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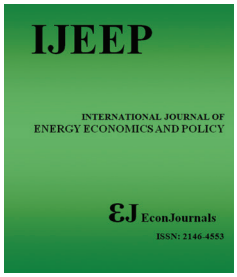

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The Impact of Budget, Accountability Mechanisms and Renewable Energy Consumption on Environmentally Sustainable Development: Evidence from Indonesia

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ABSTRACT

The goal linked with the current article is to analyse the impact of the budget approved for environmental development, accountability mechanism of the government and renewable energy consumption on the environmental sustainability development of Indonesia. The quantitative method has been executed through which secondary data has been extracted from the database of World Bank along with the finance ministry of Indonesia from 1985 to 2017 while for the analysis purpose ARDL approach has been used. The results revealed that positive nexus among the budget approved for environmental development, accountability mechanism of the government, renewable energy consumption and environmental sustainability development of Indonesia in both the short and long run. The results also revealed that negative linkage among the energy import and environmental sustainability development of Indonesia. These findings provided suitable measures to the regulatory authority of the country that they should approve more budget for environmental development along with maintaining the high accountability mechanism that enhances the environmental sustainability development in Indonesia.

Keywords: Environmental Development, Accountability Mechanism, Renewable Energy Consumption, Environmental Sustainability Development
JEL Classifications: F64, O13, P18

1. INTRODUCTION

Environmental sustainability is a very hot topic in today's world. The environmental issues have emerged as mainstream issues in the 1960s and 1970s. The world and leaders of nations are quite inquisitive about the extent of environmental degradation. These issues are more important and substantial for the survival of the human race. The election campaigns and even the electoral reforms should include environmental sustainability as an integral and foremost part. It should be clearly stated in the constitutive documents that environmental sustainability correlates with human survival and existence. Same is the case with the Republic of Indonesia. There is a proper clause in the constitution of Indonesia (1945's constitution) that includes or addresses environmental sustainability (Ögmundarson et al., 2020).

The impact of different variables like budget and other mechanisms are quite evident in this regard. The government of Indonesia is working devotedly and diligently in this regard. The government has provided funds to urban as well as rural areas of Indonesia. One such example is the funds provided to the province of Jawa in Indonesia. The province was allotted 8,373,021,018,000 rupias in 2016 and 6,384,442,058,000 Indonesian rupiahs in 2017 as the budget of development and maintenance of environmental sustainability (Kasayanond et al., 2019; Khan and Younas, 2019). The research data suggested that most of the funds are used in

infrastructure development and roads construction in the province of Jawa. This contradicts the policy of Law number 6 of the constitution of Indonesia (Astuti, 2018).

The term sustainability has vast and diverse meanings. It defines the multidimensional proposal to attain a better quality of life for everyone. The sustainable environment and economy are correlated terms. These terms are the mainstream pillars of development of a country. The distribution of resources and demand of the nation should be balanced enough to support all types of needs and requirements of present and future generations. The need is to maintain a fair balance between demand and supply (Cho et al., 2018; Kirwa and Ngeno, 2020). The world is becoming materialistic day by day. It is not supporting the maintenance of novel and unique habitats of living beings. The biodegradation and habitat destruction of the creatures or wild animals for attaining the full advantage of human living standards is increasing day by day. Nature and its resources provide all types of advantages to humans but humans are not ready to serve and conserve nature. This imbalance and selfish approach of human beings has disturbed the environmental sustainability a lot (Bertella, 2019).

A term which is known as sustainable development goals is adopted by the United Nations in the year 2015. This policy focuses on mainstream challenges like poverty, environmental degradation and climate change. These goals are included in the national policy of Indonesia. Through the Presidential Decree No. 59/2017, Indonesia has committed to mainstream the SDGs into the national context. The 17 goals were translated into national development agendas, which in turn are based on the four pillars of the National Long-term Development Plan (RPJPN), 2005-2025: Steady law and political institution, increasing wealth and prosperity, more advanced and sustainable economic structure, and biodiversity preservation. The Presidential Decree mandated the release of the SDGs Roadmap, to serve as the general policy guideline for future. The proposed timeline and listed number of sustainability goals in the context of National Action Plan and sectoral division of plan into different levels of environmental sustainability parameters. It can be assessed through this information that the Indonesian government takes the environmental stability and conservation of environmental resources quite seriously. They even have formulated a Biodiversity related strategic action plan (Halimatussadiah, 2020). The basic need here is that the accountability mechanism to maintain a proper check and balance is very necessary. The government when allocating budget for a specific purpose then that amount should be only consumed or spent for that specific purpose and to make this thing crystal clear the government should make a lot of effort. The accountability bureau of the country should be active and should give a monthly report to the finance ministry and even to the prime minister and president because they all are responsible for proper development and attainment of aims which has already set in the National Action Plan (Muda and Naibaho, 2018).

Renewable energy resources are those biodegradable and renewable agents of nature which could be utilized in an effective way (Nawaz et al., 2019). These resources are a good source of energy and they do not emit harmful chemicals and compounds in the environment. This thing helps a lot in determining the balance between economic development and environmental development (Gérardy et al., 2020). The natural resources like fossils fuels account for a total of 2% of the energy resources but these resources are energy-consuming and they are agents of environmental pollution and global warming as well. The trend changed in the world from fossil fuels consumption towards bio-based energy solutions or chemicals (Morone and D'amato, 2019).

The composting and landfills are the new bio-based methods to avoid the pollution generated by fossil fuels consumption (Fiorentino et al., 2019; Nawaz et al., 2020). The academia and industry are jointly proposing links to link the production of the bio-based chemical without any harmful chemical emission and even global warming-related concerns. The proposed share of bio-based chemicals production in Indonesia and the overall world will cover 22% of total chemical production by the end of the year 2025 (Fiorentino et al., 2019).

The bio-based chemicals can be produced by natural processes, but it is wastage of time and resources to wait for such a long time. This thing is overcome using new and latest technology and it has many advantages like timesaving and readily available methods, the raw material is quite cheap, and it is also naturally available at very low cost. The recombinant DNA technology and use microbes to produce such chemicals synthetically in labs as well in industries is quite an efficient way to produce the energy and related products like biofuels and other related bio-based chemicals. The consortia of microbes produce the required amount of chemical in very less time as compared to natural ways and in industries with harmful additives and related products which causes air and water pollution (Pagliaro, 2019).

The Indonesian economy has scaled up a lot and it is raised by 2.5% in previous years. The unique feature of their National Action Plan is that they have put great stress on environmental sustainability and allocated a handsome amount for this purpose. The accountability and other counter checking mechanisms are active enough to gauge the pace of developmental works. The government has allotted funds locally at the sectoral or regional level to ease the difficulties of less developed areas as well. The counter checking mechanism should be strong enough that the funds should be served for the right purpose. If this happens then national action plan and all the developmental incentives could easily reach to the common man at the grass-root level. This would be the dawn of a new era with unique, developed and sustained environment (Nong et al., 2020).

The share of total energy-related CO_2 emissions in 2018 in transport, agriculture, buildings, Industries, another energy sector, electricity, were 28%, 1%, 5%, 31%, 7% and 28% respectively. When comparing this statistic with others, the highest share was of transport and electricity/heat. Both pertain the same percentage. In the decarburization field, the shares of renewables, gas, oil and coal were 12%, 22%, 5% and 61%, respectively. In comparison with these statistics, the highest share was of coal. Similarly, in the field of decarburization, some other shares are; biofuels, electricity, gas, oil and coal were 3.5%, 0%, 0%, 96.5% and 0.

2. LITERATURE REVIEW

The economy of a country is directly related to the country`s environment and natural resources. Climate change and habitat destruction are two alarming things in today's world. The climate change and related problems have increased a lot and they have reached such a critical point that things are moving towards uncontrollable loss. This concern not only instigates the developed countries but also developing ones like Indonesia. A global effort is nowadays governing in this regard all across the world, a lot of rehabilitation strategies like the development of food security strategies, development of new and novel eco-friendly technologies and use of renewable energy resources are adopted to mitigate the change or damage to a minimal level (Sarkodie, 2018).

There link between economic growth, human well-being, industrialization, carbon dioxide emission and greenhouse effects is undeniable. These things are the true indicators of human development in terms of improved lifestyle, income, skill formation, employment opportunities, health care, gender parity, entrepreneurship and increased sense of environmental responsibility (Nawaz et al., 2020). The industrialization helped a lot in improvement of food security, nutrition and technological advancements. This trend has changed the outlook of the world altogether (Asumadu-Sarkodie and Yadav, 2019).

The improved conditions hygiene and living standards let the people in a more comfortable lifestyle. Air conditioners, automatic washing machines and refrigerators are present in every house. The rate of energy consumption becomes quite high nowadays and this thing triggers the need to adopt some strategies which can help to fill up the demand and supply gap. Fossil fuels and other reserves like oil have started to deplete at a very high pace. This thing made the life of people difficult. The need of the hour is to adopt new and novel energy reserves from nature to cope up the upcoming challenges. Technological advancements allowed us to do so. The recombinant DNA technology and improved agricultural practices helped us a lot to improve our living standards at a very low cost (Vergura, 2018).

The strong links between economic development, energy consumption, and environmental quality render the empirical evidence of the environment kuznets curves hypothesis largely significant, particularly for a developing country such as Indonesia, which is currently striving to boost its economy. Over the last decade, Indonesia's economy grew rapidly at an annual average rate of 5.4 percent per year. This was followed by an increasing amount of total energy supply to approximately 1525 million barrel of oil equivalents (BOE) in 2013 from 1,111 million BOE in 2000, with an annual average growth rate of 2.5 percent (Udemba et al., 2019).

Accordingly, the total emissions of carbon dioxide (CO_2) from fossil fuel combustion also showed an upward trend with a slightly faster average growth rate of 3.9 percent per year, amounting to 424.6 million tons CO_2-equivalent in 2013 from 258.3 million tons CO_2-equivalent in 2000. More than 38 percent of that combustion resulted from electricity generation (Tannady et al., 2019). This has created serious environmental problems, including the threat of climate change. A series of energy- and environment-related policies have been introduced by the Government of Indonesia (GoI) as countermeasures to nullify the environmental impacts of greenhouse gas (GHG) emissions (Sugiawan and Managi, 2016).

Developed countries have experienced a lot of success in terms of environmental sustainability and its related fields in the last three decades (Nawaz et al., 2020). The main reason is that they have very strong accountability mechanisms at both government and public sector level. They have educated their folks in such a way that they behave responsibly and play a vital role in this regard. They have promoted environmental safety, sustainability, and proper accountability mechanisms at all communicative forums like print media, social media and on networking websites. So, people become habitual to know about how they can work and play their role in environmental sustainability more effectively. The government has highlighted their action plans and agendas so clearly that even children have proper knowledge of each and everything (Fisher et al., 2018).

Developing countries are also trying to adopt the same strategy. They are trying a lot to compete with developed countries and educate their people in the same manner. The shortcoming is that these developing countries do not have adequate resources and accountability mechanisms to do the needful. Public sector accountability mechanisms are all about setting clear goals and plans to cope with emerging challenges. The level and extent of accountability mechanisms should be considered first and then the feedback from the working community should be analyzed. This thing could help the developing countries to come in competition with the developed countries (Hidayat et al., 2018).

The accountability mechanisms of environmental sustainability become complex in developing countries like Indonesia because they rely on foreign aid and international donors like the World Bank and the Asian Development Bank. These all organizations give aid to mitigate the poverty and elevate the lifestyles of people of the inhabiting countries (Paletta and Bonoli, 2019). This thing made it very difficult to do honest accountability. The effects of all the projects these type of organizations initiate in developing countries is always overseen and it adversely affects the environmental sustainability (Murdifin et al., 2019).

United Nations plays a pivotal role in shaping environmental sustainability plans and agendas. The Agenda 2030 with its 17 Sustainable Development Goals and 169 targets were adopted by all member states of the UN in September 2015 and aimed to be 'transformational', so that this world can become a better and sustainable place for living in next 15 years (United Nations General Assembly, 2015) (Boluk et al., 2019).

The Open Working Group of United Nations ended upon negotiating and finalizing the SDGs called the goals 'an integrated, indivisible set of global priorities for sustainable development (Bebbington and Unerman, 2018)'. Some of the goals are themselves integrative, and they address all of the three aspects i.e. social, environmental and economic of sustainable development.

All the other related targets are those which can easily be attained by working on all these goals (Tsalis et al., 2020).

All the eight major SDGs have a major focus on the environment and natural resources: (2) food and agriculture, (6) water and sanitation, (7) energy, (11) human settlements, (12) sustainable consumption and production, (13) climate change, (14) oceans, and (15) terrestrial ecosystems, while 86 targets concern some aspect of UNEP's work program, including at least one in each of the 17 SDGs. The remaining 83 targets are essentially either social or economic in focus and not directly relevant to the environment. These targets and agendas prove the importance of environmental sustainability measures and their impact on the economic development of the whole world (Lu et al., 2019).

The essence of all these efforts related to environmental sustainability and its related counterparts incorporate participation from all the sectors. The government should make constitutions, national action plans and rules which are to be followed by public and government employees strictly. These policies should be made clear by the print and social media campaigns. Students should study all the policies, rules and regulations related to environmental sustainability and then they should try to educate their elders and youngsters about all this stuff. The funds which are allocated to the government servants and the leaders of the public to spend on different projects of environmental safety and sustainability should be honestly spent on these projects. The timeline should be well-defined, and all the people should be responsible in case of any delay or corruption during completion of the whole project. The monthly audit report should be generated and should be presented to higher authorities by the accountability bureau (Dachroni and Muzwardi, 2017).

The renewable energy resources are utilized widely all over the world and the same is the case with Indonesia. The oil reserves and all the other business of people are largely dependent upon the electricity or power generation system. It is imperative for all the sectors and people of Indonesia to work devotedly in this regard. The biodegradable material should be used in all industrial practices. It would help a lot to low the cost of recycling machinery and on the other, it would lessen the pollution of air and water. The natural water supplies like rivers, streams and lakes can be protected in this regard. The natural landscape of Indonesia is very beautiful. The need of the hour is to maintain its sustainability. If the steps of the national action plan are implemented by the government with full zeal and devotion then it would become very easy to attain all the stated goals (Santika et al., 2020).

So, it can be said that all the developing countries are also aware of environmental sustainability and its importance. They have set specific goals and targets to achieve excellence in the attainment of environmental sustainability. The only problem is of resources and lack of education in common public which hinders the development in this regard. Developed countries have experienced a lot of success in terms of environmental sustainability and its related fields in the last three decades. The main reason is that they have very strong accountability mechanisms at both government and public sector level. They have educated their folks in such a way that they behave responsibly and play a vital role in this regard. They have promoted environmental safety, sustainability, and proper accountability mechanisms at all communicative forums like print media, social media and on networking websites. The only way to avoid all these problems is to simply help and cooperate with the institutions which are working for our well-being. Only the cooperation, understanding and implementation of environmental sustainability parameters can improve the condition of this whole world and can make it a better place to live in. Indonesian government and public sector institutions are working very diligently to achieve all the goals of their National Action Plan. The only thing which should be kept in mind that everyone is accountable for his deeds and every single person should take charge and try to improve the conditions of the environment of not only his country but also of this whole world. Thus, based on all mentioned above literature, the ongoing study has developed the following hypotheses:

H_1: Budget approved for environmental development has a direct impact on environmental sustainability development in Indonesia

H_2: Accountability mechanisms of the government have a positive impact on environmental sustainability development in Indonesia

H_3: Renewable energy consumptions are positively enhanced environmental sustainability development in Indonesia.

3. METHODOLOGY

The current article aims to examine the impact of the budget approved for environmental development, accountability mechanism of the government and renewable energy consumption on the environmental sustainability development of Indonesia. The quantitative method has been executed through which secondary data has been extracted from the database of the World Bank along with the finance ministry of Indonesia from 1985 to 2017. In addition, the data include environmental sustainability development (ESD) that has been measured as the "ratio of primary government expenditures on the environment and the original approved budget (%)." While budget approved for environmental development has been measured as the "log of a total budget of the government for environmental development". Moreover, accountability mechanism has been measured as the "CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high)" while renewable energy consumption has been measured as the renewable energy usage in a year (percentage of goods produce) and energy import has been measured as the import of energy (percentage of energy usage). These variables along with measurement have been given in Table 1.

For the analysis purpose, the ARDL approach has been used due to this model has some advantages, such as the efficiency of the work, even with small sample sizes. "The ARDL model is equally efficient for the variables that are stationary at the level I (0) or first difference I (1) or even fractionally integrated". Therefore, this study executed the ARDL approach because it can investigate the short-run as well as long-run nexus among variables. The present research has developed the equation as follow:

Table 1: Variables with measurements

S#	Variables	Measurement	Sources
1	Environmental sustainability development	Primary government expenditures on the environment as a proportion of the original approved budget (%)	Finance Ministry of Indonesia
2	Budget	A total budget of the government for environmental development	Finance Ministry of Indonesia
3	Accountability Mechanism	CPIA transparency, accountability, and corruption in the public sector rating (1=low to 6=high)	World Bank Database
4	Renewable Energy Usage	Renewable Energy usage in a year (percentage of goods produce)	World Bank Database
5	Energy Import	Import of energy (percentage of energy usage)	World Bank Database

$$ESD_t=\alpha_0+\beta_1 LNBUD_t+\beta_2 REC_t+\beta_3 EI_t+\beta_4 AM_t+ e_t \quad (1)$$

Where
t = Time period
ESD = Environmental sustainability development
BUD = Budget for environmental development
REC = Renewable energy consumption
EI = Energy import
AM = Accountability mechanism.

Moreover, the ARDL cointegrating model has been given as under:

$$\Delta ESD_t = \alpha_0 + \sum \delta_1 \Delta ESD_{t-1} + \sum \delta_2 \Delta LNBUD_{t-1} + \sum \delta_3 \Delta REC_{t-1} + \sum \delta_4 \Delta EI_{t-1} + \sum \delta_5 \Delta AM_{t-1} + \varphi_1 ESD_{t-1} + \varphi_2 LNBUD_{t-1} + \varphi_3 REC_{t-1} + \varphi_4 EI_{t-1} + \varphi_5 AM_{t-1} + \varepsilon_1 \quad (2)$$

In Equation (2) δ_1, δ_2, δ_3, δ_4, and δ_5 has been highlighted the coefficients about the short-term nexus with summation signs, however, φ_1, φ_2, φ_3, φ_4, φ_5, and ε_1 has been used as the coefficients about the long-term nexus and Gaussian white noise term, respectively. However, in the next step, this study has estimated the error correction model:

$$\Delta ESD_t = \alpha_0 + \sum \delta_1 \Delta ESD_{t-1} + \sum \varphi_2 \Delta LNBUD_{t-1} + \sum \omega_3 \Delta REC_{t-1} + \sum \theta_4 \Delta EI_{t-1} + \sum \Upsilon_5 \Delta AM_{t-1} + \delta ECM_t + \upsilon_t \quad (3)$$

4. FINDINGS

The current article has checked the stationarity before examining the dynamic linkage between environmental sustainability development, budget for environmental development, energy consumption, accountability mechanism and energy import. In addition, ARDL model has been considered as the flexible co-integrating approach due to its characteristics of executing when all variables are stationary at 1(0) or 1(1) or the mixture of 1(0) and 1(1). However, the ARDL has the limitation of cannot be executed in the case of 1(2) (Ibrahim, 2015). Thus, to test the stationarity, PP and ADF unit root test has been employed by the current study. The results indicated that no variables are stationary at I (2). Hence, this study can proceed with the ARDL approach and these figures are mentioned in Table 2.

The ARDL bounds testing approach has been estimated secondly by the current study, the results highlighted that the values of calculated F-test exceed the upper bounds' critical value at 5% and 10% significance level. Hence, co-integration among the constructs has been confirmed. These values have been shown in Table 3.

Table 2: Unit root test

Test	ESD	LNBUD	REC	EI	AM
Augmented Dickey-Fuller test (ADF)					
1(0)	–2.142	–0.476	–1.484	–1.244	–1.615
1(1)	–3.985	–7.611	–4.114	–4.113	–5.944
Phillips–Perron Test (PP)					
1(0)	–2.402	–0.403	–2.311	–1.144	–1.715
1(1)	–4.902	–8.135	–4.559	–4.448	–5.135

The results of the current study firstly show the short-run nexus among the budget approved for environmental development, accountability mechanism of the government, renewable energy consumption and environmental sustainability development. The figures highlighted that the positive along with significant nexus among the budget approved for environmental development, accountability mechanism of the government, renewable energy consumption and environmental sustainability development and accept H1, H2 and H3. However, negative along with insignificant association among the links of energy import and environmental sustainability development. These figures are highlighted in Table 4.

The findings firstly show the long run nexus among the budget approved for environmental development, accountability mechanism of the government, renewable energy consumption and environmental sustainability development. The statistics show that the positive along with significant nexus among the budget approved for environmental development, accountability mechanism of the government, renewable energy consumption and environmental sustainability development and accept H1, H2 and H3. However, negative and insignificant nexus among the links of energy import and environmental sustainability development. These figures have been mentioned in Table 5.

5. DISCUSSION

The results revealed that positive nexus among the budget approved for environmental development, accountability mechanism of the government, renewable energy consumption and environmental sustainability development of Indonesia in both the short and long run. These findings are similar to the output of the He et al. (2016) who also examined that renewable energy consumptions have positively impacted on the environmental sustainability development. In addition, a study by de Silva et al. (2020)

Table 3: ARDL bound test

Model	F-statistics	Lag	Level of significance (%)	Bound test critical values	
				I(0)	I(1)
ESD/(LNBUD,REC,EI,AM)	5.120	4	1	4.5	5.02
			5	3.37	4.47
			10	3.13	4.16

Table 4: Short-run coefficients

Variables	Beta	S.D.	t-statistics	P-values
D(LNBUD)	0.555895	0.273246	2.034413	0.0646
D(REC)	3.664565	1.025358	3.573936	0.0038
D(EI)	–126.257830	77.385978	–1.631534	0.1287
D(AM)	0.733537	0.206316	3.555411	0.0040
ECM(–1)	-0.581288	0.217867	–2.668091	0.0205

Table 5: Long-run coefficients

Variables	Beta	S.D.	t-statistics	P-values
D(LNBUD)	0.956315	0.664893	1.438299	0.1759
D(REC)	6.304212	2.305644	2.734252	0.0181
D(EI)	–217.203453	190.717768	–1.138874	0.2770
D(AM)	1.261915	0.370850	3.402762	0.0052
C	396.388392	355.923351	1.113690	0.2872
@TREND	0.502763	0.351509	1.430300	0.1781

exposed that the accountability mechanisms of the government could enhance the environmental sustainability development and this could be similar to the current study outcomes. Moreover, a study conducted by Gelderman et al. (2017) investigated that the approved budget for the sustainability purpose has positive influence the environmental sustainability development and this also matched with the findings of the ongoing study. The results also revealed that negative linkage among the energy import and environmental sustainability development of Indonesia.

6. CONCLUSION

Thus, the conclusion has drawn by the present study that the Indonesian government has proved reasonable budget for the environmental sustainability purpose and also has strong accountability mechanisms along with high but effective renewable energy consumption that is the reason of high environmental sustainability development in the country. This conclusion guided to the other countries they should also focus on the measures that are taken by the Indonesian government for environmental sustainability development. These findings provided suitable measures to the regulatory authority of the country that they should approve more budget for environmental development along with maintaining the high accountability mechanisms that enhance the environmental sustainability development in Indonesia. This study has some limitations such as they ignore the cross country analysis and suggested to the future studies that they should add more countries in their analysis. In addition, this study has adopted the ARDL adopted due to the one country time series analysis and recommended that future studies should adopt the panel analysis such as robust standard error and generalized method of moment (GMM) in the studies. Finally, the time frame of the study has been used only 32 years from 1985 to 2017 and suggested that future studies should increase the data set to expand their scope of the study.

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