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## CONTENTS

<b>Evaluating an environmental tax as a source of funding for Social Health Insurance: Sudan case</b> <i>Fawzia Mohammed Idris</i>	1-9
<b>Public debt of Nepal: It's effect on economic growth</b> <i>Yadav Mani Upadhyaya</i>	11-21

# 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.

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## 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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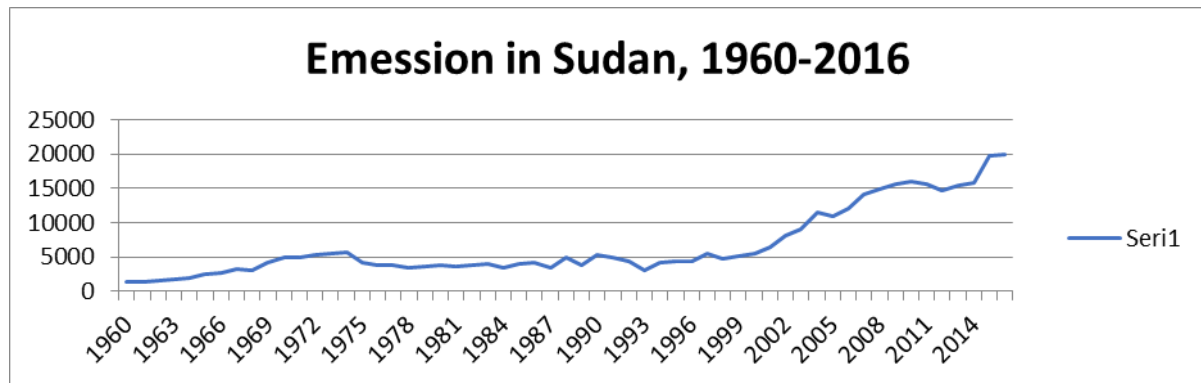
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to permanent treatment, while the government’s budget that suffers from the deficit, since real GDP growth is 0.4 (IMF, 2021), and if the government covers some of the poor, it will not be able to take care of everyone, therefore, other sources of 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 CO<sub>2</sub> 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

<b>66.67% deduction</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
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 CO<sub>2</sub> 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)

<b>66.67% deduction</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
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

<b>100% deduction</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
Projected National tax on vehicle in million Sudanese pounds	114.1 5	141.6 6	169.1 6	196.6 7	224.1 8	251.6 9	279.2 0
Expected environmental tax in million Sudanese pounds	114.1 5	141.6 6	169.1 6	196.6 7	224.1 8	251.6 9	279.2 0
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

<b>50% deduction</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
Projected National tax on vehicle in million Sudanese pounds	114.1 5	141.6 6	169.1 6	196.6 7	224.1 8	251.6 9	279.2 0
Expected environmental tax in million Sudanese pounds	57.07	70.83	84.58	98.34	112.0 9	125.8 4	139.6 0
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%

<b>66.67% deduction</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>	<b>2024</b>	<b>2025</b>
Expected population growth rate (2.4)	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)	4281323	4384075	4486827	4589579	4692330	4795082	4897834
growth rate	8	6	3	1	9	7	4
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)	4281323	4384075	4486827	4589579	4692330	4795082	4897834
growth rate	8	6	3	1	9	7	4
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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## Public debt of Nepal: It's effect on economic growth

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### Abstract

Different economists have expressed different views on public debt from time to time. Different articles about public debt and economic development also have different concepts. But there is a great need for public debt in Nepal's economic development to date. It often seems impossible to sustain economic development of Nepal with our resources. The main objective of this article is to explain the trend of public debt and economic development from 1992/93 to 2018/19. It is also to study the impact of public debt on Nepal's economic development. For this, to study the relationship between the simple linear regression model and multiple regression model has used. The regression model is constructed four equations. The conclusion of the study,  $R^2$  is more than 90% and P- value is almost zero of the entire regression model. This states that there is a positive relationship between public debt and economic development in Nepal. Despite such positive relations, our growth rate has not been uniform and public debt has been steadily increasing. But even today, Nepal's economic development needs internal and external debt. The main task today is to properly manage public debt for the economic growth of Nepal in coming days.

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### 1. Introduction

Around the 18th century, the term "public debt" was often used. Classical economists were usually opposed to borrowing and believed that the government should play only a minor role in favoring constructive lending. However, after the Great Depression of the 1930s, increased government spending resulted in increased public debt as a result of the country's rapid economic growth and resource use (Taylor, 1961). J.M. Keynes is in favor of a government-controlled economy that increases the government's deficit. To achieve their deficit targets, governments must take on public debt, which does not always imply inefficiency, inflation, or burden (Nevin, 1962).

Public debt is based on the debt of the concerned government entity. In the current situation, public spending is increasing very rapidly relative to national income. Increasing public expenditure cannot be achieved by raising revenue alone. Public debt entails the obligation to repay the people (Samuelson, 1964).

Public debt is one of the important sources of generating income for the government of Nepal. It helps to achieve targeted economic growth and also helps to narrow down the gap between expenditure and revenue, saving, and investment required for a targeted growth rate. In Nepal, institutional backwardness makes the functioning of economic development a complicated business. In order to remove such obstacles in the economy, public debt can be used as an inevitable tool. Thus, public debt is the most important source of income for the economic development of Nepal (Acharya, 2015).

The role of public debt is increased significantly after the planned economic development. The process of economic development in Nepal was started with the implementation of the first five years plan in 1956. Since

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then the volume of public expenditure has seen increasing because of the growing demand for funds (Adhikari, 1996).

Nepal remained almost a debt-free country till 1961/62. The accumulation of debt begins in 1963. Then Nepal has been receiving public debt from both internal as well as external sources. The internal source includes borrowing from individuals and from the financial sector. External debt is receiving from both bilateral and multilateral sources (Joshi, 1982).

In Nepal, the trend of borrowing external debt is much higher than the trend of borrowing internal debt. Thus, particularly after 1970, the budgetary deficit has also been increasing. So, Nepal is facing a serious problem of financial resource gap on one hand and increasing population growth and inflation on another (Khanal, 2000). But no doubt, if the trend of foreign debt goes on increasing like this recently, definitely, one day Nepal will be in the worse situation of the debt trap.

As a result, public debt has both favorable and unfavorable effects on a country's economic growth. On the one hand, it was an essential component of the development budget and assisted in the mobilization of additional financial capital, despite the fact that the nation was heavily in debt due to interest and principal payments. As a result, Nepal must make effective use of its public debt.

## 2. Review of public debt and economic development of Nepal

Government debt, according to Barik (2012), has made a major contribution to economic development both directly and indirectly. The paper's findings indicate that, all things being equal, public debt appears to induce investment over time.

According to Harris (1974), the individual, customer, and business firm all use resources more efficiently. According to Goode (1984), investment finance will stifle economic growth. In general, public debt refers to a loan taken out by a government, either within or outside of the country, according to Encyclopedia Britannica (2006).

Domar (1944) described debt burden as an increase or decrease in the amount owed. When either the ratio of deficit to income or the rate of interest paid on debt rises, the burden of debt rises with it, or the burden of debt rises with the ratio of deficit to income and the rate of interest paid on debt rises with it.

Chongo (2013) found that the findings of the study support the existence of a long-term relationship between public debt and economic development. Ozurumba and Kanu (2014) investigated and discovered that not all aspects of Nigeria's domestic debt profile contribute positively to the country's economic development, both short and long term. According to Isaac and Rosa Garca-Almada (2016), the findings verified that public debt is positively associated with public spending, which leads to economic growth.

The most inflationary nature of internal borrowing, according to Singh (1983), increases inflection in the economy. While foreign loans have softer terms for Nepal than India and China, Gurugharana (1996) claims that the very low rate of return and rising share of loan in foreign aid mean that aid is gradually moving Nepal toward a debt crisis in the coming years.

According to Nguyen, (2015) having a big public debt is similar to driving with the emergency brake on in the long run. Overdependence on external debt could result in debt repayment default and, eventually, the country's economic collapse. Government debt, according to Koirala (2002), has a clear relationship with the government deficit over a given year being equivalent to the budget deficit, or higher economic growth necessitates a higher level of spending that is not feasible solely through taxation, requiring the government to pursue public borrowing.

Nadim (1992) studied global inflation and the negative real interest rate. Lekhi (2001) said that he was opposed to the use of public debt. As Paniza (2008) pointed out, a country, like an entity, cannot keep adding to its liabilities indefinitely without exhausting its resources.

The government expenditure and revenue patterns, according to Pyakurel (2004), show that the economy has lost its productive capacity to respond to sustained growth. According to Thapa (2005), Nepal's debt burden and servicing should not be considered excessive in terms of growth, but it is rather burdensome. According to Neupane (2007), government borrowing has increased unlikely uncertainties.

According to Regmi (2008), the proportion of foreign debt relative to domestic debt is too large. For the period 1972-2009, Bista (2011) found that public external debt has a negative and substantial relationship with per capita GDP and investment in Pakistan, both in the short and long run.

According to Bhattarai (2013), the share of internal loans is substantially higher than the share of external loans. According to Sharma (2014), the rising pattern of borrowing creates a significant problem for debt management and has become a difficult issue for the country.

### 3. Research objectives & Methodology of the Study

Generally, the objectives of this article is to show the impact of Nepal's internal debt and external debt on economic development, but the following two main objectives are mentioned here:

- i. To examine the overall pattern of Internal, External debt and GDP of Nepal
- ii. To examine the impact of public debt in economic growth of Nepal

Both descriptive and analytical research designs were used in this study. The aim of this study is to examine the effect of foreign debt and internal debt on Nepal's economic growth. I created a regression model for this reason, and the variables used in the model are described in this methodology. The OLS Method was used to estimate the model.

Using only secondary data, this study's review attempts to obtain different empirical findings. The required data is gathered from a variety of sources, including the Economic Survey (2018/19), the Ministry of Finance (MOF), the World Bank (WB), the Nepal Government (NG), the Nepal Rastra Bank (NRB), and other bulletins and publications, such as the budget speech, the Human Development Report (HDR), the World Development Report (WDR), and various National Planning Commission (NPC) publications.

The simple regression model and a multiple regression model prepared for this article have been used for a total of 27 years from 1992/93 to 2018/2019. This includes Nepal's internal debt, external debt and total debt as well as the GDP growth which is required for Nepal's economic development. The following regression models have been prepared to study how the country's internal debt, external debt and total debt have affected the GDP growth.

#### Regression Equation

$$GDP_t = \beta_0 + \beta_1 ID_t + \varepsilon \dots\dots\dots(i)$$

$$GDP_t = \beta_0 + \beta_2 ED_t + \varepsilon \dots\dots\dots(ii)$$

$$GDP_t = \beta_0 + \beta_1 TD_t + \varepsilon \dots\dots\dots(iii)$$

$$GDP_t = \beta_0 + \beta_1 ID_t + \beta_2 ED_t + \beta_3 TD_t + \varepsilon \dots\dots\dots(iv)$$

Where,

GDP = Gross Domestic Product, TD = Total Debt, ID = Internal Debt, ED = External Debt and  $\beta_0, \beta_1, \beta_2$  and  $\beta_3$  are the parameters.

The theoretical statement of this regression model is that Gross Domestic Product (GPD) is depends upon the Total Debt, Internal Debt and External Debt. This study has not attempted to examine the effect of public borrowing on macro-economic variables such as money supply, price level, employment, and etc.

### 4. Analysis of current situation of public debt in Nepal

The Nepal Rastra Bank (NRB, Nepal's central bank) borrowed money from the IMF under the Rapid Credit Facility and then re-loaned it to the government (5,861,100,000.00 NPR). The central bank's bond issuances were solely for the purpose of monetary policy. Since Nepal's state-owned enterprises (SOEs) borrow money

from abroad via the central government, they are covered by the central government's debt. The government has recently begun to guarantee debts owed by SOEs.

**Table 1.** Subsectors of the public sector

1.	Central government
2.	Province Government
3.	Local government
4.	Other elements in the general government
5.	Social security fund
6.	Extra budgetary funds
7.	Guarantees (to other entities in the public and private sector, including to SOEs) Central bank (borrowed on behalf of the government)
8.	Non-guaranteed SOE debt

**Source:** Debt Sustainability Analysis, IMF, 2020.

At the mid of 2019, Nepal's gross public debt was projected to be 30.1 percent of GDP. Nepal's public debt grew to 30.2 percent of GDP in mid-2018, after falling to 25 percent of GDP in mid-2015. The public debt stock in July 2019 was nearly unchanged from the previous fiscal year. In comparison to other low-income countries, Nepal's public debt remains low.

In mid-July 2019, the external public debt was 17 percent of GDP. Since mid-2018, the external debt-to-GDP ratio has decreased by 0.4 percentage point. Owing to the high degree of concessionality, the external debt's net present value (PV) is expected to be about 12.2 percent of GDP. Multilateral creditors, such as the World Bank's International Development Association (IDA) and the Asian Development Bank, accounted for the majority of Nepal's external debt (89 percent of total external debt). Their loans had low interest rates (on average 1%) and long repayment terms (26 years on average). Japan was the main bilateral borrower, led by China, India, and Korea in terms of bilateral loans.

**Table 2.** External Public Debt in FY2018/19

	Rs. in millions	In percent of GDP	In percent of external debt
Total external	629,013.25	17.0%	100%
Multilateral	557,976.72	15.1%	89%
ADB	214,047.37	5.8%	34%
IDA	325,994.38	8.8%	52%
Bilateral	71,036.53	1.9%	11%
Paris Club	37,393.82	1.0%	6%
Non-Paris Club	33,642.71	0.9%	5%

**Source:** Debt Sustainability Analysis, IMF, 2020.

At the end of July 2019, the domestic public debt stood at 13.1% of GDP. Treasury bills with a maturity of up to one year (28-day, 91-day, 182-day, and 364-day treasury bills) account for about 32% of domestic public debt, with 364-day bills accounting for about half of the total. The majority of medium- to long-term debt is made up of construction bonds with maturities ranging from 3 to 15 years and interest rates ranging from 3-6.5 percent per year. Since citizens kept all of the domestic public debt, the study is currency-based.

**Table 3:** Public Domestic Debt in FY2018/19

	Rs. in billions	GDP percent	Domestic Debt percent
Total domestic	453	13.1%	100%
Treasury bills	147	4.2%	32%
Treasury bonds	306	8.8%	68%
Development bonds	297	8.6%	66%
Others	9	0.3%	2%

**Source:** Debt Sustainability Analysis, IMF, 2020.

The government of Nepal has not released the stock of private external debt, but it is estimated to be very small. Although the government and the NRB encourage commercial banks to borrow from outside sources to relieve BOP pressures, bank external borrowing has been restricted due to limited access and high relative costs. Authorities' regulations, such as enforcing a maximum spread cap (6-month Libor + 4%) on banks' foreign loans, limit banks' ability to borrow internationally. The non-public sector has only borrowed a small amount of money from abroad (about 0.1 percent of GDP as of mid-July 2019). Private external debt is expected to rise to 1% of GDP in the long run, reflecting recent government measures to promote foreign loans.

**Table 4.** Public Debt Situation

1	The country's coverage of public debt	The central, state, and local governments plus extra budgetary funds, central bank, government-guaranteed debt, non-guaranteed SOE debt	
		Default	Used for the analysis
2	Other elements of the general government not captured in 1.	0 percent of GDP	0
3	SoE's debt (guaranteed and not guaranteed by the government)*	2 percent of GDP	2.0
4	PPP	35 percent of PPP stock	2.1**
5	Financial market (the default value of 5 percent of GDP is the minimum value)	5 percent of GDP	5
Total (2+3+4+5) (in percent of GDP)		7.0	
*The default shock of 2% of GDP will be triggered for countries whose government-guaranteed debt is not fully captured under the country's public debt definition (1.). The Nepali government provided guarantee to the purchase of airline by SOE in FY 2018/19, which is 1% of GDP.			
**2.1 percent of GDP = 6.01 percent of GDP (PPP contracts as of 2017) 35 percent of shock (default setting).			

**Source:** Debt Sustainability Analysis, IMF, 2020.

Contingent liabilities from SOE debt (2 percent of GDP), PPP ventures (2.1 percent of GDP), and financial sector debt are all included in the contingent liability stress test (5 percent of GDP). The government has not officially compiled PPP projects. As of 2017, Nepal's PPP contracts are projected to account for around 6% of GDP, according to the World Bank's PPI database. Nepal's big SOEs are the Nepal Oil Corporation (NOC) and the Nepal Electricity Authority (NEA). The debt of the NOC and NEA was 3.3 percent of GDP as of July 2019. Since their loans are all owed to the government, they are now counted in the debt of the government. In FY2018/19, the government issued a 1.0 percent of GDP guarantee to Nepal Airlines Corporations for the purchase of an airplane.

For the past couple of years, growth has performed admirably. Actual GDP growth increased to 7.1 percent in FY2018/19 from 6.7 percent the previous fiscal year, thanks to good performances in agriculture, reconstruction,

and tourism. It is expected to converge to 5.3 percent potential growth in the mid- to long-term. The annual inflation rate was 4.6 percent in FY2018/19 and jumped to 6.0 percent in mid-July 2019 due to a spike in food prices, but it is projected to settle at 5.3 percent in the medium term.

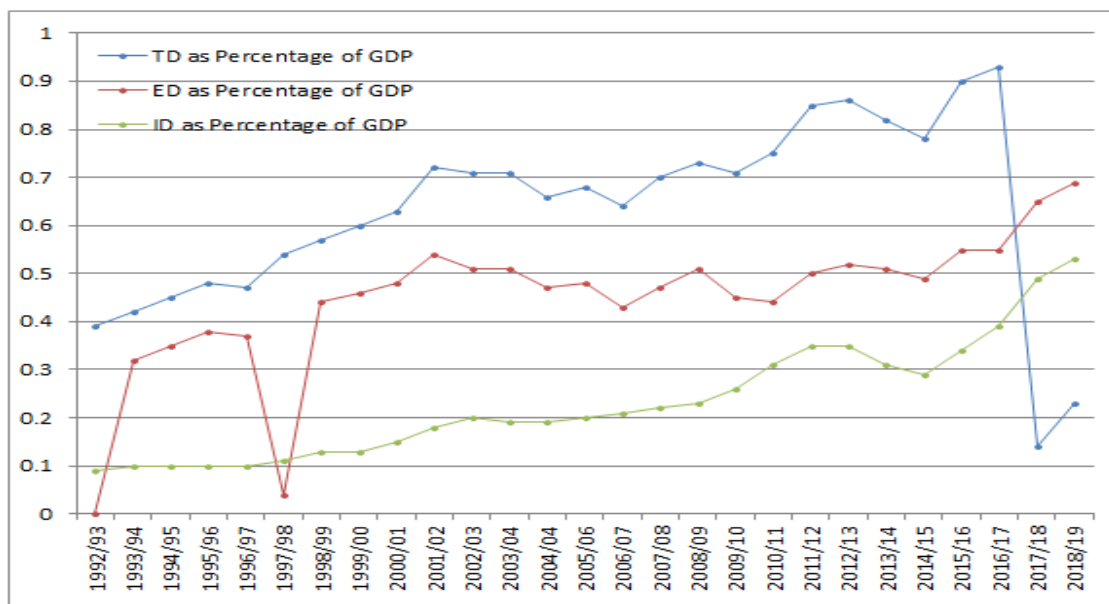
Due to continued strong import expansion, the current account deficit remained high at 7.7% of GDP in F/Y2018/19. Exports and foreign direct investment remained small, with remittances (which accounted for a quarter of GDP) helping to fund the high trade deficit. From Rs. 108 billion at the end of the previous fiscal year, gross official reserves fell to Rs. 99 billion in July 2019. Due to significant positive net errors and omissions in the balance of payments (2.7 percent of GDP in FY2018/19), the large current account deficit did not result in a commensurate rise in external debt or reduction in reserves in FY2018/19. With slowing import demand, the current account deficit is expected to narrow in the medium term. External debt will steadily decrease over time, reaching 18.5 percent of GDP by mid-2020.

The central government's primary fiscal deficit outturn fell to 4.0 percent of GDP in F/Y2018/19, down from 6.1 percent the previous year. Despite the fact that the FY2019/20 budget calls for a large rise in spending, the primary fiscal deficit is expected to be 3.9 percent of GDP in FY2019/20 due to spending capacity constraints. It is expected to fall to 3.2 percent of GDP in the medium term.

To cover its fiscal deficit, Nepal's government is expected to steadily increase domestic borrowing. Domestic borrowing is expected to cross 4% of GDP annually, and the domestic debt stock is expected to rise from 13 percent to 35.5 percent of GDP in the long run, while external debt is expected to fall to 11% of GDP over the forecast period.

## 5. Trends of Public Debt with GDP from 1992/93 to 2018/19

The figure 1 shows the total debt, internal debt and external debt as a percentage of GDP. Internal debt and external debt have been steadily increasing from 1992/93 to 2018/19 and the GDP percentage of external debt in 1997/98 was the lowest at 0.04 percent. The highest percentage is seen in 2018/19. It represents the percentage of internal and external debt by 0.5 percent and 0.93 percent, respectively. This means that the internal and external debt of Nepal seems to be steadily increasing at the GDP percentage. Thus, with the increase in debt, the economic development of the country also seems to have gradually increased, which can be taken positively. The total debt looks slightly different in 2016/17 and 2017/18. The highest is 0.93 percent in 2016/17 and the lowest is 0.14 percent in 2017/18.

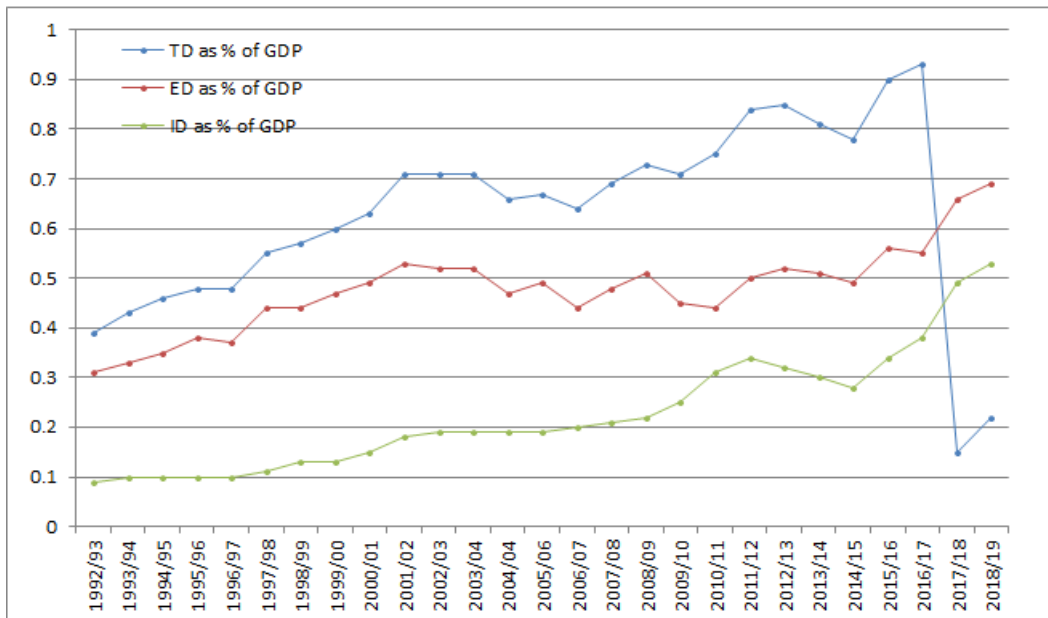


**Figure 1.** Trends of Public Debt with GDP from 1992/93 to 2018/19

**Source:** Drawing from Economic Survey, 2021/20

**6. Trends of Outstanding Debt with GDP from 1992/93 to 2018/19**

The figure 2 shows Nepal's outstanding debt so far which we have shown by the percentage of GDP. In this diagram also, the share of internal debt and external debt with GDP percentage has been increasing steadily since 1992/93. In 2018/19, both of them are in high percentage. That is, in 1992/93, the percentage of GDP in internal debt and external debt was 0.53 percent and 0.69 percent respectively. This means that as the outstanding debt increases and the GDP percentage also increases.



**Figure 2.** Trends of Outstanding Debt with GDP from 1992/93 to 2018/19

**Source:** Drawing from Economic Survey, 20219/20

The figures 1 and 2 show that GDP has not increased as expected as internal and external debt has increased. But even as our total debt burden is gradually increasing, are we falling into the debt trap ourselves? Questions can be analyzed.

**7. Discussion from the Regression Model**

Nepal's public debt and economic development is explained by the above two figures. In this part, we can explain the four equations of the regression model prepared in the research method with the help of Microsoft Excel 2016 by the following figures and equations on how public debt has affected the economic growth of Nepal.

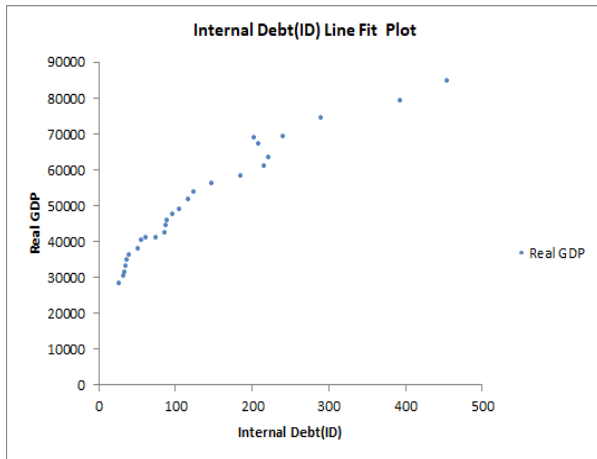


Figure 3. Internal Debt with GDP

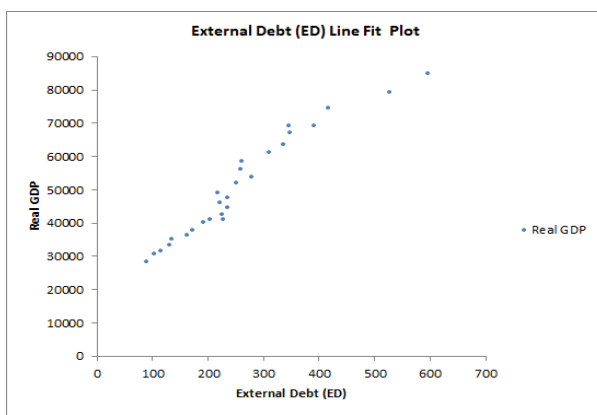


Figure 4. External Debt with GDP

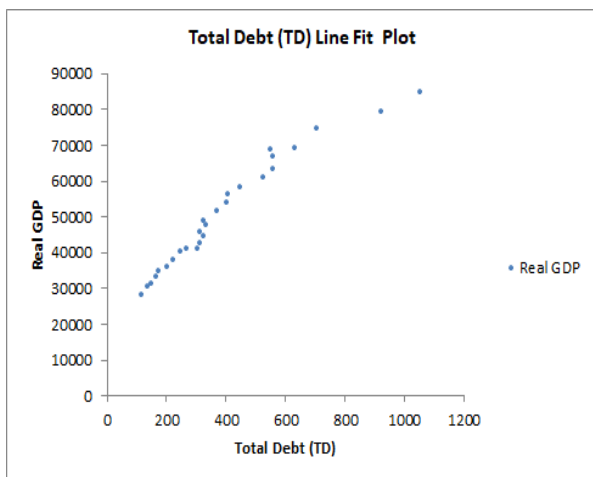


Figure 5. Total Debt with GDP



From the equation no. 1,  $GDP_t = 32670.15 + 136.38ID_t + \varepsilon$

P -Value = 1.80692E – 15 and  $R^2 = 0.92354$

From the equation, there is positive relationship between GDP and ID which means when ID increases then GDP also increases. The intercept term  $\beta_0$  is 32670.15 which indicates that GDP would be 32670.15 if the ID is zero. The result shows that change  $\beta_1$  of ID is 136.38 which explains that one unit increase in ID causes GDP to increase by 136.38. The coefficient of determination  $R^2$  is 0.92354 which means that 92.35% of the variation of GDP is determined by the explanatory variable i.e. internal debt. In other words, if we are trying to explain what may affect GDP. There might be other factors that can explain this variation but this model which includes only internal debt can explain 92.35% of it. This means that 7.65% of the variation in GDP cannot be explained by internal debt alone. Therefore, there must be other variables that have an influence also. Similarly, the calculated P-value is 1.80692E-15 means almost zero of P-value which is less than the 0.05 which implies that the model is statistically significant. Hence, the study is statistically significant.

From the equation no. 2,

$GDP_t = 19074.81 + 125.71\beta_2ED_t + \varepsilon$

P -Value = 1.59438E – 16 and  $R^2 = 0.93700$

GDP and ED have a positive relationship, according to regression model equation no.2. Simply put, as the ED rises, so does the GDP rise. If the value of ED is zero, the GDP is 19074.81. This equals 19074.81 for intercept zero. Similarly, the change in ED is 125.17, implying that a one-unit change in the ED produces a 125.17 change in GDP. The coefficient of determination  $R^2$  is 0.93700, indicating that the explanatory variable, foreign debt, is responsible for 93.7 percent of the difference in GDP. This means that external debt alone cannot account for 6.3 percent of GDP variance. As a result, there must be other factors that play a role. Similarly, the calculated P-value is 1.59438E-16 which is also almost zero and which is also less than the 0.05; this implies that the model is statistically significant.

From the equation no. 3,

$GDP_t = 25299.03 + 65.986TD_t + \varepsilon$

P -Value = 7.32947E – 17 and  $R^2 = 0.94079$

There is also a positive relationship between GDP and TD, as shown by regression model equation no. 3. 25299.03 is the value of  $\beta_0$  and 65.986 is the value of  $\beta_1$ . The change in the TD is 65.986, which is equivalent to a change in one unit of GDP. The coefficient of determination  $R^2$  is 0.94079, indicating that the TD is responsible for 94.07 percent of the difference in GDP; the remaining percentage cannot be explained solely by total debt. The regression model's P-value is also less than 0.05, which is almost zero 7.32947E-17. The regression model has a statistically significant coefficient of determination.

From the final equation no. 4,

$GDP_t = 23389 - 37.32\beta_1ID_t + 0 + 83.772TD_t + \varepsilon$

P -Value = 1.85966E – 16 and  $R^2 = 0.94162$

From this equation, this is the multiple regression model, where  $\beta_0$  is 23389 and value of  $\beta_1$  is -37.32,  $\beta_1$  is 83.772. The coefficient of determination  $R^2$  is 0.94162 which means 94.16% of the variation of GDP is determined by the public debt alone and the remaining part of the other variables influences the 5.84% only. The P-value is 1.85966E-16, this value is also less than the 0.05 level of confidence, and hence, this model is also statistically significant.

## 8. Conclusion

The effect of the rising trend in government borrowing on economic growth was examined in this report. Because of the limited revenue resources, government spending has risen faster than government revenue. As a result, the government has taken out loans from both internal and external sources. Borrowing is on the rise,

posing a significant problem for debt management and posing a major challenge for the economy. Borrowing money is most likely funded by non-monetized and unproductive sectors of the economy, putting the nation at risk.

Owing to a lack of internal capital mobilization, a widening investment saving gap, export import gap, tax expenditure gap, and a high fiscal deficit, the external debt's degree of indebtedness has increased. As a result, there has been an overabundance of international loans to fill in the gaps. As a result, the debt burden and debt servicing obligations are increasingly rising each year, while the economy's debt servicing ability is not keeping up.

During study, it was discovered that government borrowing has risen unlikely and has been funded mostly on unproductive sectors such as uncertainties and high expenses, resulting in the government still lacking the money and having to take out new loans to pay off the old ones. As a result, the public debt and its interest are steadily rising, but the debt's repayment potential is not increasing at the same pace.

Nepal has been taking public debt for economic development since 1963. This process continues to date. This can be clearly seen from the figures we have described in the analysis, in the period from 1992/93 to 2018/19. This is also analyzed the current situation of Nepal's public debt and economic growth of 2018/19.

Thus, for almost 27 years, Nepal's public debt growth rate has been steadily increasing, albeit to a lesser extent. Total debt only looks slightly different in 2016/17 to 2017/18 while it has only increased steadily at other times.

The regression model is constructed from four equations of data. The same results are obtained in all the equations. The regression model constructed between economic growth and internal debt, external debt and total debt is statistically significant in all. Also P value is almost zero in the total equation. This means that the choice of independent variable and dependent variable seems to be correct.  $R^2$  is more than 90% of the entire equation model. Not only in Nepal but also various other developing countries are taking public debt for the economic development of their country. Not only in Nepal but also in other countries there is a positive relationship between public debt and economic development. But they seem to have made a leap forward in the country's economic development from public debt. In the case of Nepal, it cannot be seen as such, but public debt seems to have increased the country's economic development. But it needs to be used properly.

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