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Evaluating an environmental tax as a source of funding for Social Health Insurance: Sudan case

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Abstract

The majority of countries face challenges in providing social health insurance coverage to the poor. In order to improve people's well-being, this study will investigate the possibility of imposing an environmental tax in order to raise funds for national health insurance subscriptions for vulnerable families in Sudan. A qualitative analysis method depends on in-depth interviews to draw conclusions and quantitative predictions are utilized. The majority of the relevant studies focused on the impact of interventions in reducing environmental pollution, whereas this study focused on the allocation of environmental funds to pay subscriptions on behalf of the vulnerable. This study found that there is an impact of environmental pollution on health. Consequently, a mandatory law to reduce the effects of pollution on health is a necessity. Besides, there is a possibility to impose an environmental levy, which requires the formation of a team of experts from relevant bodies to determine the criteria for drafting the law. Moreover, there is a possibility of deducting a percentage of taxes already imposed on vehicles that varies according to what is agreed upon.

1. Introduction

Pollution is a major global environmental problem that has a variety of negative effects on human wellbeing and the climate. Air pollution is thought to be a major cause of a number of diseases. Even a report by (2021) concludes that pollution is a critical factor in the appearance of the corona virus COVID 19, concluding that a small increase in air pollution contributes to a large increase in COVID-19. Furthermore, (Yamineva & Romppanen, 2017) addressed how existing legal and administrative approaches to air pollution seem inadequate when the detrimental effects of new seen and risks at stake are taken into account. At the global, territorial, and national levels, compelling air pollution laws and approaches necessitate incitement and engagement, overcoming most economic factors that hit the public. (Bagayev & Lochard, 2017) use the European Union as an example of the influence of pollution control laws and regulations, claiming that countries with tighter air pollution regulations import more hazardous goods than developing and emerging European and Central Asian countries. Kutzin et al. (2017) in the guidance strategy to finance health stressed that stakeholders from the diverse sectors related to health need to be included. As a result, this study, which looked for fiscal space to fund national health insurance in Sudan, shed light on the importance of imposing pollution taxes and allocating the proceeds to health care. In this regard, the government is considering exploring the possibility of imposing an environmental tax with the aim of paying for the poor family's social health insurance fund subscription. The study sought to address similar questions, such as whether an environmental tax can be imposed and how an environmental tax can be imposed to finance the national health insurance fund (NHIF).

The importance of this study stems from the fact that the poverty rate in Sudan in 2017 was 36.1% (World Bank, 2021), and these poor cannot afford to pay health insurance contributions and thus ensure that they have access

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to permanent treatment, while the government's budget that suffers from the deficit, since real GDP growth is 0.4 (IMF, 2021), and if the government covers some of the poor, it will not be able to take care of everyone, therefore, other sources of financing coverage for the poor should be considered.

Figure 1 shows the CO2 emissions (kt) in Sudan, 1960-2016, WB, 2021, which reflect an increasing manner, and definitely have implications on health. Besides, the transport and storage sector expanding in a decreasing manner as in Table 1 the rates of growth in the transport and storage industry from 2013 to 2017.

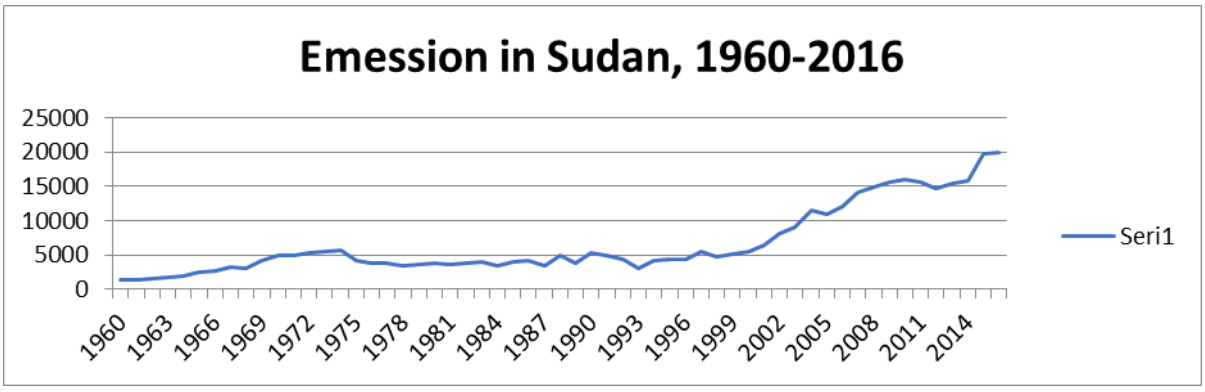

Figure 1. CO2 emissions (kt) in Sudan, 1960-2016

Source: World Bank, 2021

Table 1. Growth rate in transport and storage sector, 2013- 2017

2013	2014	2015	2016	2017
15.32	17.35	0.29	(5.25)	9.09

Source: Ministry of finance and national economy, 2017

2. Methodology and data collecting

This research relies on a qualitative approach, in which Ryan & Bernard (2000) recommend using theme recognition methods, and a quantitative approach, in which in-depth interviews are used to draw conclusions. An in-depth interview data collection mechanism was used in this analysis. For the years 2013-2015, the report used secondary data from the Federal Tax Bureau and the Ministry of Finance and National Economy. Besides, a primary data collected from in depth interviews. According to Showkat & Parveen (2017), in-depth interviews are one of the most effective methods for gathering crucial data. One of the most important advantages of the in-depth meeting is that it reveals more insights and in-depth data than other information collection approaches such as overviews, because it is more viable and less formal. This is an extensive interview of participants, performed for the most part by a limited number of respondents, unlike other meeting formats. According to Moser & Korstjens (2018), subjective analysis is a technique for selecting individuals who have a wealth of data about the wonder, and one of the first widely used is degree evaluating, so key sources must be carefully selected. Key witnesses have excellent and ace data that is nearly the wonder to be considered, and they are able to share their knowledge and experiences with you as the investigator. Therefore, three director government officers working administration in related to the issue; General directorate of tax collection manager in Ministry finance, Director of environmental inspection in the Ministry environment and urban development and, Environmental Sanitation and Pollution Control official in Ministry of health, in Sudan had taken part in an in-depth meet. They were selected depending on a criterion sampling; since the three of them are general manager in their field and experienced. During the interviews, three predetermined subjects and several questions were addressed, including the seriousness of pollution and its effect on health, the benchmarks and legislation used to monitor contamination, the associated contamination charges and plausibility of applications, and other emerging topics. Actuarial science, according to Pemberton (1999), is concerned with the development of models that predict the behavior of reality and have a degree of foresight control. Sensitivity analysis explained by Schneeweiss (2006), as a method for determining an assessment's robustness by examining how changes in methods, models, unmeasured variable values, or assumptions affect the results. The projection model depend on the health sector finance reform model (HSFRM), Fairbank et al. (2000), which indicates that future values are generally defined by fixed relationships or are influenced by parameter sets or growth assertions input into the model, and these parameters necessitate the analyst to enter their values as parameters.

The analysis process divided into two phases, the first phase about actuarial approach adopted in this study utilizing secondary data as a base data, in Sudan, there is a national tax on vehicles with less than 1000 cc that is assessed by PCC, so the aim of this study is to see if national health insurance will benefit from this tax. Considering three scenarios, adopting the Swiss model, two-thirds (66.67%) of the CO2 tax collected is allocated to the citizens by the insurer and the balance is deducted from the health insurance premium (FOEN, 2019).as the first scenario, then applying 100% and 50% respectively of the emissions tax to be allocated to national health insurance as the second and third scenarios. However, the administration costs of the ministry of financing and other related liabilities need to be considered. The second phase will focus on an in-depth interview in which stakeholder analysis is conducted with the goal of assessing the current situation as well as the technical and legal feasibility of the environmental tax, and the SWAT analysis used to extract the key findings. The basic data are the national tax on vehicles in million Sudanese pounds for the years 2015 to 2018; growth rate in transport and storage sector, and, projected National tax on vehicles by million pounds 2020-2024. The exchange rate SDG/US$ data used in this analysis from IMF 2020, Sudan report for 2019, and estimated to 2020 and central Bank of Sudan for 2021 and estimated to 2022 to 2025. The percentage change in Table 2 for the collected tax used to project the expected environmental tax for the years 2019 to 2025.

Table 2. Percentage change for the collected environmental tax 2014-2017

Item	2015	2016	2017	2018	percentage change
Collected environmental tax	59.13	67.6	80.42	86.64	31.75

Source: Author

There are no surveys, studies, or estimates prepared in advance in the form of a paper by officials in charge of environmental pollution management and control to enforce a tax to be used as a source in this review.

3. Literature review

Pollution is described by JA Nathanson (2020) as the release of any material or source of energy into the atmosphere at a rate faster than it can be scattered, weakened, decayed, reused, or stored in a safe state. Today, pollution is the leading natural cause of illness and premature death around the world. Contamination-related diseases are responsible for more than one death out of every four in the most severely affected countries. According to Landrigan et al. (2018), pollution-related infections caused 16 percent of all premature deaths worldwide in 2015, which is 15 times more than all wars and other types of savagery combined (2018). In the absence of effective regulation, surrounding air pollution is expected to kill between 6 and 9 million people by 2060. Seventy percent of deaths caused by air pollution are caused by non-communicable diseases. Furthermore, air pollution can be a significant and underappreciated cause of non-communicable diseases. Furthermore, despite the fact that the risk of neurodegenerative diseases has not been measured, pollution has been shown to be significant, according to Landrigan (2017). INTOSAI WGEA (2014) defines environmental taxes as "environmental taxes, green taxes, or taxes that are related to the environment." Environmental taxes may be a unit or proxy levy, as well as direct or indirect taxes, with the aim of reducing negative environmental effects. (Cornelia, & Lenuta, 2012) and INTOSAI WGEA (2014) studied the consequences of environmental taxes and found that it was necessary to shed light on certain criteria, such as expenditure, productivity, effective resource distribution, and equity impacts of environmental taxation, in order to examine the benefits and drawbacks of policymaking. Furthermore, a study by (Miller & Vela, 2013) aimed at assessing the feasibility of environmental taxes in reducing pollution in 50 countries found that higher environmental tax revenue is associated with lower pollution levels. According to the WHO study 2016, air pollution has a negative impact on health and is one of the leading causes of illness and death around the world. Meanwhile, according to a study conducted by C.et al. (2017), implementing environmental taxes has a positive impact on health by reducing pollution exposure. According to the approved report by (Zimmer & Koch, 2017), the feasibility of fuel evaluate improvements to control destructive air pollution as a result of transportation in Europe, based on changes in costs, actuated by contamination charge, as a basic determinant for outflow in response to approaching intercessions, is dependent on changes in costs, actuated by contamination charge, as a basic determinant for outflow in response to approaching intercessions. The Swiss Confederation, as stated in a document published by FOEN (2013), levies duties on environmentally hazardous products, which is a significant example of environmental taxation. The money raised from environmental fees is returned to the general public through health insurance companies. To summarize, the study found that pollution has a negative impact on health and is a high risk factor, as described by Landrigan (2017), who calls air pollution "the great killer of our time." It also stressed the value of pollution-control systems, which some studies show have promise.

4. Findings and discussions

The study is heavily reliant on the results of the in-depth interviews with three governmental officers held in Khartoum in May 2019, for each of the three stakeholders separately, because the imposition of an environmental tax on emissions was only recently implemented in Sudan with insufficient data and has yet to be allocated to health subsidies. Furthermore, an actuarial report discusses three scenarios for raising funds to pay for poor people's health insurance premiums by deducting a portion of the already-implemented carbon tax and a tax on other types of pollution.

4.1 Implemented environmental tax on emission

The first phase of the study is looking into economic analysis and scheduling feasibility in order to make informed decisions. Table 3 shows the revenue generated by national vehicle taxes from 2015 to 2018. Tables 5–7 show the anticipated vehicle tax based on the actual vehicle tax. Table 4 shows the basic values for the scenarios.

Table 3. National tax on vehicle in million Sudanese pounds 2015-2018

2015			**2016**			**2017**			**2018**		
Targeted	Collected	%	Targeted	Collected	%	Targeted	Collected	%	Targeted	Collected	%
69.96	59.13	85	0	67.6	0	0	80.42	0	111.9	86.64	77.4

Source: Federal Tax bureau 2018

Table 4. The projected national tax on vehicle in million Sudanese pounds, 2019-2025

66.67% deduction	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Projected National tax on vehicle in million Sudanese pounds	114.15	141.66	169.16	196.67	224.18	251.69	279.20

Source: Author

In this study, three scenarios were developed if analysis scenarios were used based on the initial data projection in Table 4. If Sudan's social health insurance is allowed to benefit from these taxes, this environmental tax can be distributed in three ways. The first scenario, according to the Swiss model, is two-thirds of total environmental revenue, two-thirds of CO2 collected tax. The expected fund for national health insurance would then be as shown in Table 5.

Table 5. Expected environmental tax by applying 2/3 deduction (The Swiss model)

66.67% deduction	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Projected National tax on vehicle in million Sudanese pounds	114.15	141.66	169.16	196.67	224.18	251.69	279.20
Expected environmental tax in million Sudanese pounds	76.10	94.44	112.78	131.12	149.46	167.80	186.14
Exchange rate SDG/US$	71.60	71.60	408.00	408.00	408.00	408.00	408.00
Expected environmental tax in US million dollars	1.06	1.32	0.28	0.32	0.37	0.41	0.46

Source: Author

Scenario (2): If we applied 100% as a portion of the total revenue (greater than the Swiss model)

Table 6. Expected environmental tax by applying 100% deduction

100% deduction	2019	2020	2021	2022	2023	2024	2025
Projected National tax on vehicle in million Sudanese pounds	114.15	141.66	169.16	196.67	224.18	251.69	279.20
Expected environmental tax in million Sudanese pounds	114.15	141.66	169.16	196.67	224.18	251.69	279.20
Exchange rate SDG/US$	71.6	71.6	408	408	408	408	408
Expected environmental tax in US million dollars	1.59	1.98	0.41	0.48	0.55	0.62	0.68

Source: Author

Scenario (3): If we applied 50% as a portion of the total revenue (lower than the Swiss model)

Table 7. Expected environmental tax by applying 50% deduction

50% deduction	2019	2020	2021	2022	2023	2024	2025
Projected National tax on vehicle in million Sudanese pounds	114.15	141.66	169.16	196.67	224.18	251.69	279.20
Expected environmental tax in million Sudanese pounds	57.07	70.83	84.58	98.34	112.09	125.84	139.60
Exchange rate SDG/US$	71.6	71.6	408	408	408	408	408
Expected environmental tax in US million dollars	0.80	0.99	0.21	0.24	0.27	0.31	0.34

Source: Author

In a summary of the revenues forecast tables, we can see that in schedule 5, the highest expected return is 1.32 million dollars in 2020, and the lowest expected return is 0.28 million dollars in 2021, whereas in schedule 6, the highest expected return is 1.98 million dollars in 2020, and the lowest expected return is 0.41 million dollars in 2021, When the deduction is 50%, the highest expected return is 0.99 million dollars in 2020, and the lowest expected return is 0.21 million dollars in 2021.

The study used the Sudan population growth rate of 2.4, World Bank, (2021), and the projection results shown in Tables 8, 9, and 10 to calculate the expected benefit of using the three deduction scenarios in covering vulnerable groups of the population by using the environmental tax deduction. Taking into account that, according to the internal regulations of the National Health Insurance Fund 2021, the coverage fees for a poor family are 4.800 Sudanese pounds per year, which is equivalent to $ 11.76 (SDG/US$, 2021; Central Bank of Sudan).

Table 8. expected coverage for vulnerable if the deduction is 66.67%

66.67% deduction	2019	2020	2021	2022	2023	2024	2025
Expected population (2.4) growth rate	42813238	43840756	44868273	45895791	46923309	47950827	48978344
Expected environmental tax in million Sudanese pounds	76.10	94.44	112.78	131.12	149.46	167.80	186.14
expected coverage of poor people	15854.71	19675.48	23496.26	27317.03	31137.81	34958.58	38779.36
percentage of total population	0.04	0.04	0.05	0.06	0.07	0.07	0.08

Source: Author

Table 9. expected coverage for vulnerable if the deduction is 100%

100% deduction	2019	2020	2021	2022	2023	2024	2025
Expected population (2.4) growth rate	42813238	43840756	44868273	45895791	46923309	47950827	48978344
Expected environmental tax in million Sudanese pounds	114.15	141.66	169.16	196.67	224.18	251.69	279.20
expected coverage of poor people	23781	29512	35243	40974	46704	52435	58166
percentage of total population	0.06	0.07	0.08	0.09	0.10	0.11	0.12

Source: Author

Table 10. expected coverage for vulnerable if the deduction is 50%

50% deduction	2019	2020	2021	2022	2023	2024	2025
Expected population (2.4) growth rate	42813238	43840756	44868273	45895791	46923309	47950827	48978344
Expected environmental tax in million Sudanese pounds	57.07	70.83	84.58	98.34	112.09	125.84	139.60
expected coverage of poor people	11890	14755	17621	20486	23352	26217	29083
percentage of total population	0.03	0.03	0.04	0.04	0.05	0.05	0.06

Source: Author

According to the expected coverage tables 8, 9, and 10, the expected coverage with environmental tax funds has the highest expected coverage rate of 8% in 2025 and the lowest expected coverage rate of 4% in 2019, when the deduction is 66.67%. Whereas the highest expected coverage rate is 12 percent in 2025, the lowest expected coverage rate is 6 percent in 2019, when the deduction is 100 percent. Furthermore, when the deduction is 50%, expected coverage has the highest expected coverage rate of 6% in 2025 and the lowest expected coverage rate of 3% in 2019, out of the total population. It is important to note that any percentage makes a difference in the population's insurance coverage and reduces the burden on the state and vulnerable groups, as the highest expected percentage of coverage is 12 percent in 2025 when the deduction is 100 percent of the environmental tax, and the expected covered people are approximately 58,166 people. While the lowest expected coverage is 3% in 2019, when the deduction is 50% of the environmental tax, and the expected covered population is 11,890 people out of the total population.

4.2. In depth interview

In phase 2 of the study, an in-depth interview with stakeholders: three governmental officers which held in Sudan on may 2019, and so the current situation was assessed, as well as the technical and legal feasibility of the environmental tax, and stakeholder analysis was used as follow.

4.2.1. In-depth interview with environmental Inspection official

Climate change, nature assurance, hazardous squander, and aquatic pollution are four global natural laws that have been confirmed in terms of enactment and natural laws within the Preeminent Chamber for the Environment and Urban Advancement. Prepare for the global administration of chemicals in addition to the main strategy. Since pollution management is beset by legal conflicts and the presence of several levels of government with no single legal system for environmental protection, standardizing environmental law is needed to ensure high performance and improve environmental regulation. Environmental taxes are imposed on household and corporate enterprises and operations. Waste charges and social responsibility (environmental-oriented) are examples of non-specific charges based on company and institution projections. To summarize, forcing an environmental tax is feasible; however, this strategy necessitates a workshop between environmental specialists, government environmental officials, and business leaders to establish benchmarks for determining the charge and the law's wording, as well as to lift the levee from qualified specialists.

4.2.2. In-depth interview with Environmental Sanitation and Pollution Control official

The majority of diseases cured in Sudanese health facilities are diseases that are directly related to pollution, such as intestinal worms, watery diarrhea, and cancers. And the most severe respiratory diseases are caused by air pollution, where the number of diseases linked to pollution is on the rise, according to the most recent figures. The Federal Ministry of Health monitors the environmental effect on health, such as in White Nile (Asalia) projects where sewage is discharged directly into river water, cement companies in Atbara, and mining companies that have substantial environmental impact by using toxic substances such as mercury as cancers. The Department of Environmental Health has undertaken a number of initiatives to combat environmental pollution, including the development of a textbook, training, and medical and solid waste surveys, as well as plans to conduct air pollution surveys. Non-governmental organizations also collaborate in the preparation of papers and training both within and outside Sudan. Polluter collaboration and emissions control management have been harmed by the Decentralized Federal Governance Law (2005). Furthermore, there is a lack of resources, conflicts of interest, and administrative crossroads, all of which impede results. A seminar on administrative intersections was held at the Union Court of Arbitration, after which a vision for the creation of the National Authority for Hygiene and Safe Waste Management was drafted. Environmental emissions control interventions have a positive effect in some states, such as Khartoum and Gedaref. In summary, businesses that pollute are aware of the problem but refuse to comply, and regulations are not enforced.

4.2.3. In-depth interview with federal Taxation Official

There is no environmental legislation; instead, there is a national tax on vehicles smaller than 1000 cc assessed by PCC, with charges imposed on the Ministry of Finance. Because of the difficulties of measuring carbon, it is difficult to implement an emissions tax; however, legislation can be enacted; however, factory waste can be used to implement an environmental tax because tax liability is simple to implement. There is no current trend to enact an environmental tax because the taxation bureau has other objectives, but there are awareness campaigns to enforce the intended tax or new laws. Officials from the tax office and the Ministry of Finance, it is thought, are aware of the value of enacting an environmental tax. The organizations to be taxed must support the application of the environmental tax if it is binding and in a proportion that does not impact development. If an environmental tax is imposed, it will be accepted, especially by companies with significant environmental impact, such as cement factories (as a percentage of production). There should be a joint committee from the Ministry of finance and national economy, national health insurance fund and pollution officials and experts. To summarize, since the tax legislation was drafted by other parties and passed by the Legislative branch, certain forms of taxes are collected by the tax office and distributed directly to other beneficiaries other than the Ministry of Finance.

4.3. In depth interview conclusion

Three environmental and taxation experts were interviewed in depth: an environmental inspector; an environmental sanitation, and pollution control official, and a federal taxation official.

SWAT analysis conclusions, the ministry of health's efforts to monitor and reduce environmental impacts, research and training, collaboration with international organizations, and international environmental legislation commitments are among the strengths. Opportunities are represented by the fact that the majority of diseases in Sudan are diseases that are completely linked to environmental pollution, as well as the most serious respiratory diseases caused by air pollution. In addition, plans are being made to establish the National Authority for Hygiene and Safe Waste Management. Weaknesses are evident in the need for awareness-raising programs considering the environmental tax's, the decentralized Federal Governance Law has weakened polluter cooperation and pollution control management, and the lack of funding. Aside from conflicts of interest and administrative intersections, contradictions between laws at different levels of government, and a lack of environmental tax legislation, the environment is given low priority within the taxation bureau. Threats can be explained as entities that pollute the environment, refusing to cooperate. Pollution measurement challenges and, some environmental taxes allocated directly to recipients other than the Ministry of Finance.

To summarize the results of the in-depth interview, environmental pollution has an effect on health because many forms of pollution cause a large number of pathogens. As a result, as part of the mitigation process, mandatory regulations to minimize the impact of emissions on health should be applicable. Furthermore, the different parties involved in the management and control of environmental contamination should work together. There is the possibility of imposing an environmental levy, which could be enforced by forming a committee of experts from relevant organizations to decide the conditions for drafting the legislation. Furthermore, to standardize environmental law, environmental authorities should provide a single legal structure. Vehicle emissions have also been taxed, and there is the prospect of imposing an environmental tax on other forms of pollution, which would necessitate collaboration between the national health insurance fund and pollution control stakeholders.

5. Conclusion

It is obvious that imposing environmental taxes could result in increased welfare, environmental improvement, and economic development. The study by (Bovenberg and Van der Ploeg, 1998) investigates the effect of environmental levy on reducing the burden of distortionary charges on labor and discovers that environmental taxes improve both natural development and labor force employment dependability. Another study, by Oueslati (2015), looked at the impact of an environmental levy amendment and state spending on development and welfare, as well as the relationships between the environment, health, and education. The findings confirmed the positive effects. An environmental levy is required to reduce deadweight losses and improve societal well-being. According to Bosquet, B. (2000), environmental tax reform is the process of shifting the tax burden from the labor force burden to contamination. This study explained how an environmental tax could be used to benefit the poor in Sudan by paying social health insurance contributions. A study by M'hamdi, provides an ethical framework for defining social responsibility to address health inequalities in order to enhance the debate on health responsibility, because the developmental concept of health, disease, and epigenetics may be misunderstood to emphasize the importance of individual responsibility for health rather than social responsibility for health, especially at a time when a negative response from policymakers is frequently used to justify individual responsibility. Therefore, because it is the responsibility of the state to increase the gained well-being, If an accurate and comprehensive implementation of the environmental tax is implemented in Sudan, and a percentage of these taxes is approved for health insurance to cover the groups exposed to environmental toxins, as the feasibility study clarified, this procedure will increase coverage by a significant percentage, and the community will assume its responsibility. There is a possibility of imposing an environmental levy, which necessitated the formation of a team of experts from relevant organizations to determine the criteria for drafting the law. Furthermore, there is the possibility of deducting a percentage of already imposed taxes on vehicles, which varies depending on what is agreed upon. This study discovered that environmental pollution has an effect on health. As a result, a mandatory law to reduce the effects of pollution on health is required.

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