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Journal of Environmental & Earth Sciences

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ARTICLE

The Effectiveness of Official Development Assistance to Indonesia Climate Mitigation

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ABSTRACT

This research investigates the effectiveness of climate-related development aid in Indonesia's climate mitigation. Specific objectives include assessing the contribution of official development assistance (ODA) to reducing CO_2 emissions and evaluating the implementation of the Busan Principles of aid effectiveness to achieve Indonesia's mitigation priorities and targets. We utilize a new primary dataset based on interviews with the most knowledgeable stakeholders of ODA on climate change mitigation. Additionally, we use secondary data from the annual Rio Marker and the Common Reporting Standard data of the Organization for Economic Co-operation and Development. The results show a significant correlation between climate-related development aid and CO_2 emission reduction in Indonesia. Additionally, the implementation of the Busan Principles enhances aid management by fostering project ownership and increasing the involvement of civil society and private sector. The study has implications for devising an effective climate change mitigation strategy for Indonesia. It is suggested that the government of Indonesia exercise greater flexibility and dynamism in engaging with development partners.

Keywords: Climate Mitigation; Official Development Assistance; Aid Effectiveness; Busan Principles; Indonesia

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ARTICLE INFO

Received: 7 May 2024 | Revised: 20 May 2024 | Accepted: 27 May 2024 | Published Online: 3 March 2025
DOI: https://doi.org/10.30564/jees.v7i3.6547

CITATION

Oktavia, R., Park, H., 2025. The Effectiveness of Official Development Assistance to Indonesia Climate Mitigation. Journal of Environmental & Earth Sciences. 7(3): 151–165. DOI: https://doi.org/10.30564/jees.v7i3.6547

1. Introduction

Mitigating the impacts of climate change requires concerted global efforts to reduce GHG emissions. Numerous international agreements and national policies have been developed to address this challenge. The Paris Agreement, adopted in 2015, aims to limit global temperature rise to well below 2 °C above pre-industrial levels, with efforts to limit the increase to 1.5 °C[1]. Achieving these targets necessitates the implementation of effective emission mitigation strategies, including transitioning to renewable energy sources, enhancing energy efficiency, and protecting and restoring forests[2].

Reducing GHG emissions also has significant co-benefits for air quality. Efforts to decrease fossil fuel consumption, enhance energy efficiency, and promote renewable energy sources not only reduce CO_2 emissions but also lead to lower emissions of air pollutants such as sulfur dioxide (SO_2), nitrogen oxides (NOx), and particulate matter (PM). Renewable energy projects funded through climate change Official Development Assistance (ODA) in Indonesia contribute to cleaner air by reducing the reliance on coal and other fossil fuels for electricity generation.

Indonesia, as one of the largest GHG emitters in the world due to its extensive use of fossil fuels and deforestation activities, has undertaken significant steps to mitigate its emissions. The country has committed to reducing its GHG emissions by 29% by 2030 compared to the business-as-usual scenario, with the potential to increase this target to 41% with international support. Key policies include the National Action Plan for Greenhouse Gas Emission Reduction (RAN-GRK) and the Indonesia Climate Change Sectoral Roadmap (ICCSR), which outline sector-specific strategies to achieve these targets[3].

Aid effectiveness is a significant aspect of climate change issues. The Busan high-level forum prioritizes that development cooperation should comply with global commitments including environmental sustainability. The Busan high-level forum 2011 released an outcome document mentioning the commitment to effective development cooperation. The relationship between effectiveness principles and climate finance was highlighted at the 4th High-Level Forum on Aid Effectiveness in Busan and climate funding was prioritized for successful international development. The document suggests continuing to "support national climate change policy and planning as an integral part" of the overall national development plans of developing countries[4]. Additionally, it states that wherever appropriate, these measures should be financed, delivered, and monitored via developing countries' systems in a transparent manner. Implementation of the four Busan Principles of country ownership, focus on results, inclusive development partnerships, and mutual accountability and transparency could enhance the effectiveness of climate-related official development assistance (ODA). This may, in turn, promote carbon-reduction endeavors.

Li and Lin[5] suggested that developed countries provide funds and technological support to developing countries to assist in CO_2 emissions reduction. As per the report of the Intergovernmental Panel on Climate Change, developed countries should expedite financial support for developing countries to improve and extend mitigation activities to limit the rise in global temperature to between 1.5 and 2 degrees Celsius above pre-industrial levels. Additionally, the report emphasized the necessity of international cooperation in achieving climate mitigation goals. International financial, technological, and capacity-building assistance could help developing countries adopt nationally determined contributions (NDCs). Impacts of climate change and the environment must be considered in all ODA spending activities, including in typically unrelated areas.

Generally, developing countries contributed approximately one-third of the total annual worldwide emissions in 1990. China, the US, India, the EU, Russia, Japan, Brazil, Indonesia, Iran, and Canada are the top 10 emitters globally[6]. Indonesia has received substantial financial commitments and pledges from various international development partners to combat climate change. This has considerably impacted Indonesia's approach and the development of its comprehensive national-level climate change policy.

The government of Indonesia has issued several regulations and policies to implement aid effectiveness based on internationally agreed principles. The Laws of the Republic of Indonesia 1/2004 About State Treasury seerve as the basic law for managing foreign loans and grants, and the Government Regulation Number 10/2021 on the Procedures for Procurement of Foreign Loans and Grant Receipt includes a few of the Busan Principles. As stated in this regulation, foreign loans are utilized to finance the national budget deficit, finance priority activities of a ministry or government agency, manage a debt portfolio, or finance local government and

state-owned companies. Thus, loans should be approved by the parliament as part of the national state budget. The Ministry of National Planning developed the technical regulation number 4/2011 regarding planning procedures, proposals, assessment, monitoring, and evaluation of funded activities from foreign loans and grants. The concerned minister conducts quarterly monitoring and evaluation regarding the realization of funding, progress of achievement, physical implementation, development of the procurement process of goods and services, problems/ constraints faced, and the follow-up steps required.

Therefore, this research aims to assess the effectiveness of climate-related development aid in Indonesia's climate mitigation. This is performed by identifying the impact of ODA on CO_2 emissions and evaluating aid effectiveness based on the Busan Principles on Global Partnership for Effective Development Cooperation (GPEDC) in alignment with Indonesia's priority and target on mitigation.

The findings of this study are not only relevant to Indonesia but also offer valuable lessons and strategies that can be applied to other developing countries facing similar challenges. Key contributions that can be utilized by other countries include: framework for assessing aid effectiveness, implementation of Busan Principles, and policy recommendations.

The methodological framework developed in this study can be adapted by other countries to assess the effectiveness of their climate-related ODA. This includes the integration of statistical analysis with interview insights to provide a comprehensive evaluation. The insights gained from the implementation of the Busan Principles in Indonesia can guide other countries in enhancing their own ODA projects. By emphasizing national ownership, result-oriented approaches, inclusive partnerships, and mutual accountability, countries can improve the effectiveness of their climate mitigation efforts. The policy recommendations derived from this study, such as aligning ODA with national development plans and ensuring stakeholder engagement, are universally applicable. These strategies can help other countries optimize the use of development aid to achieve their climate goals.

2. Overview of Climate Change and ODA in Indonesia

2.1. Indonesia Climate Change and Strategy

Indonesia is the largest contributor to emissions from forests and the eighth-highest emitter of greenhouse gases (GHGs) worldwide[6]. Based on Indonesia's Third Biennial Update Report submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in December 2021, Indonesia's GHG emissions were 1,593,163 Gg CO2e in 2019—an increase of 863,645 Gg CO2e from the 2000 level. In addition to being an emitter, Indonesia has a role in emissions reduction based on the existence of tropical forests that absorb and reduce emissions. The energy, forestry, agriculture, waste, production processes, and product use sectors have a major role in climate change mitigation efforts.

However, Indonesia is extremely vulnerable to climate change. Indonesia is the 14th largest country in the world with the third-longest coastline, and the direct threat of sea-level rise in 17,504 islands in Indonesia has been officially recognized. Low-lying cities such as Jakarta and Surabaya would be the most adversely impacted by the rise in sea levels, which is a hallmark effect of climate change.

Indonesia's commitment to addressing climate change was confirmed by the ratification of the UNFCCC in 1994. The country further strengthened its commitment by signing the Kyoto Protocol and establishing the Designated National Authority—Clean Development Mechanism in 2004. In 2008, Indonesia launched an action plan formulated into the National Development Planning Response to Climate Change. This was followed by the establishment of the National Council on Climate Change and the National Energy Council. The country's climate change policy and commitment became more aggressive with the launch of the Economic and Fiscal Policy Strategies for Climate Change Mitigation in 2009. In the same year, at the G20 meeting in Pittsburgh, Indonesia announced its intention to voluntarily reduce GHG emissions by 26% from present levels by 2020 compared to a business-as-usual (BAU) scenario, and another 15% with international collaboration. Furthermore, in 2009, the Law on Protection and Management of the Environment was passed.

Following these high-level promises, numerous key policy initiatives were launched, beginning with the introduction of the Indonesian Climate Change Sectoral Road Map in 2010 as a contribution to upcoming development plans and a climate financing needs assessment. Indonesia's

first NDC raised its commitment to reduce GHG emissions by up to 41% below the 2030 BAU level and up to 29% below the BAU scenario, subject to international support for funding, technology transfer, and capacity building. The strategy intends to address some of the key environmental issues, such as forest and peatland loss, waste creation surpassing management capacity, water resource depletion, and water contamination.

Indonesia has incorporated its policies for mitigation and adaptation into its long-term development plans; for example, the Indonesia Vision 2045 and the National Medium-Term Development Planning (RPJMN 2020–2024). Moreover, Indonesia updated its climate pledges by submitting an updated NDC to the UNFCCC on 22 July 2021. The revised NDC emphasizes equitable carbon reduction targets. To attain its NDC objective of decreasing GHG emissions by 29% by 2030, Indonesia will require an estimated USD 247 billion. The national action plan on GHG emissions reduction was regulated via Presidential Regulation No. 61/2021 and the GHG inventory was regulated via Presidential Regulation No. 71/2021. Presidential Regulation No. 98/2021 was launched to address the implementation of carbon pricing to achieve the targets of nationally determined contributions and GHG emissions reduction in national development.

To achieve climate targets, Indonesia implements four main approaches. First, the landscape approach is expected to produce a holistic and all-encompassing solution by integrating viewpoints from the terrestrial, coastal, and marine ecosystems. Second, consolidate and coordinate traditional and innovative activities to mitigate and adapt to climate change. Third, climate change will be incorporated into all development plans in Indonesia. Finally, Indonesia will improve the quality of natural resource management to ensure food, water, and energy security. The NDC highlighted the significance of reducing emissions based on land-use change and forestry by a moratorium on primary forest clearing and peatland conservation. Ecosystem restoration and sustainable forest management, including a social forestry approach, also become part of this strategy. In the forestry sector, Indonesia has set an ambitious target of peatland restoration of 2 million ha and rehabilitation of degraded land of 12 million ha by 2030. REDD+ remains a key component of the NDC target from the land-use sector.

The energy sector is also significant in this context. Indonesia has adopted a policy of mixed energy use. The creation of clean energy sources constitutes a national policy directive in Indonesia; by 2025, the country plans to meet at least 23% of its total energy requirement from new and renewable energy sources. The updated NDC submitted in 2021 mentions 31% penetration of renewable energy by 2050. Furthermore, fossil fuel subsidies are being phased out. The monies previously utilized for the subsidies will be converted to construct renewable energy infrastructure, education, health, social assistance, and infrastructure, as well as for public transport. The government of Indonesia is also committed to the waste management sector by developing relevant strategies, implementing pertinent policies, and improving local institutional capacity. Additionally, it is committed to improving management capacity for urban wastewater; promoting reduce, reuse, and recycle to decrease waste dumping in landfills; and utilizing waste for energy generation. To significantly reduce emissions from the waste sector, the main approaches utilized relate to policy development, institutional strengthening, funding mechanisms, innovative technology, and sociocultural approaches.

2.2. Climate-Related Development Aid to Indonesia

To aid Indonesia in combating climate change, international development banks as well as bilateral and multilateral donors have pledged to provide the country approximately USD 100 million during 2022–2026. Development partners collaborate with the government of Indonesia and various domestic institutions, such as the Ministry of Environment and Forestry Indonesia, and promote economic development and mitigation of environmental degradation to stimulate Indonesia's ambitious climate change-related approaches. The development of a comprehensive national-level climate change policy is also significantly influenced by international organizations and bilateral funders. Thus, international actors have considerably impacted Indonesia's response to climate change. To achieve the government's overarching aim of reducing CO_2 emissions by 26% by 2020, development partners collaborate with the government of Indonesia and key organizations to formulate a strategic plan; for example, the Green Paper from the Ministry of Finance and Indonesia's Second National Communication for the UNFCCC.

Based on the Organization for Economic Co-operation

and Development data[7], total climate-related development aid to Indonesia during 2013–2020 shows an increasing trend—especially during the years 2015 and 2018. The increase in climate change-related activity and funding in Indonesia has been accompanied by challenges related to coordination and financial alignment between donors and the government, and between the systems of the donor and of the government. A total of 79% of climate-related development aid is provided via multilateral development banks in the form of debt instruments (88%), equity and grants (8%), and collective investment (4%). The top aid providers include the World Bank, Asian Development Bank, Climate Investment Funds, Green Climate Fund, Asian Infrastructure Investment Bank, International Fund for Agricultural Development, and Global Environment Facility. Climate-related development aid to Indonesia mainly focuses on the following sectors: energy, agriculture, forestry and fishing, disaster prevention and preparedness, other social infrastructure and services, multisector, government and civil society, water supply and sanitation, banking and financial services, and general environmental protection.

3. Conceptual Framework and Literature Review

3.1. Carbon Emission and Development

Numerous studies have demonstrated that CO_2 emissions are intimately related to economic development. According to Lee and Lin[5], a 1% increase in GDP per capita leads to a 0.0163% increase in per capita CO_2 emissions. The study also suggested that significant economic expansion is accompanied by an acceleration in CO_2 emission growth. Lamb et al.[8] stated that in upper- and lower-middle-income countries, rising income more than offsets any energy structural or intensity gains, leading to increased emissions. CO_2 emissions increased the most in low-income countries owing to significant increases in carbon intensity, income level, and population. Kinda and Thiombiano[9] suggested that the increase in per capita income levels in countries rich in extractive resources could be explained based on industrial development, which is a source of deforestation. Forest cover loss may increase a region's carbon emissions. Mohmmed et al.[10] showed that population and income are significantly impacted by CO_2 emission fluctuations.

Several studies have investigated the impact of climate change on development. As per Stern[11], the overall damage costs from climate change are comparable to losing at least 5% of the world's GDP per year, with bigger losses in most developing countries. Kahn et al.[12] revealed that the adverse effects of climate change on several economic sectors, labor productivity, and employment. Tol[13] claimed that the unfavorable effects of climate change are more severe in less developed, hotter, and low-lying countries. Thus, the global economy's growth rate may be impacted by climate change, and more people may become poor as a result. A World Bank[14] report suggests that climate change may push at least 100 million people into poverty by 2030.

3.2. Climate-Related Development Aid

Tuan, Huong and Yen[15] investigated the impact of climate-related development aid to Vietnam. The study shows that donors supported placing climate change on the political agenda and helped develop the skills required to create policy instruments and formulate plans and objectives. The Vietnam National Target Program to Respond to Climate Change exemplifies the use of ODA to support Vietnam's climate change response. Researchers identified that ODA and social development variables are crucial to promoting adequate and balanced responses to climate change. Domestic resources alone are, apparently, inadequate to help the SIDS because of the endogenous limits of countries' beneficiaries.

As per Wu, Pan and She[16], climate-related development aid refers to ODA relevant to mitigation and adaptation. The aid sources are from bilateral and multilateral donors, as well as philanthropic organizations. Climate-related development aid is also defined as development assistance that continuously supports mitigation and adaptation objectives recognized in the Rio Markers approach adopted by the OECD Development Assistance Committee for reporting financial flows for climate change. Climate-related development aid for mitigation implies development cooperation activities that target the objectives of climate change mitigation; welfare is the main objective. The aid contributes to stabilizing GHG emissions in the atmosphere by promoting attempts to diminish or restrain GHG emissions. Halimanjaya[17] clarified that climate-related development aid for mitigation is part of ODA for developing countries' emission reduction to achieve global targets. Development cooperation target-

ing climate mitigation has welfare and development benefits such as investment in energy efficiency and public transport.

3.3. Factor Impacting Effectiveness of Climate-Related Development Aid

Wang, Guo and Dong[18] developed the dynamic panel threshold regression model to explore the effects of ODA and CO_2 emissions in 59 low-income and lower-middle-income countries. Mahalik et al.[19] investigated the relative impact of foreign energy aid and total aid inflows on CO_2 emissions in India from 1978 to 2014 by including globalization, economic development, energy consumption, foreign direct investment, and remittance inflows as additional components in a carbon emissions function. The study showed that foreign aid inflows, globalization, and energy consumption significantly reduce CO_2 emissions in developing countries. The study aligned with previous studies in that the development stage of the ODA recipient country affects the carbon emission reduction effect of energy assistance. ODA has considerable carbon emission reduction potential in these countries and will impact the formulation and implementation of carbon reduction policies in recipient countries. In the context of energy transition, ODA is supporting its climate finance commitments. Presently, renewable energy development significantly relies on ODA. The study was conducted by developing a model of carbon emissions per capita.

Lee et al.[20] utilized the annual panel data from Korea's 30 recipient countries from 1993 to 2017 to examine the impact of ODA on CO_2 emissions using both direct and indirect approaches. For the direct and indirect models, respectively, the study applied a simultaneous equation framework and a modified impact, population, affluence, and technology (IPAT) model. The following formula was applied: Environmental Impact = Population × Affluence × Technology. In this study, the researcher modified this model by substituting technology with foreign aid (ODA). Additionally, the researcher estimated the simultaneous equation to establish the indirect pathway from ODA to CO_2 emissions via economic growth, using factors of energy, capital, labor, and ODA.

Carfora, Scandurra and Thomas[21] investigated the factors affecting ODA distribution and identified the relevance of ODA for the development of developing countries and the reduction in GHG emissions. Wu, Pan and She[16] stated that the mediation model is established to investigate the existence of the mediating effect of energy structure on the association between climate aid and carbon emissions in recipient countries. The researchers developed three models equations: to examine the total effect of climate aid on carbon emissions in the absence of a mediating variable, where the coefficient represents the total effect; to analyze the impact of climate aid on the mediating variable; and to investigate the effect of climate aid on carbon emissions by adding the mediating variable. To comprehensively investigate the carbon emission effect of climate aid and ensure the robustness of results, we selected the following two indicators to reflect the emission level in recipient countries: CO_2 emissions per unit of GDP and CO_2 emissions per capita.

Wang, Guo and Dong[18] adopted the panel threshold regression model, with ODA as the threshold variable to investigate the non-linear impact of urbanization on environmental pollution. Urbanization is the explanatory variable; renewable energy, real GDP growth rate, life expectancy, and population growth rate are control variables. Urbanization is employed as a threshold variable. The researchers proposed a model that indicates the inertial characteristics and dynamic changes of carbon emissions using the threshold effect model to verify the non-linear relationship. This method could be employed to verify the multiple equilibrium phenomenon of carbon emissions. With the introduction of lags in carbon emissions, the dynamic panel model could be applied to examine the impact of ODA on the carbon emissions of recipient countries. Based on the carbon emission coefficient of the lag period, it could determine whether carbon emission has a path-dependent effect. The non-linear relationship is examined to verify whether ODA is effective in reducing carbon emissions. The study identified that when the urbanization of recipient countries is below the threshold value, a 1% increase in ODA leads to a 0.2259% increase in carbon emissions. When urbanization exceeds the threshold value, a 1% increase in ODA leads to a 0.2281% increase in carbon emissions.

Zhang and Liang[22] offer four potential criteria for evaluating current and proposed international cooperation initiatives to mitigate climate change: environmental effectiveness, aggregate economic performance, distributional impacts, and institutional feasibility. Attempts to explain the effectiveness of foreign aid on CO_2 emissions have been ex-

plored by several researchers as discussed above. Patterns of cross-national aid allocation, sub-national aid composition, and the role of recipient governments in aid delivery have all received increased academic attention.

The Principles of Aid Effectiveness

Aid effectiveness principles have been discussed internationally and have been the outcome of several high-level fora on aid effectiveness, such as the Rome Declaration, Paris Declaration, Accra Agenda for Action, and Busan Partnership. The Paris Declaration outlined five guiding principles: ownership, alignment, harmonization, results-based management, and reciprocal accountability. The Declaration was praised for establishing an explicit monitoring framework to track progress with twelve indicators and targets by 2010 as well as a useful and action-oriented roadmap. Several high-level fora on aid effectiveness were OECD efforts to modernize, deepen, and broaden development cooperation and aid delivery.

The Paris Declaration provides a platform for an evidence-based conversation to enhance aid practices and their effects on actual development. The development of the Declaration has motivated the following changes to the definition of development effectiveness. Aid should focus on the results in addressing development requirements of effective management of aid and the involvement of actors outside of the OECD so that a greater share of global development cooperation could be addressed. Additionally, aid could have a complementary as well as catalytic role. For recipient countries, aid effectiveness is crucial for achieving sustainable development results.

Based on the studies synthesized above, we believe that this study is distinctive and contributes to the literature in the following ways: 1. There is a noticeable gap in research focusing specifically on Indonesia. As one of the largest recipients of climate change ODA, unique challenges and outcomes of ODA within the Indonesian context should be addressed. This research aims to fill this gap especially under the framework of the Busan Principles which emphasize the importance of country ownership, focus on results, inclusive partnerships, and mutual accountability. 2. In addition, understanding the roles and perceptions of key stakeholders, including government agencies, the private sector, and civil society organizations, this research added mapping of stakeholder engagement in in Indonesia's climate mitigation efforts. 3. Studies like Nasir, Huynh and Tram [23] and Farooq [24] have not adequately integrated Indonesia's national policy frameworks, such as the National Medium-Term Development Plan (RPJMN) and the Nationally Determined Contributions (NDCs), with evaluations of ODA effectiveness. This research aims to bridge this gap by aligning the assessment of ODA with these key policy documents, providing a comprehensive understanding of how international aid supports national climate targets and policy implementation.

4. Data and Methodology

Qualitative and quantitative methods were applied in this research. The empirical data for this research uses secondary data. The study examined the relationship between CO_2 emissions and climate-related development aid to assess the effectiveness of climate-related development aid. Additionally, it analyzed potential factors that may impact Indonesia's GHG reduction performance. Variables in **Table 1** were used:

Table 1. Variables of affecting factors.

Variable	Specification of Variable	Sources
AID	Total aid for mitigation	Rio Marker, Credit Reporting System (OECD)
EC	Total energy consumption	EIA
CO_2	CO_2 emission	
GDP	Real GDP per capita (current)	
P	Population	World Development Indicators (WDI), The World Bank
U	Urban population	
FC	Forest cover	

Based on the availability of the necessary data on various indicators/series, the study examined the annual data from 2002 to 2019 to analyze the aforementioned purpose. The data collected based on secondary data review from reliable resources for each variable are presented in **Table A1** in the appendix. The data are presented on a yearly basis. The determinants of CO_2 emissions per capita for ODA effectiveness in Indonesia were chosen based on data availability and theoretical argument. Climate-related development aid for mitigation shows the total aid received by the government of Indonesia from bilateral partners related to mitigation purposes. CO_2 emission measures the level of GHG emission, GDP per capita explains economic growth, energy consumption refers to total energy consumption, population shows the effect of population growth on emission, urbanization explains the level of population migration, and forest cover explains the land-use change.

The statistics on carbon emissions per capita, used as the dependent as well as independent variable including real GDP per capita, population, urban population, and forest cover, were extracted from the World Development Indicators of the World Bank. Total energy consumption per capita was collected from the Energy Information Administration. Climate-related development aid for mitigation data were collected from the Organization for Economic Co-operation and Development Common Reporting Standard (OECD-CRS) with no systematic or independent third-party verification. Currently, the data for climate-related development finance reported to the OECD Rio Marker is available only on a commitment basis. Since the Rio Marker was introduced in 1998, the data using mitigation tagging were not available. All the data were converted into natural logarithms to avoid heterogeneity and to reduce the effect of outliers in the data series. Those variables in **Table A1** in the appendix were examined using regression analysis.

To assess aid effectiveness based on the Busan principles, the data collected from interviews and literature review were qualitatively analyzed. Primary data were collected via interviews using a semi-structured expert interview conducted via Zoom. Experts are defined as the most knowledgeable stakeholders of ODA on climate change mitigation, such as the representatives from the Ministry of Environment and Forestry responsible for climate mitigation and international cooperation, development partners, and project implementation management. All interviews were conducted in the interviewees' first language. The interviews revealed a range of mechanisms reflecting the effectiveness of climate-related development aid implementation.

This study applies the term, the principles of aid effectiveness, to refer to the principles agreed at the conferences in Busan. The study also favors this term over the term, principles of effective development cooperation, which was introduced in the Busan Declaration because it connects more directly to the voluminous empirical literature on aid effectiveness. The interview questions were highly related to the implementation of the Busan Principles. The questions were divided based on indicators for assessing the Busan principles as follows:

1. Countries strengthen their national result frameworks:
    - 1.1 How are development partners engaged in defining and strengthening the Indonesia results framework on climate mitigation?
    - 1.2 To what extent do the development partners align their intervention's objectives with existing government-owned results frameworks and planning tools?
    - 1.3 Is Indonesia and aid providers having Common Results Frameworks agreed on development cooperation?
2. Civil Society enabling environment and development effectiveness
    - 2.1 How is the involvement of CSOs in the design, implementation, and monitoring of climate mitigation policies?
    - 2.2 If CSOs are actively involved, do they report annually to the government on the basic finances, support to climate mitigation, and main geographic areas of involvement in climate mitigation activities?
    - 2.3 Are there resources and/ or training opportunities for addressing capacity building of all stakeholders (including government, CSOs, and cooperation providers) to meaningfully engage in multi-stakeholder dialogue?
3. Indicator 3: Quality of public–private dialogue
    - 3.1 How is the engagement and interaction between the private sector and government related to climate mit-

igation projects?

3.2 Is the private sector willing to invest time and capital in climate mitigation projects?

3.3 Is there a private sector that engages with climate mitigation in a more attractive business model?

4. Indicator 4: Transparent information on development cooperation is publicly available

4.1 Is information on international development cooperation related to climate change mitigation published for the general public? If so, through what media? How often is the information published?

4.2 What types of information are published for the public?

5. Indicator 9b: Development partners use a country system

5.1 Does the procurement of goods and services for development cooperation use the Indonesian procedures for procuring goods and services?

5.2 How is the process of aid disbursement for development cooperation? Is it conducted according to the schedule agreed by both parties? If it is delayed, what is the reason?

Following Mahalik et al.[19], we specify a model of carbon emissions per capita as given in the equation. This will empirically establish the linkage between the natural logarithm of CO_2 emissions per capita ($LNCO_2$) and its determinants, such as the natural logarithm of climate-related development aid per capita inflows (LNAID), gross domestic per capita (LNGDP), energy consumption per capita (LNEC), total population (LNP), urban population (LNUP), and forest cover (LNFC).

5. Results and Discussion

Table 2 presents the descriptive statistics and **Table 3** presents the pairwise correlation of the variables, such as CO_2, GDP per capita, population, urban population, forest cover total energy consumption per capita, and climate-related development aid for mitigation. Descriptive statistics and a correlation matrix were used to analyze the presence of a normal distribution among the series utilized in estimating the function of CO_2 emissions per capita, as well as to assess the degree of linkage between the variables studied. Among all the variables, the average values of CO_2 emissions per capita and climate-related development aid were 0.562 and 14.566, respectively. The mean CO_2 emissions per capita ($LNCO_2$) is 0.562, with a median of 0.559, indicating a roughly symmetric distribution. The mean climate mitigation aid (LNAID) is 14.566, and the median is 14.515, suggesting a fairly symmetric distribution of aid received.

Table 2. Descriptive statistics.

	$LNCO_2$	**LN AID**	**LN GDP**	**LN E**	**LN P**	**LN FC**	**LN UP**
Mean	0.562	14,566	7,790	1,755	19,310	3,954	3,910
Standard Error	0.031	0.082	0.122	0.049	0.016	0.007	0.019
Median	0.559	14,515	8,079	1,815	19,311	3,967	3,917
Mode Standard	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Deviation	0.133	0.349	0.519	0.208	0.070	0.029	0.079
Variance	0.018	0.122	0.269	0.043	0.005	0.001	0.006
Kurtosis	–0.589	–0.841	–1,020	–1,044	–1,244	–1,150	–1,146
Skewness	0.285	–0.030	–0.735	–0.274	–0.055	–0.635	–0.216
Range	0.488	1,235	1,525	0.676	0.219	0.085	0.251
Minimum	0.341	13,921	6,803	1,409	19,197	3,900	3,774
Maximum	0.829	15,156	8,327	2,085	19,416	3,985	4,025
Sum	10,109	262,191	140,219	31,583	347,572	71,167	70,372
Count	18,000	18,000	18,000	18,000	18,000	18,000	18,000
JB test	0.503	0.534	2,403	1,044	1,169	2,202	1,124
p-value	78%	77%	30%	59%	56%	33%	57%

The standard deviation of GDP per capita (LNGDP) is 0.519, the highest among the variables, indicating significant variability. The range of energy consumption (LNEC) is 0.676, reflecting considerable variability in energy use. Skewness values indicate that $LNCO_2$ is slightly positively skewed (0.285), while other variables exhibit a negative

skew. Kurtosis values below three for all variables suggest platykurtic distributions. The Jarque-Bera test results (p-values > 0.05) indicate that the data do not deviate significantly from normality. The correlation analysis reveals a positive relationship between $LNCO_2$ and LNEC, suggesting that higher energy consumption is associated with increased CO_2 emissions. Conversely, there is a negative correlation between LNFC and $LNCO_2$, underscoring the role of forest cover in reducing emissions. The analysis reveals notable trends and correlations that form the basis for understanding the effectiveness of climate-related development aid in Indonesia.

Table 3. Correlation analysis.

	LN CO_2	**LN AID**	**LN GDP**	**LN E**	**LN P**	**LN FC**	**LN UP**
LN CO_2	1	0.0956	0.9046	0.9471	0.9406	–0.9025	0.9394
LN AID	0.0956	1	0.1692	0.2372	0.2465	–0.2382	0.2517
LN GDP	0.9046	0.1692	1	0.9643	0.9368	–0.7982	0.9531
LN E	0.9471	0.2372	0.9643	1	0.9856	–0.9052	0.9908
LN P	0.9406	0.2465	0.9368	0.9856	1	–0.9529	0.9983
LN FC	–0.9025	–0.2382	–0.7982	–0.9052	–0.9529	1	–0.934
LN UP	0.9394	0.2517	0.9531	0.9908	0.9983	–0.934	1

Having established the quantitative foundation through statistical analysis, we now shift our focus to the qualitative insights derived from semi-structured interviews and literature analysis. These insights specifically address the implementation and impact of the Busan principles in the context of climate-related development aid in Indonesia. This approach allows us to capture the nuanced perspectives and experiences of those directly involved in the implementation of climate-related ODA projects.

Through interviews with representatives from the Ministry of Environment and Forestry and development partners, we found strong evidence of national ownership in climate mitigation projects. Respondents emphasized that the alignment of ODA with national priorities, as outlined in Indonesia's National Medium-Term Development Plan (RPJMN), has been a critical factor in project success.

Regarding the 'Focus on Results' principle, measurable outcomes were consistently highlighted in the interviews. Development partners and government officials noted that setting clear, achievable targets for emission reductions and regularly monitoring progress were essential for maintaining accountability and achieving significant results.

Regarding the 'Inclusive Development Partnerships' principle, involving government agencies, civil society, and the private sector, has enhanced the effectiveness of ODA projects. Stakeholders reported that inclusive planning and implementation processes fostered greater buy-in and cooperation from all parties involved.

Regarding the 'Mutual Accountability' principle, transparency and accountability mechanisms were frequently mentioned as critical components. Interviewees pointed to regular reporting and open communication channels between Indonesia and its development partners as vital for ensuring mutual accountability and trust.

To further illustrate the involvement and perceptions of various stakeholders, we present a stakeholder mapping in the table below. **Table 4** summarizes the roles and perceptions of key stakeholders involved in ODA-funded climate mitigation projects in Indonesia.

To assess the implementation of the Busan principles, the researchers discussed several indicators in the previous chapter. Indicator 1: Countries strengthen their national result frameworks. In the context of Indonesia, it is reflected in the National Long-Term Development Plan (RPJP 2005–2025). The Plan becomes a reference for the government, people, and businesses to achieve the national objectives. Development partners also refer to this document in delivering development cooperation. The Plan is divided into four National Medium-Term Development Plans (RPJMN), developed every five years. The RPJMN highlights the nation's medium-term priorities. Climate change adaptation and mitigation constitute an integrated and cross-cutting priority of the National Medium-Term Development Plan. To ensure that yearly development plans and targets are aligned with national objectives, policymakers in line ministries and local government must follow the RPJMN's targets when establishing implementation targets in annual action plans at all levels of government. The Masterplan for Accelera-

tion and Expansion of Indonesia Economic Development (MP3EI) was developed in 2011. Based on this masterplan, the government initially targeted for economic growth rate of 7–8% per year after 2013. The RPJMN became the main reference in developing Indonesia's First NDC document submitted to the UNFCCC in November 2016. The NDC is used as a reference for implementing climate change mitigation commitments with emission reduction plans. The Ministry of Environment and Forestry Indonesia became the National Focal Point for Climate Change in Indonesia.

Table 4. Stakeholder mapping.

Stakeholder	Role	Perceptions
Ministry of Environment and Forestry	Responsible for national policies on climate change and coordinating ODA-funded projects.	ODA is crucial for achieving national climate targets but needs greater alignment with national priorities.
Ministry of Finance	Manages financial aspects of ODA, including budgeting and allocation.	ODA needs to be managed effectively to ensure financial accountability and support for climate initiatives.
Local governments	Implement climate mitigation projects at the regional and local levels.	Local governments see ODA as essential for implementing local-level climate mitigation actions.
Bilateral donors	Governments that provide ODA directly to recipient countries through agreements.	Development partners focus on transparency, accountability, and results-based management.
Multilateral organizations	International institutions that pool resources from multiple countries to provide ODA.	Multilateral organizations emphasize the importance of adhering to international standards and principles.
Civil Society Organizations (CSOs)	NGOs and community groups involved in advocacy, implementation, and monitoring of climate projects.	CSOs highlight the need for inclusive and participatory approaches in ODA projects.
Private sector	Companies and industries participating in or affected by climate mitigation efforts.	The private sector sees opportunities but also requires regulatory clarity and incentives.
Local communities	Indigenous and local populations directly affected by climate mitigation projects.	Local communities are concerned about potential impacts but support projects that offer tangible benefits.

The agreement and development cooperation strategy specified with each development partner reflect the engagement of donor countries. For example, the Country Development Cooperation Strategy (CDCS) provides an outline of the US development cooperation in Indonesia for five years and its development based on mutual agreement. Development cooperation between Indonesia and Australia also states the main objectives of the partnership to support Indonesia's national response priorities as determined by its National Medium-Term Development Plan 2020–2024. The Country Program for Indonesia was devised by the United Nations Development Programme (UNDP) in alignment with the priorities of the government of Indonesia, including supporting Indonesia to address development challenges and achieve targets regarding climate mitigation and adaptation. Based on the interview with the UNDP National Project Manager, the development of the UNDP Project refers to the country's requirements and priorities as reflected in the RPJP and RPJMN, including sectoral priorities. Other interviews with the GIZ Project Officers in Indonesia mention that the development cooperation priority between Indonesia and Germany was discussed based on a mechanism called bilateral consultation and bilateral negotiation, and the result was included in the agreement document. To decide the priority of cooperation, both parties are currently considering the Indonesia National Development Plan to develop a program and project. Furthermore, Germany and Indonesia are engaged in developing mechanisms to enable governmental agencies, the private sector, and/ or civil society to propose projects to receive funding or grants to support the implementation of the development cooperation strategy and priority.

6. Conclusions

Our findings align with Halimanjaya[17], who reported that climate-related development aid significantly contributes to emission reductions in developing countries. Our statistical analysis similarly indicates a positive relationship of ODA with reducing CO_2 emissions in Indonesia. Rahman[25] emphasized the importance of aligning ODA with national priorities for effective outcomes. Our study confirms this, showing that the alignment with Indonesia's National Medium-Term Development Plan enhances the effectiveness of aid.

The link between climate change ODA and climate change mitigation effects also suggests that if the international

community experiences the kind of COVID-19 pandemic it did in 2019, it will have an impact on climate change mitigation efforts. Reduced industrial activity and transportation during lockdowns resulted in temporary reductions in greenhouse gas emissions. However, the pandemic-induced economic downturn has affected the financing and implementation of climate mitigation projects. Recent studies have shown that climate-related initiatives are likely to be delayed or scaled back as resources are diverted to immediate public health and economic recovery measures. This shift in priorities could slow progress toward meeting emissions reduction goals.

However, at least one positive effect of the pandemic is that it has highlighted the importance of integrating resilience into climate policy in the international community. For example, Indonesia's national recovery plan includes elements aimed at scaling up renewable energy and improving energy efficiency. In other words, the COVID-19 pandemic has had a mixed impact on climate change mitigation efforts: while it has temporarily reduced carbon emissions, it has also diverted resources and attention away from long-term climate goals. Going forward, it will be essential to integrate climate resilience into recovery plans and ensure that mitigation efforts are inclusive and equitable.

The qualitative analysis demonstrates that the Busan principles—country ownership, focus on results, inclusive development partnerships, and mutual accountability—are crucial for enhancing the effectiveness of ODA. Dipama [4] discussed the critical role of the Busan principles in enhancing aid effectiveness through country ownership and mutual accountability. Our interview results corroborate this, highlighting that strong national ownership and accountability mechanisms are crucial for successful ODA projects in Indonesia. McKee et al. [26] suggested that inclusive partnerships and a focus on results are essential for development cooperation. Our findings support this view, showing that inclusive development partnerships and a results-oriented approach lead to better emission reduction outcomes. Robinson and Dornan [27] highlighted the importance of stakeholder engagement in climate adaptation projects. Our study extends this to mitigation projects, demonstrating that the active involvement of government, civil society, and the private sector enhances project implementation and effectiveness. Tuan, Huong and Yen [15] identified coordination and financial alignment issues as significant challenges in climate-related ODA. Our research also notes these challenges in the Indonesian context but highlights that effective implementation of the Busan principles can mitigate these issues. By addressing the gaps in the existing literature and providing a detailed analysis of the Busan principles' implementation, this study contributes to a better understanding of how climate-related development aid can effectively support emission reduction efforts in developing countries.

For policymakers, this study reveals that the alignment of ODA with national priorities and strategies, such as Indonesia's National Medium-Term Development Plan (RPJMN), is critical for maximizing the impact of aid. This alignment can also enhance the relevance and sustainability of ODA-funded initiatives. In addition, this study shows a results-oriented approach, with clear, measurable targets and regular monitoring, significantly improves the effectiveness of ODA projects. Policymakers should prioritize the establishment of robust monitoring and evaluation frameworks that focus on outcomes rather than inputs. Regarding private sector investment, this study alarms policymakers to create an enabling environment through regulatory clarity, financial incentives, and public-private partnerships.

The qualitative analysis is based on semi-structured interviews with a limited number of stakeholders. While these interviews provide valuable insights, a broader range of interviews, including more diverse stakeholder groups, could enhance the comprehensiveness of the findings. Expanding the scope of stakeholder analysis to include a wider range of participants, including more local communities, private sector representatives, and non-governmental organizations, would provide a more comprehensive view of the factors influencing ODA effectiveness.

In addition, the study covers a specific timeframe, which may not capture long-term trends and impacts of ODA on CO_2 emissions. Longitudinal studies extending over a more extended period would be valuable for understanding the long-term effects of ODA. Conducting longitudinal studies to track the long-term impact of ODA on CO_2 emissions and other sustainable development goals would provide deeper insights into the effectiveness and sustainability of aid projects.

Lastly, exploring the integration of climate-related ODA with other policy areas such as economic development, health, and education could provide insights into how holistic approaches can enhance overall development outcomes. Further

research should explore the long-term impacts of climate-related ODA on sustainable development goals beyond CO_2 emission reductions. Comparative studies across different countries can provide deeper insights into the generalizability of our findings and identify best practices for implementing the Busan principles in various contexts. Investigating the role of private sector participation in climate-related ODA projects can offer new perspectives on enhancing aid effectiveness through public-private partnerships.

Author Contributions

Analysis and literature review, R.O.; literature review, editing, and revising according to review, H.P.

Funding

The work was funded by Korea Ministry of Environment (MOE) as "Graduate School specialized in Climate Change".

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data used in this study is publicly accessible at https://stats.oecd.org/Index.aspx?DataSetCode=crs1, https://www.eia.gov/consumption/data.php, and https://databank.worldbank.org/source/world-development-indicator.

Conflicts of Interest

The authors declares no conflict of interest.

List of Acronyms

BAU	Business-As-Usual
CDCS	Country Development Cooperation Strategy
CSO	Civil Society Organization
EIA	Energy Information Administration
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)
IPAT	Impact, Population, Affluence, Technology
JB	Jarque-Bera
$LNCO_2$	Natural Logarithm of Carbon Dioxide Emissions
LNAID	Natural Logarithm of Aid
LNGDP	Natural Logarithm of Gross Domestic Product
LNEC	Natural Logarithm of Energy Consumption
LNP	Natural Logarithm of Population
LNUP	Natural Logarithm of Urban Population
LNFC	Natural Logarithm of Forest Cover
NDC	Nationally Determined Contributions
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
RPJMN	National Medium-Term Development Plan
RPJP	National Long-Term Development Plan
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
USD	United States Dollar
WDI	World Development Indicators

Appendix A

Table A1. Variable data.

Year	Climate Mitigation Aid (USD, Million, 2020)	GDP per Capita (USD) Current	Total Energy Consumption (quad btu)	CO_2 Emission (Metric Ton per Capita)	Population	Forest Area (% of Land Area)	Urban Population (% of Total Population)
2002	1,357,696	900.178	4,092	1.406	217,357,790	53.771	43.568
2003	2,026,142	1065.649	4,206	1.516	220,309,473	53.685	44.356
2004	1,999,058	1150.261	4,388	1.528	223,285,666	53.598	45.149
2005	1,799,400	1263.287	4,57	1.512	226,289,468	53.512	45.942
2006	2,477,596	1589.801	4,729	1.589	229,318,262	53.426	46.738
2007	1,833,499	1860.003	5,162	1.635	232,374,239	53.339	47.535
2008	2,694,182	2166.854	5,398	1.597	235,469,755	53.253	48.335
2009	3,196,111	2261.247	5,655	1.639	238,620,554	53.167	49.134
2010	2,782,344	3122.363	6,187	1.718	241,834,226	53.080	49.914
2011	1,381,960	3643.047	6,093	1.939	245,115,988	52.587	50.595
2012	1,110,836	3694.359	6,301	1.938	248,451,714	52.094	51.276
2013	2,280,115	3623.927	6,451	1.779	251,805,314	51.600	51.955
2014	1,801,138	3491.637	6,672	1.897	255,128,076	51.107	52.635
2015	3,331,135	3331.695	6,697	1.891	258,383,257	50.614	53.313
2016	1,505,960	3562.816	6,788	1.845	261,556,386	50.743	53.989
2017	3,819,640	3837.578	7,005	1.955	264,650,969	50.039	54.659
2018	3,178,524	3839.860	7,721	2.156	267,670,549	49.717	55.325
2019	1,784,340	4135.233	8,043	2.290	270,625,567	49.394	55.985

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