligning national laws with international environmental standards and agreements is not only a legal imperative but also a strategic imperative for advancing sustainable development, promoting economic prosperity, and safeguarding the planet for future generations. By embracing a global framework of cooperation and mutual accountability, countries can overcome the complex challenges posed by illegal mining and water pollution, and forge a path towards a more resilient, equitable, and sustainable future.

Conclusion

In Ghana, illegal mining poses a serious environmental hazard to water resources and cross-border contamination. Water quality and aquatic habitats are severely impacted by illicit mining, and immediate action is needed to lessen these effects. The problem has been developed into policies and plans in both nations, but urgent action is needed to solve it from the standpoint of international environmental law due to the serious effects that transboundary contamination from illicit mining has on nations.

International law gives the affected nations the right to seek redress, and states are obligated to stop transboundary contamination and deal with its impacts, including paying out damages. To address transboundary contamination and advance environmental protection, cooperation, and sustainable development must be encouraged.

Therefore, Ghana must regulate its mining activities in a way that lessens the harm being done to the other nation.

References

1. Hilson G (2016) The environmental impact of small-scale gold mining in Ghana: Identifying problems and possible solutions. The Geographical Journal, 182: 41-55.

2. McMahon G, Mieth C (2020) The social license to operate and artisanal and small-scale mining: The critical connection. Resources Policy, 65: 101552.

3. Veiga et al. (2014) Artisanal and small-scale gold mining and mercury pollution in Brazil: A review of recent studies. The Science of the Total Environment, 495: 33-42.

4. Hentschel T, Hruschka F, Priester M (2003) Artisanal and small-scale mining: Challenges and opportunities. International Institute for Environment and Development (IIED).

5. Le Billon P (2005) The political ecology of war: Natural resources and armed conflicts. Political Geography, 20: 561-84.

6. Spiegel SJ, Veiga MM, Angeloci-Santos G (2014) Clean artisanal gold mining: A utopian approach? Journal of Cleaner Production, 64: 1-12.

7. Veiga MM, Angeloci-Santos G, Meech JA, Carvalho CR (2018) The hidden costs of gold: Mercury poisoning from artisanal mining and the current challenges to sustainable development. Environmental Impact Assessment Review, 68: 101-8.

8. Creswell JW (2013) Qualitative inquiry and research design: Choosing among five approaches. Sage Publications.

9. Merriam SB (2009) Qualitative research: A guide to design and implementation. San Francisco, CA: Jossey-Bass.

10. Ghana Chamber of Mines (2019) Minerals and mining policy of Ghana. Accra: Ghana Chamber of Mines.

11. Oulasvirta P, Kim JY, Antwi-Agyei P (2019) Political ecology of the mining sector in Ghana and Cote d'Ivoire: An overview. Resources Policy, 62: 235-44.

12. United Nations Environment Programme (UNEP) (2019) Global Mercury Partnership.
Retrieved from https://www.unenvironment.org/explore-topics/chemicals-waste/what-we-do/global-mercury-partnership

13. International Union for Conservation of Nature (IUCN) (2019) Water and Nature Initiative.
Retrieved from https://www.iucn.org/theme/water/water-and-nature-initiative

14. Sands P (2012) Principles of international environmental law. Cambridge University Press.

15. Shaw MN (2017) International law. Cambridge University Press.

16. ITLOS (2010) Pulp Mills on the River Uruguay (Argentina v. Uruguay).
Retrieved from https://www.itlos.org/cases/list-of-cases/case-no-16/

17. García-Fernández I, Carrasco LR, Irarrazaval F (2018) Environmental impacts of illegal mining activities in Latin America: A review. Environmental Science & Policy, 89: 43-52.

18. Lupinacci, John, Alison Happel-Parkins "In the Living Planet Report 2014 by the WWF (formally known as the 4 World Wildlife Fund), researchers introduce a new index that considers “10,380." The Educational Significance of Human and Non-Hu-

man Animal Interactions: Blurring the Species Line (2016): 13.

19. Morrison-Saunders, Angus (2019) "The action is where the social is! The ecosystem services concept and other ideas for enhancing stakeholder engagement in integrated mine closure planning." Mine Closure 2019: Proceedings of the 13th International Conference on Mine Closure. Australian Centre for Geomechanics.

20. Akorli, Charity Dzifa, Philip Kofi Adom (2023) "The role of corruption control and regulatory quality in energy efficiency transition tendencies in Africa." Iscience 26: 3.

21. Government of Ghana (2006) Minerals and Mining Act, 2006 (Act 703). Accra: Government Print.

22. Asori M, Mpobi RKJ, Morgan AK, Apoanaba TA, Katey D et al. (2023). Is illegal mining socio-politically entrenched? An opinion piece of the interaction between formal politics and chief dominance in mineral governance, and its influence on fighting Galamsey in Ghana. GeoJournal, 88: 1953-63.

23. Aryee B, Ntibery B, Atorkui E (2013) Trends in the small-scale mining of precious minerals in Ghana: A perspective on its environmental impact. Journal of Cleaner Production, 62: 218-27.

24. Crawford G, Botchwey G (2017) Galamsey, rural livelihoods, and gold mining policy reforms in Ghana: From stagnation to a diversified small-scale mining industry. African Studies Review, 60: 157-83.

25. Hilson G (2017) Small-scale mining, poverty and economic development in sub-Saharan Africa: An overview. Resources Policy, 52: 83-91.

26. Kuma JS, Yendaw E (2018) Understanding the determinants of sustainable small-scale mining practices: The case of mining communities in Ghana. Resources Policy, 57: 246-53.

27. Ovadje, Lauretta, et al. (2021) "Registration status, mercury exposure biomarkers, and neuropsychological assessment of artisanal and small-scale gold miners (ASGM) from the Western Region of Ghana." Environmental Research, 201: 111639.

28. United Nations Development Programme (UNDP) (2015) Sustainable Development Goals.

29. Mensah Isaac, et al. (2020) "Small-scale mining, the SDGs and human insecurity in Ghana." Africa and the sustainable development goals, 2020: 81-90.

30. United Nations (1992) Convention on Biological Diversity (CBD).

31. Leb C (2017) Multinational mining companies and environmental regulation in Ghana: A case of a contested sovereignty. African Affairs, 116: 1-21.

32. United Nations Environment Programme (2021) Global Environmental Outlook - GEO-6: Healthy Planet, Healthy People. Nairobi: United Nations Environment Programme.

33. Minamata Convention on Mercury (2013) Minamata Convention on Mercury.

34. Burke, Laura, Armando García Schmidt (2013) "Ghana: Staying on Track in a Challenging Environment." Winning Strategies for a Sustainable Future: Reinhard Mohn Prize, 2013: 127.

35. Republic of Ghana (2017) Multilateral Mining Integrated Project: Preliminary Integrated Assessment Report.

36. Stern C, Jordan Z, McArthur A (2014) Developing the review question and inclusion criteria. AJN The American Journal of Nursing, 114: 53-6.37. Anney VN (2014) Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria.

37. Republic of Ghana (2017) Multilateral Mining Integrated Project: Preliminary Integrated Assessment Report.