Determinant Factors of Ecological Fiscal Transfer in Indonesia

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ABSTRACT

This research aims to identify the factors that determine the allocation of ecological fiscal transfer, including the size of local governments, biodiversity program diversity, and revenue sharing from natural resources. The sampling method employs purposive sampling and is analyzed using multiple regression analysis. The population of this research is the local government that plans and implements ecological fiscal transfers recorded in the DJPK of the Ministry of Finance in 2021-2023 with an analysis sample of 32 data that implement and plan ecological fiscal transfer. The findings of this study suggest that the size of local governments and revenue sharing from natural resources positively influence ecological fiscal transfer, while the diversity of biodiversity programs negatively impacts ecological fiscal transfer.

Keywords: Ecological Fiscal Transfer; Size of Local Government; Biodiversity; Natural Resource Revenue Sharing

Faktor Determinan Ecological Fiscal Transfer di Indonesia

ABSTRAK

Penelitian ini bertujuan untuk mengetahui faktor determinan yang mempengaruhi pengalokasian ecological fiscal transfer antara lain ukuran pemerintah daerah, keragaman program biodiversitas dan pendapatan bagi hasil sumber daya alam. Metode pengambilan sampel menggunakan teknik purposive sampling dengan pengujian melalui analisis regresi berganda. Populasi penelitian ini adalah pemerintah daerah yang merencanakan dan melaksanakan ecological tramsfer fiscal yang tercatat pada DJPK Kemenkeu tahun 2021 – 2023 dengan sampel analisis sebanyak 32 data yang menerapkan dan merencanakan ecological fiscal transfer. Hasil dari penelitian ini yaitu ukuran pemerintah daerah dan pendapatan bagi hasil sumber daya alam berpengaruh positif terhadap ecological fiscal transfer, sedangkan keragaman program biodiversitas berpengaruh negatif terhadap ecological fiscal transfer

Kata Kunci: *Ecological Fiscal Transfer*; Ukuran Pemerintah Daerah; Biodiversitas; Pendapatan Bagi Hasil

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INTRODUCTION

Climate change in recent years has led to a deterioration in environmental quality worldwide. (Desdiani et al., 2021). In 2023, Indonesia recorded its highest ever surface temperature of 38°C (Herlambang, 2025). Over the past three years, the number of natural disasters in Indonesia has increased, from a total of 3,402 in 2021 to 14,346 in 2023. Floods, hurricanes, landslides, and forest fires were predominant (PDSI et al., 2024).

Due to the frequency of natural disasters, forest fires in Indonesia are an environmental problem that requires both government and public attention. Forest fires are caused by various factors, such as long dry periods and deforestation by fire. (Iqbal, 2022). In 2023, the global forest fire area reached 399,923,200 hectares (Samborska & Hannah, 2024). Indonesia itself contributed 0.29%, or 1,161,192.9 hectares, to the global forest fire area, with the burned area increasing significantly compared to 2022, when it was only 204,894 hectares (Sipongi, 2024).

Forest fires can lead to the loss of habitats for flora and fauna biodiversity, as well as damage to environmental ecosystems in the form of air and water pollution caused by forest fires (www.nationalgeographic.grid.id). The government is making efforts to address environmental damage with the promulgation of Law PMK No. 216/PMK.07/2021 on the Use, Monitoring, and Evaluation of Funds from Forest Natural Resource Revenue Sharing and Reforestation Funds (www.jdih.kemenkeu.go.id). Within the framework of this policy, Indonesia continues to make efforts to mitigate and adapt to climate change. In 2019, mitigation and adaptation measures related to environmental management required IDR 4.52 trillion, of which 66% came from private and international funds and 34% from the ecological fiscal transfer budget (Desdiani et al., 2021).

The ecological fiscal transfer policy aims to improve financial relations and ecological governance between the central and local governments in the area of biodiversity and the environment (Halimatussadiah et al., 2021). The ecological fiscal transfer policy has been implemented by several countries worldwide using the indicators and financing sources listed in Table 1.

Table 1 shows that the government plays an important role in the distribution of ecological fiscal transfer at the regional level, the faster the implementation of ecological fiscal transfer, the greater the impact on optimizing environmental quality management based on various required indicators.(Busch et al., 2021). In Indonesia, the distribution of ecological fiscal transfer has changed annually (Desdiani et al., 2021). The increase in distribution is evident in Table 2.

Table 1. Application EFT in the World

Country	Year Implementation	Indicator	Source of Funds
Portugal	2007	Protected Areas	Government Budget
France	2007	Land areas that are strictly protected	Government Budget
China	2012	Water quality	Government and Regional Budget
India	2015	Dense forest area	State Tax
Indonesia (Kalimantan Utara)	2019	Forest fires, water quality, air quality, waste management and open space index	Government Budget (DAU)
Brasil (Alagoas)	2020	Biodiversity Diversity	Tax State

Source: Busch et al., (2021); Droste et al., (2016)

Tabel 2. Implementation EFT in Indonesia

Year	Budget (Thousand rupiah)
2021	14,051,100,000
2022	14,109,200,000
2023	14,100,000,000

Source: Kementrian Keuangan, 2023

Table 1 shows, that the government plays an important role in the distribution of environmental financial transfers at the regional level. The faster environmental financial transfers are implemented, the greater their impact on optimizing environmental quality management based on various required indicators (Busch et al., 2021). Therefore, central and regional governments must cooperate to ensure a fair budget for ecological fiscal transfer and avoid fraud that could negatively impact all stakeholders (Nevi Costari & Putri Ariella Belinda, 2021). This aligns with the theory of budget rationality, which emphasizes common interests and mutual benefits to achieve shared objectives (Coleman, 1990). However, there is a gap in previous research on ecological financial transfers. Ecological financial transfer policies play a crucial role in improving biodiversity and environmental management (Halimatussadiah et al., 2021).

The allocation of ecological fiscal transfer depends on the size of a regional government. The larger the government or region with extensive protected areas, the more budget is required for environmental management (Droste et al., 2016). The size of local governments or regions with large geographical extents can influence the allocation of the budget for ecological fiscal transfers. The larger the local government, the greater the need for ecological fiscal transfers tends to be (Martinez-Vazquez & Timofeev, 2009). In the context of local government size, ecological fiscal transfer are utilized to manage environmental protection (Wang, 2022).

According to international best practices, a regional government whose size is determined by the area of protected zones compared to the total critical area

receives more general funding than regions with a land cover index relative to the total critical area or a smaller area of protected zones. The goal is to reward regions and motivate them to support forest and environmental protection initiatives within their respective areas (Haryanto, 2015). Another aim is to achieve economic equality between regions (Aditiya & Dirgantari, 2017). Consequently, the larger the protected area in a region, the higher the allocated ecological fiscal transfer funds (Haryanto, 2015)(Busch et al., 2021).

This is consistent with the theory of fiscal rationality, regions with large protected areas need to better manage their ecological fiscal transfer budgets to improve the quality of the region (Canavire-bacarreza et al., 2019). Based on previous research by Desdiani et al., (2021) and Eisenack, (2024), it was found that the size of local government has a positive impact on ecological fiscal transfer. Therefore, the first hypothesis of this research is:

H1: Size of the local government has a positive effect on ecological fiscal transfer

Ecological fiscal transfer also encourages local governments to implement various biodiversity programs to attract investors and external stakeholders. These investors support local governments in financing biodiversity programs, while the central government benefits through regional taxes (Haryanto, 2016). Taxes make a significant contribution to the Indonesian economy (Kusbandiyah et al., 2022).

In the context of ecological fiscal transfer, the concept of high biodiversity program diversity is used as a measurement tool to determine the relevant biodiversity program to implement ecological fiscal transfer both in a national and global context, it is used to finance reforestation programs and the restoration of coral reef areas after environmental degradation (Busch et al., 2021)(Köllner et al., 2002)(Lima de Paulo & Camões, 2019). According to the theory of budgetary rationality, the existence of biodiversity program diversity requires government resources to achieve the efficiency expected by all parties, both central and regional governments (Gu et al., 2022). Furthermore, potential negative impacts due to poor management of biodiversity program diversity are eliminated (Cao et al., 2022). Thus, ecological fiscal transfer support local governments in the conservation and restoration of biodiversity program diversity management (Hariyati et al., 2020). Previous studies have shown that biodiversity program diversity has a positive effect on ecological fiscal transfer (Busch et al., 2021)(Gu et al., 2022). This is supported by a study conducted by Desdiani et al., (2021) with research subjects in Indonesia, which found a positive effect of biodiversity program diversity on ecological fiscal transfer.

Another study by Köllner et al., (2002) with research objects in Switzerland also concluded that the diversity of biodiversity programs strongly determines the allocation of budgets for ecological fiscal transfer, thus making it easier for the government to allocate budgets for ecological fiscal transfer to different regions. Meanwhile, Santos Rui et al., (2012) with research objects in Portugal found that a relatively high diversity of biodiversity programs has a negative effect on the amount of ecological fiscal transfer. This is consistent with the findings of Busch & Mukherjee, (2018) who found using research objects in Brazil, that the failure of local governments to identify biodiversity had a negative effect on the implementation of ecological fiscal transfer, as local governments attempted to

increase other transaction costs to increase the amount of ecological fiscal transfer. The second hypothesis of this research is:

H2: Diversity of biodiversity programs has a positive effect on ecological fiscal transfer

In addition to ecological fiscal transfer, financing for environmental management for local governments can also be achieved through the sharing of natural resource revenues (Tianawati, 2022). Since areas with large land areas typically limit access for potential investors, local governments urgently need support through ecological fiscal transfer to finance environmental management (Mumbunan et al., 2012). The allocation of natural resource revenues can affect the budget for ecological fiscal transfer, regions with high natural resource revenues tend to have high conservation spending needs. This is because they do not implement environmental protection measures, so they actually require an ecological fiscal transfer budget for environmental management (Mumbunan et al., 2012).

In the theory of fiscal rationality, the level of natural resource revenue sharing can increase the allocation of government ecological fiscal transfer according to the presence of protected areas to achieve the common goal of environmental protection Droste et al., (2016). Studies by Dougherty & Montes, (2023) and Tianawati, (2022) showed that natural resource revenue sharing has a positive effect on ecological fiscal transfer. Thus, the third hypothesis of this research is:

H3: Sharing of revenues from natural resources has a positive effect on ecological fiscal transfer

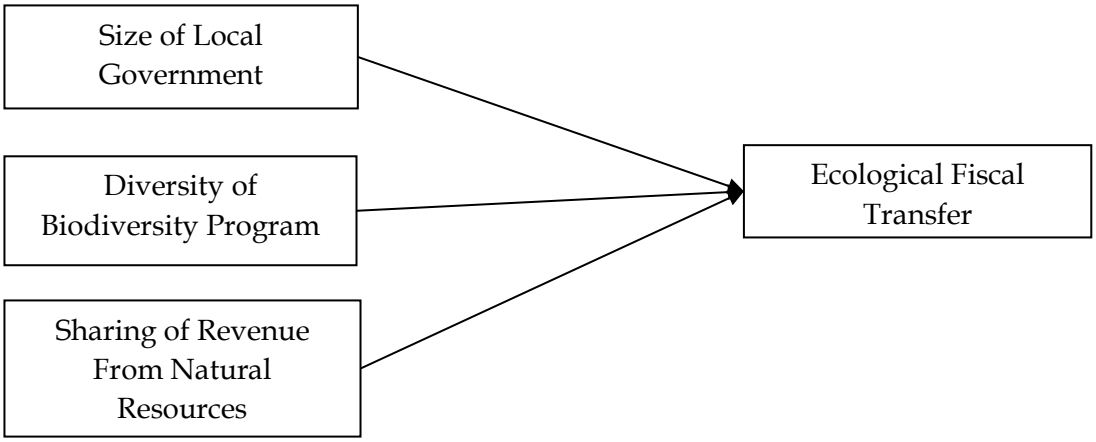

Figure 1. Research Model

Source: Research Data, 2025

RESEARCH METHOD

In this research, the researchers used quantitative research methods and secondary data from local government reports. Multiple regression analysis was used as the analysis method. The sample consisted of local governments implementing ecological fiscal transfer. Sampling was conducted using purposive sampling based on the following criteria:

1. Regional governments receiving ecological fiscal transfer in 2021–2023, listed in the Directorate-General for Budgetary Accounting.

2. Regional governments implementing and planning to use ecological fiscal transfer in 2021–2023, listed in the Asia Foundation (TAF).

This research uses revenue-sharing funds in the forestry sector to measure ecological fiscal transfer. The existence of revenue-sharing funds between the central and regional governments opens up opportunities to use the ecological fiscal transfer budget for environmental protection (Ridwan & Fitriyani, 2022). The ecological fiscal transfer is calculated using the formula (DJPK, 2022):

$$\text{Ecological Fiscal Transfer} = 80\% \times \text{Regional Section} \times \left(\frac{\text{PNBP SDA Certain Area}}{\text{Total PNBP National}}\right) \quad \ldots\ldots\ldots (1)$$

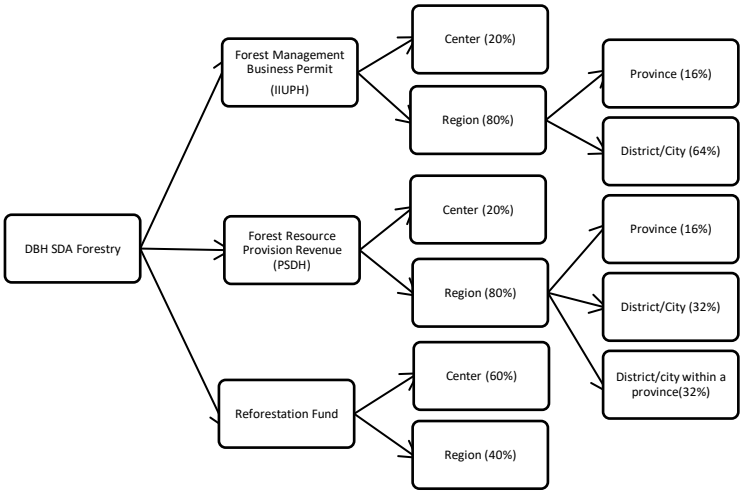

Figure 2. DBH Natural Resources Forestry Sector Mechanism

Source: (Manurung, 2019)

Figure 2 illustrates the mechanism for allocating the DBH-SDA budget in the forestry sector. This budget consists of three components: business permits for control (IIUPH), resource provision revenue (PSDH), and reforestation funds, which are derived from non-fiscal government revenues (PNBP) (Manurung, 2019). The IIUPH plays an important role in regulating regional forestry contributions according to applicable regulations, particularly in the area of forest protection (Aronggear & Ungirwalu, 2021). At the same time, the PSDH can make contributions related to regional revenues, which are part of the non-fiscal government revenues from natural resources in the forestry sector (Palapessy et al., 2024). Reforestation funds must be used for reforestation measures following forest damage, the three components are regulated in Law No. 33 of 2004 on Financial Equalization between the Central Government and the Regional Governments, Law No. 9 of 2018 on PNBP and PP No. 55 of 2005 on Budget Equalization (Manurung, 2019).

In this research, the size of the local authority is measured by the protected area. The protected area is comparable to the area of a region, as it can represent the total proportion of areas that were not reported due to reporting errors (Visconti et al., 2013). The protected area is calculated using the following formula (Visconti et al., 2013):

$$\text{Conservation Area} = \frac{\text{Protected Land Area} + \text{Total Land Area of OECM}}{\text{Total Land Area}} \quad \ldots\ldots\ldots (2)$$

Conservation area: The total area of land and water protected by the government for biodiversity conservation, expressed in hectares (Pemerintah Indonesia, 1990).
Protected land area: The entire protected area designated as a scientific reserve by the national authorities (WCMC, 2024).
Total land area of OECM (Other Effective Area-Based Conservation Measures): Geographically defined areas that are not legally defined, can be identified, and whose results support protected areas, including coastal waters and small islands, offshore areas, and the deep sea (Kehutanan, 2023).
Total land area: The total land area of a region is measured in square kilometers or hectares, excluding inland waters, continental shelves, and exclusive economic zones (Badan Informasi Geospasial, 2021).

Measurement of biodiversity program diversity using the area of forest and waters (Ha) in the region and identified as having high biodiversity program diversity included in the program performance indicators (IKP) by the Directorate General of KSDAE. The diversity of biodiversity programs is grouped into two parts, namely terrestrial and aquatic biodiversity, where these two parts are a unit that influences each other in the form of balance and productivity of the environment of an area (Matatula, 2024). The diversity of biodiversity programs is calculated using the formula (Commision, 2024):

$$\text{Biodiversity Program Diversity} = \frac{\text{Forest and Water Area (Ha)}}{\text{IKP Achievement}} \quad \text{..... (3)}$$

Measurement sharing of revenue from natural resources uses the total natural resource revenue sharing funds of a region. This is because the sharing of revenue from natural resources funds of a region comes from regional natural resource revenues, to carry out regional development and avoid fraud from parties involved in the distribution of regional revenue sharing funds, especially in areas rich in natural resources (Olivia, 2020). Sharing of revenue from natural resources is calculated using the formula (Saputra et al., 2021):
Sharing of Revenue From Natural Resources = Total Region DBH SDA

The analysis method used is the multiple linear regression method to determine the relationship between independent variables and dependent variables. Hypothesis testing in this research uses the determination coefficient test (R-squared) and the model feasibility test (F-test). The regression equation in this research is:

$Y = \alpha + \beta 1UPD + \beta_2 KPB + \beta_3 PBHSDA + e$.....(4)

Description:
Y = Ecological Fiscal Transfer
X_1 = Size of Local Government
X_2 = Biodiversity Program Diversity
X_3 = Sharing of Revenue From Natural Resources
α = Constant
β_1 β_2 β_3 = Coefficient

RESULTS AND DISCUSSION

This research examined local governments that planned and implemented ecological fiscal transfer, as recorded by the Asian Foundation (TAF) in 2021–2023. There were 32 local governments with a total observation sample of 96 data. 35 of

these data points were outliers, as they contained extreme values—data whose values were very large or very small compared to other data, which could result in the data distribution being non-standard. Thus, the final sample size was 61 research data.

Table 3. Descriptive Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
Ecological Fiscal Transfer	61	0.02	447.20	32.42	78.85
Size of Local Government	61	0.01	45.33	12.76	12.52
Biodiversity Program Diversity	61	0.00	3.45	0.73	0.97
Sharing of Revenue From Natural Resources	61	14.65	19.53	16.62	1.40
Valid N (*listwise)*	61				

Source: Research Data, 2024

Based on the data above, it can be seen that the ecological fiscal transfer and biodiversity program variables have a std. deviation value that is greater than the average value so that it can be concluded that these variables have varied data. Meanwhile, the size of the local government and revenue sharing of natural resources have a std. deviation value that is smaller than the average value so that it can be concluded that these variables have concentrated data.

Table 4. Classical Assumption Test Results

	Criteria	Results	Conclusion
Normalitas (One Sample K-S Test)	Value sig > 0.05	Asymp. Sig (2-tailed) .176	The data is normally distributed.
Multikolinearitas	Value VIF ≤ 10 and ≥ 0.10	Size of Local Government = VIF 1.226 Biodiversity Program Diversity = VIF 1.147 Sharing of Revenue From Natural Resources = VIF 1.377	In this research, multicollinearity did not occur.
Heteroskedastisitas (Uji Park)	Value Sig. > 0.05	Size of Local Government Sig .758 Biodiversit Program Diversity Sig .558 Sharing of Revenue From Natural Resources Sig .606	In this research, heteroscedasticity did not occur.
Autokorelasi (Durbin-Watson)	du < dw < 4-du	du =1.6904 dw = 2.267 4-1.690 = 2.310 1.690 < 2.267 < 2.310	In this research, there was no positive or negative autocorrelation.

Source: Research Data, 2024

Table 5. Multiple Linear Regression Results

Model	Unstandardized Coefficients B	t	Sig.
(Constant)	-741.839	-7.071	0.000
Size of Local Government	1.427	2.188	0.033
Biodiversity Program Diversity	-17.774	-2.199	0.032
Sharing of Revenue From Natural Resources	46.256	7.487	0.000
Adjusted R Square	0.474		
Sig. F	0.000		

Source: Research Data, 2024

The regression equation is as follows:

Y = -741,839 + 1,427X1 – 17,774X2 + 46,256X3 + e

If the size of local government, the biodiversity program diversity, and the sharing of revenue from natural resources are 0 or constant, it will increase the ecological fiscal transfer by Rp. 741,839. Every increase in the size of local government by 1 ha will increase the ecological fiscal transfer by Rp. 1,427. Every increase in the area of high category biodiversity conservation as an indicator of measuring the biodiversity program diversity by 1 ha will decrease the ecological fiscal transfer by Rp. 17,774. Every increase in the sharing of revenue from natural resources by Rp. 1 will increase the ecological fiscal transfer by Rp. 46,256.

Based on table 5, it can be seen that the sig value is 0.033 and the coefficient value is 1.427. So it can be concluded that the size of the local government has a positive effect on ecological fiscal transfer. Thus, the first hypothesis (H1) in this research is accepted. Ecological fiscal transfer is used to improve the environmental performance of a region (Mochammad, 2020). Thus, the larger the size of the local government, the greater the allocation of the ecological fiscal transfer budget (Droste et al., 2016). Because regions with large government sizes are more likely to be required to improve environmental quality better than local governments that are relatively small in size (Schröter-Schlaack et al., 2014). This is in line with the theory of budget rationality, where ecological fiscal transfer must be used as well as possible in improving the quality of a region in a government that has a large size (Canavire-bacarreza et al., 2019).

Based on table 5, it can be seen that the sig value is 0.032 and the coefficient value is -17.774. So, ecological fiscal transfer can be concluded that the biodiversity program diversity has a negative effect on ecological fiscal transfer. Thus, the second hypothesis (H2) in this research is rejected. The more biodiversity program diversity, the better the environment of an area which can be seen through the good air cycle, water cycle and maintenance of reproductive habitats (Soeprobowati et al., 2020). So that the emphasis on budget efficiency or allocation of ecological fiscal transfer will be reduced, because one of the indicators in the allocation of ecological fiscal transfer is based on environmental quality indicators such as water quality, air quality, land cover quality and gender development index (Fitriyani et al., 2022). In addition, the practice of measuring the biodiversity program diversity is still very low in Indonesia, resulting in the allocation of ecological fiscal transfer being set in a less relevant amount because one of the problems is that Indonesia has a very large biodiversity program diversity with

diverse geographical conditions but lacks infrastructure support to carry out identification, so that the allocation of ecological fiscal transfer is not in accordance with the biodiversity program diversity that should be (Saputra et al., 2021). This results in the process of allocating ecological fiscal transfer for each region not being able to have uniformity.

The results of research by de Paulo & Camões, (2020) stated that ecological fiscal transfer is related to the measurement of biodiversity because it cannot be separated from the political will factor, because in determining ecological fiscal transfer and measuring biodiversity, it concerns certain political interests including large companies that will influence the decision-making process at the legislative level. Because environmental factors play a very important role and have positive and negative effect on social life (Pramono et al., 2022). Thus, de Paulo & Camões, (2020) also explained that the unclear division of financing related to the determination of biodiversity between the central and regional governments has the consequence of increasing the budget burden for the regions, resulting in the allocation of ecological fiscal transfers being carried out in an unmeasured manner. This is not in line with the theory of budget rationality which should be in order to avoid a high budget burden, local governments tend to set the amount of ecological fiscal transfer that do not always match the environmental performance indicators that have been set (Droste et al., 2017). There are efforts to ensure that the determination of ecological fiscal transfer does not create an additional burden on the budget and the emergence of additional conservation costs, identification of high biodiversity that regions are forced to spend in order to meet environmental performance indicators (Schröter-Schlaack et al., 2014).

Based on table 5, it can be seen that the sig value is 0.000 and the coefficient value is 46.256. So it can be concluded that sharing of revenue from natural resources has a positive effect on ecological fiscal transfer. Thus, the third hypothesis (H3) in this study is accepted. Regions with high sharing of revenue from natural resources can trigger high environmental damage, this is because people will take and use natural resources in large quantities without considering the impact of their actions (Siregar et al., 2021). Thus, there needs to be an ecological fiscal transfer to increase concern for the environment (Mumbunan et al., 2012). With the ecological fiscal transfer, it is hoped that it will be able to achieve common goals between the central and regional governments in preserving the environment which will later provide benefits for all parties by the theory of budget rationality (Droste et al., 2016).

Based on the results of this study, the size of local governments and the distribution of natural resource revenues will increase the allocation of ecological financial transfers to local governments. Municipalities receiving high allocations of ecological financial transfers will need to further improve their environmental quality (Schröter-Schlaack et al., 2014). At the same time, the diversity of biodiversity programs will reduce the allocation of ecological financial transfers to local governments. Indeed, the more diverse the biodiversity programs, the better a region's environment (Soeprobowati et al., 2020).

CONCLUSION

The size of local government and sharing of revenue from natural resources have a positive effect on ecological fiscal transfer. Meanwhile, the biodiversity program diversity has a negative effect on ecological fiscal transfer. The limitation of this study is the limited research data because not all regions in Indonesia implement or plan ecological fiscal transfer, so researchers need to change the measurement method for the biodiversity program diversity variable. It is recommended for further researchers to use a measurement concept that is more applicable to Indonesia and can include the political will variable as a moderating variable as a link between variables.

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