XXXVIII CONFERENZA ITALIANA DI SCIENZE REGIONALI

CLIMATE FINANCE IN SMALL ISLAND DEVELOPING STATES: A WAY TO PROMOTE CLIMATE ADAPTATION

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SOMMARIO

La "Climate Finance" è uno strumento di politica economica-ambientale destinata ad incentivare e supportare i Paesi in via di sviluppo ad intraprendere percorsi di sviluppo resilienti ed eco-sostenibili, finanziando misure di riduzione delle emissioni e quelle destinate all'adattamento al cambiamento climatico.

Per studiare l'effetto dei fondi climatici destinati ai Small Island Developing States (SIDS) volti a supportare uno sviluppo eco-sostenibile aumentandone la resilienza, analizziamo i fondi internazionali destinati a promuovere la "protezione ambientale generale" ed ad incentivare la produzione di "energia". In particolare, esaminiamo la relazione tra i finanziamenti climatici e le determinanti delle performance ambientali di tali Paesi per valutare gli effetti sulla mitigazione e l'efficacia dei fondi nella riduzione della vulnerabilità al cambiamento climatico.

La nostra analisi contribuisce al dibattito sulla vulnerabilità e sulla sostenibilità dei Paesi SIDS suggerendo che i fondi climatici, lo sviluppo umano e gli aiuti internazionali sono fondamentali per promuovere politiche di adattamento al cambiamento climatico.

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1. INTRODUCTION

Small Island Developing States (SIDS) were first recognized as a distinct group at the United Nation Conference on Environment and Development in June 1992 where it was stated: "*Small island developing States, and islands supporting small communities are a special case both for environment and development. They are ecologically fragile and vulnerable. Their small size, limited resources, geographic dispersion and isolation from markets, place them at a disadvantage economically and prevent economies of scale*" (United Nations Conference on Environment and Development Rio de Janerio, Brazil, 3 to 14 June 1992 - AGENDA 21).

SIDS are generally considered highly vulnerable to climate change, due to their remoteness, smallness, and proneness to natural disasters (see, e.g. Briguglio, 1995). They also struggle with common environmental problems such as land degradation, biodiversity losses, and coastal and marine pollution, caused, inter alia, by population growth and urbanization (e.g. Barnett, 2011; Connell, 2013). Climate change exacerbates these challenges. These physical changes in turn have negative consequences for island societies. Changing precipitation and warmer temperatures help spread vector-borne diseases; ocean acidification affects fisheries; increased storm activity and sea-level rise threaten infrastructure and agriculture – all concentrated along the coast, even on larger mountainous islands. Reduced agriculture and fisheries, in turn, not only affect food security, but also employment and income, both of which also suffer from declines in tourism, for instance after a cyclone (e.g. Barnett, 2011). To minimize these impacts, the onus of action is first and foremost on large emitters to reduce their greenhouse gas emissions. However, efforts to reach the cuts in greenhouse gas emissions necessary have largely failed. Even if we were to completely stop emitting greenhouse gases today, we are locked in to a certain level of warming. Adaptation has thus become unavoidable, a priority and urgent necessity for SIDS.

The United Nation – Department of Economic and Social Affairs (UN-DESA) recognizes, currently, 57 countries (37 UN-Members and 20 NON-UN) broken down into three main geographic areas: i) Caribbean, ii) Pacific and iii) Atlantic, Indian Ocean, Mediterranean and South China Sea (AIMS).

The main issue regarding the vulnerability assessment is that the concept of vulnerability has no universally accepted definition. A common definition of vulnerability is: "the degree to which an exposure unit is susceptible to harm due to exposure, to a perturbation or stress, in conjunction with its ability to cope, recover, or fundamentally adapt" (Kasperson and Kasperson, 2001). The IPCC defines the vulnerability as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Therefore, the vulnerability become a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

When the vulnerability - referred to as the intrinsic sensitivity to exposure to exogenous or endogenous risk and to capacity to manage or adapt to them – is referred to SIDS, the concept is mainly relate their remoteness from main markets, the dependence from energy and food and their small size including the large range of impacts from climate change (UN-DESA, 2015; UN-ECLAC, 2011; Beroya-Eitner, 2016; Bates et al., 2014; Briguglio, 2014).

The identification of the determinant of human and natural systems' sensitivity to climate change become strategic for targeting and evaluating adaptation plans. This aspect become relevant in developing countries where the lack of natural resources and a low level of social development make the problem of vulnerability a key issue. Therefore, the concept of vulnerability varies widely across communities, sectors and regions and it became the starting point for a vulnerability assessment.

Several methods of vulnerability assessment have been developed over the past several decades in the all fields related to natural hazards, poverty analysis and sustainable livelihoods. The vulnerability assessment becomes crucial when it can be used to address the policies and funds toward specific need and priorities (Pickering et al., 2015). The funds can help to build resilient countries by supporting the construction of an economically and environmentally sustainable framework, from the realization of off-grid electricity to

improving relationships between political actors, which have become essential to promote the adaptation policies. The importance of adaptation and resilience becomes even more marked if we consider that the economic development of a country depends not only on the improved coordination of aid but also on the way aid is organized and distributed.

As stated by Beroy-Eitner (2016) and Hinkel (2011), although the policy interest in vulnerability research has increased and in the same manner the demand of indicators, the related issue, about their validity can create confusion between policy makers and scientists. The main issue relate to lack of a definition and a framework endorsed by community (politic and academic). A second relevant issue relate to lack of data. This affects mainly the countries that are generally known as most vulnerable as SIDS.

The main goal of this work is to analyze the determinants of vulnerability in SIDS and the effectiveness of climate funds committed. We want to investigate whether countries can contrast their vulnerability using the flow of funds directed to improve and protect the environment and increase the deployment of renewable energy sources. This paper proposes a temporal and geographic comprehensive indicator for vulnerability in SIDS. Moreover, in this paper we identify the factors (economic, socio-demographic, etc.) that can affect, negatively or positively, the SIDS' vulnerability. Thus, we first construct a composite indicator to assess the multidimensional phenomena of the vulnerability of countries (proposing a vulnerability index). Furthermore, we analyze the SIDS' vulnerability with regard to adaptation and mitigation policy using a panel regression model.

The remainder of the paper includes a presentation of the data employed (Section 2) and the conceptual and methodological review (Section 3), results analysis and discussion (Section 4) and concluding remarks (Section 5).

2. DATA FRAMEWORK

As stated by Beroy-Eitner (2016) there is not a clear and universal definition of vulnerability. As consequence, the frameworks for the construction of vulnerability indices proposed in literature are various and fragmented. Several works treat together the concepts of vulnerability and resilience or separately, considering the vulnerability or the resilience.

For sake of simplicity, we can divide the frameworks proposed in two classes. A former, in which vulnerability is considered to be the inverse of resilience (and then they account the resilience in the vulnerability concept) and those where vulnerability is a complex phenomenon that includes multidimensional aspects different from the resilience's concept.

In the first class, we can consider Bates et al. (2014) and Angeon and Bates (2015) that classifies the variables included in Vulnerability-Resilience index in five dimension representing the economic, environmental, social, political/governance and peripheral dimension. Guillaumont (2010), assessing the economic vulnerability for SIDS, identifies four indicators to measure the exposure to shocks as population smallness, the remoteness, the share of agriculture and the export concentration. Maiti et al. (2017) consider the exposure, sensitivity and adaptive capacity as sub-sectors of vulnerability in India's districts while Tapia et al. (2017) develop an Indicator based Vulnerability Assessment for European countries based on potential hazard-receptor combinations (i.e. heatwaves on human health, drought on water planning and flooding (sub-divided into pluvial, fluvial and coastal) on the socio-economic tissue and the urban fabric).

In the second class, we can include the paper by Briguglio (2014) that develops an economic vulnerability and resilience framework for small states. The author identifies four components for economic vulnerability (trade openness, export concentration, dependence on strategic imports and proneness to natural disasters) and five components for economic resilience (macroeconomic stability, market flexibility, political governance and institutions, social development and environmental management). To this class belongs also the Vulnerability-Resilience Country Profile (VRCP) (UN-DESA, 2015) that represents a country-owned analytical framework for assessment of sustainable development in Small Island Developing States.

In our study we use as reference framework the VRCP that include the priorities highlighted in the SIDS Accelerated Modalities of Action (SAMOA) pathway, which identifies the contributing factors to SIDS vulnerabilities and groups them in four different class i) economic, social and environmental, ii) small size, iii) remoteness from markets and iv) narrow resource base. Based on this framework, the economic vulnerability regards the risks faced by economies from exogenous shocks to the systems of production and distribution, and from the very high exposure to economic conditions in the rest of the world. The social vulnerability is defined, indeed, by UNDP as the degree to which societies or socio-economic groups are affected by stresses and hazards, whereas the environmental vulnerability refers to risks of loss and/or deterioration to a country's natural ecosystem including any events that can cause damage.

Based on this approach we can group the aspects captured by exogenous variables considered for the construction of a measure of vulnerability in SIDS in various factor classes. They are related to economic, social, environment, and remoteness. The data for the construction of indicator were obtained from World Bank and U.S. Energy Information Administration (EIA) databases.

The analysis of vulnerability should take into account the multidimensionality of the same concept, focused on economic, social, environmental and geographic factors. For these reasons, indicators are grouped into homogeneous thematic areas: economic, social, environmental, and remoteness.

The class of economic factors includes the fossil fuels electricity, the import value index and the percentage of food imports on merchandise imports to account the dependence from world markets. To account the economic resources (the first of all is the tourism sector) we consider the number of arrivals of international inbound tourists. We also include in this class of factors the per capita electricity consumption as a proxy of technological and economic progress and as proxy of policy conduct to improve the renewable energy usage and exploitation (Romano et al., 2016). In this class of factors, we include also the percentage of terrestrial and marine protected areas, the life expectancy at birth, the number of births for adolescents and the percentage of population with access to electricity. These variables can provide information on degree of human development as proxy for a 'socially progressiveness', hypothesizing that higher sub-dimension, higher would be the capacity to cope up with climate-related stress (Maiti et al., 2017; Lemos et al., 2016). This class of factors is useful to define SIDS' economic vulnerability, as suggested by Briguglio (1995, 2014) and UNDESA (2015). The concept of remoteness is linked with the characteristics of SIDS and their insularity and susceptibility to climate change. In this class of factors, we include the liner shipping connectivity index, the distance - in kilometers – from the Capital to nearest continent (the data was retrieved from the Island's directory by UNEP-GRID Geneva) and the number of internet users.

In the social dimension of vulnerability, we include the factors that potentially impact on climate change and that can damaged from it. Climate and human settlements are favorable conditions for transmission of diseases and are susceptibility to extreme weather events. Thus, we include variables that regard population and human health. We consider the population density, the growth rate of population, the total population, just as the percentage of the urban population, the deaths and fertility rate. To account the health human vulnerability we include the percentage of the population using improved sanitation facilities and the percentage of the population and urban population using an improved drinking water source and the incidence of tuberculosis.

The environmental dimension includes factors related to natural hazards and climate change. We consider the renewable electricity generation, the country's total area and the percentage of land area where elevation is below 5 meters and the percentage of the total population living there and finally the percentage of forest area. We include in also the CO_2 emissions per capita. Although the SIDS have a very low level of GHG emissions they present a special vulnerability to climate change as assessed by UNFCCC that based on the equity considerations, consider that these countries are both low-capacity and highly vulnerable (Kline et al., 2016). Finally, we include the percentage of arable land, the average precipitation and the fisheries production since both agriculture and fisheries are vital resources for SIDS economies and both can be affected by climate change issues.

3. METHOD

Previous section reveals the multidimensional features of dataset employed to construct the proposed indicator. To reach our aims we firstly construct a vulnerability indicator and, secondly, we individuate the determinants behind the vulnerability and the effectiveness of funds provided to climate change adaptation using a panel regression.

3. 1. Composite Indicator

One way to make comparison across space (and time) is to combine the various indicators in a single index. According to the OECD (2008), "*A composite indicator (CI) is formed when individual indicators are compiled into a single index, on the basis of an underlying model of the multi-dimensional concept that is being measured"*.

A CI has the advantage of allowing the ranking of countries because it represents overall Environmental Performance in one number. Two of the greatest difficulties are the selection of variables and indicators and the determination of the weights that should be assigned to them to differentiate their correlation with vulnerability. Summarizing, the construction of the CI is based on several steps (a complete guide can be found in (OECD, 2008)):

- Data Normalization
- First aggregation to identify the sub-indices;
- Aggregation of the sub-indices to obtain the CI.

3.2 Panel Analysis

To analyze the effectiveness of climate funds on the SIDS' vulnerability, we employ a panel dataset including the 31 countries from 2012 to 2014. Three main issues can be solved using a panel dataset. In fact, a panel dataset allows us to have more degrees of freedom than with time–series or cross–sectional data, and to control for omitted variable bias and reduce the problem of multicollinearity, hence improving the accuracy of parameter estimates (Hsiao and Shen, 2003), having more informative data. The use of annual data also avoids the seasonality problems. For the estimation, we employ the Random Effects Estimator in which the variation across entities is assumed random and uncorrelated with the predictor variables included in the model:

$$VI_{ct} = \alpha + \sum_{k=1}^{k} \beta_k X_{kct} + \nu_c + \mu_{ct} \qquad [1]$$

where for country c and time t, VI_{ct} is the composite indicator of vulnerability, X_{kct} is a vector of the k explanatory variables and μ_{ct} is a random disturbance term of mean 0 that allow for intragroup correlation. The idiosyncratic error u_{ct} is supposed to be independent with regressors while the individual (time-invariant country) error component v_c correlated with regressors. This model is estimated using the family of generalized least squares (GLS) estimators in order to avoid correlation across the composite residual terms (within individuals).

4. RESULTS AND DISCUSSION

The aim of our research is to find the influence of climate financing on SIDS' vulnerability over space and time. SIDS have limited financial resource to implement adaptation policies, thus they need international cooperation to mitigate and adapt to any adverse impacts of climate change and reach the sustainability of

the development. To reach these aims we develop a composite indicator for assessing vulnerability and individuate the key factors of the index and the incidence of climate funds.

4. 1. Vulnerability Index

The composite indicator summarizes the four dimension of vulnerability both as impacts from climate change and as factors that can stress the overall vulnerability[3].

Higher values of the VI indicate countries that they are most vulnerable (see Appendix A). In 2012 the VI is comprised between 0.14 (Barbados) and 0.59 (Kiribati) while in 2014 it is comprised between 0.12 (Singapore) and 0.62 (Kiribati). We observe that Kiribati is stable in the last position (most vulnerable) with Guinea-Bissau, Haiti, Papua New Guinea and Solomon Islands, while the countries with a lower value of the vulnerability index change between Singapore and Barbados. As assessed by UNDP and UN-OHRLLS (2015), the human development plays an important role in financing. Some countries as Barbados and Singapore show very high levels of human development while others, such as Guinea-Bissau and Haiti score poorly. They also present different capacities to mobilize domestic resources and to attract external finance. Thus, countries with similar income levels face very different specific vulnerabilities.

At the other extreme, we find Singapore and in the small states context it does not suffer from its remoteness, having greater interlinking and diversified markets (first of all with USA and China).

Focusing on the variation between 2012 and 2014, we observe that among the most vulnerable countries, only Samoa records a decrease of vulnerability of about 10%, while the others show an average increase of 4.58%.

Some of these countries have the electrification rates very low but they have potential for develop off-grid plants. Climate financing has to favor the build of off-grid solutions that are more suitable given the specific geography of fragmented archipelagic (Betzold, 2016a).

Focusing on adaptation financing although pacific islands are among the top recipients of adaptation aid per capita, the total is relatively low if we compare it to overall adaptation aid, as well as compared to global development financing destined to the Pacific region (Betzold, 2016b).

To summarize the principal aspects came to light from analysis of dynamics in VI, we can show that although SIDS are generally the most vulnerable countries in the world, there are countries more vulnerable than others. Their vulnerability is in part driven by several common characteristics such as isolation and the extreme exposure to effects of climate change. However, the degree of overall exposure changes with regard to analyzed dimension of vulnerability. Although to this countries are destined adaptation aid, they show an increase in their vulnerability.

This can suggest designing policies targeted to specific sectors to cope the adverse effects of their vulnerability.

4.2 Panel estimation

To analyze the effectiveness of the climate funds in combatting the vulnerability and promote the adaptation to climate change we employ a panel regression model. A panel regression allows controlling for omitted variable bias and reducing the problem of multicollinearity, hence improving the accuracy of parameter estimates (Hsiao and Shen, 2003), increasing the informative data. Moreover, we can increase the dimension of our sample.

To reach our aim we analyze the relationship between vulnerability index and climate funds controlling for a set of others variables. In the set of control variables we include the Gross Domestic Product in Purchasing Power Parity (GDP), the Foreign Direct Investment (FDI), the Human Development Index

[3] To assess how well a sub-dimension measures the phenomenon we use the Cronbach's α, to test for internal consistency of sub-dimensions and dimensions based. The values suggest acceptable levels of internal consistency for building a composite index at the world scale. For the dimensions considered, the Cronbach's α are: 0.78 (Economic); 0.55 (Remoteness); 0.83 (Social); 0.62 (Environmental).

proposed by UNDP (HDI), the per capita carbon emission and the distance from nearest continent. The choice of these variables is based on literature (see, eg, Betzold and Weiler, 2017; Harris and Lee, 2017).

The international and domestic private investment in clean technologies and adaptation, together with the Climate funds, represent the background of international monetary mobilization to combat and prevent the effects of climate change (Pickering et al. 2017). In SIDS, the Foreign Direct Investments (FDI) represent an important factor that contributes to investments in alternative green energy usage and it can improve the technological progress in combatting climate change (Zhao et al., 2012; UNDP and UN-OHRLLS, 2015). These countries, in fact, with only domestic economic resources can't support the costly adaptation policies. On the other hand, with the GDP we control the effect of vulnerability on their economies. Thus, we expect that this variable have a positive effect on vulnerability's reduction of SIDS, by helping them to cope the adverse effects of climate change.

The funds involved in our analysis are specifically concerned with environmental issues: i) energy generation and supply, and ii) general environmental protection. Both types of aid are among the funds directed to climate change (adaptation and mitigation). The funds involve policy, planning, development programmes, surveys and incentives for the energy sector (with the sole exception of power generation of non-renewable sources). As suggested by Zhao et al. (2012), these funds represent a contributing factor in creating investments in alternative green energy usage and enhancing technological progress in environmental protection. The funds are related to commitment provided in 2012 and 2013, which is retrieved from the AidData database (Tierney et al., 2011). In the same way as domestic (GDP) and foreign financing (FDI), we expect a negative relationship with vulnerability, and thus a positive effect by decreasing the SIDS' vulnerability. The Human Development Index (HDI) is a proxy of social development (Lucas et al., 2017), incorporates measures of health, education, and material living standards and represents an evaluation of the human condition. van den Bergh and Botzen (2016) assessed that this indicator is an alternative criterion for judging the welfare effects of climate policy and it can be used as a proxy of social development and sensitivity as dimensions of urban vulnerability (Garschagen and Romero-Lankao, 2015). We expect that an increase of this indicator can decrease the VI. The distance is a remarkable issue from SIDS. Their isolation, both physical-environmental and from main world markets, remains a key challenge to overcome. Moreover, the transport costs related to trade and commerce are higher as distance increases (Becker, 2012), so we expect a positive relationship with VI. The per capita carbon dioxide emissions are considered to capture the environmental degradation due to anthropogenic activities related to economic growth. An increasing of this variable is generally view as in indication of environmental deterioration. The particular characteristics of SIDS, as their low GHG-emissions impact, cannot support this theory.

The estimates are based on the random effect estimator in which the standard errors allow intragroup correlation[4]. We use the analytical World Bank classification of the country's economies based on estimates of gross national income (GNI) per capita to define the group that may cause the intra-cluster correlation. The estimated model id the following:

$$VI_{ct} = \alpha_0 + \alpha_1 sum\_comm_{ct} + \alpha_2 co2\_em\_pc_{ct} + \alpha_3 distance_{ct} + \alpha_4 gdp\_pc\_ppp_{ct} + \alpha_5 fdi_{ct} + \alpha_6 hdi_{ct} + v_c + \mu_{ct} \quad [2]$$

Estimation results are reported in table 1.

Table 1. Model estimates.

Variables	*Estimates*
sum_comm	-7.25e-11***
co2_em_pc	-2.082e-03***
distance	3.51e-05***
GDP_pcPPP_2011	2.49e-06***
fdi	-2.916e-12***

[4] Due to time-invariant independent variables, such as distance, fixed-effect models would not be appropriate.

hdi	-9.435e-01***
Constant	9.959e-01***
*** p<0.01, ** p<0.05, * p<0.1	

Source: Our elaborations on AidData database

Coefficients of the estimated model are all significant. Climate funds present a significant and negative sign. This implies that the committed funds contrast the vulnerability and promote adaptation to climate change in SIDS. This result is in according with recent literature (see, e.g. Betzold and Weiler, 2017) that assess that countries that are more exposed to climate change effects, received more adaptation aid.

Regarding the FDI, we find a significantly negative impact on VI: an increase in FDI decreases the vulnerability of SIDS. This result shows, as some countries are able to attract foreign direct investment.

Regarding the GDP, we observe a significantly positive sign. That is to say that the economic growth increase the vulnerability of SIDS. This result can be view in according with the first two results. The results show, in fact, that only the external financial resources can promote investments to help these countries to cope the effects of environmental worsening and, thus, decrease the vulnerability.

These results are consistent with previous literature. A positive and significant bivariate relationship between aid allocation and structural vulnerability also was, found by Henry (2015). As argued by Bandyopadhyay and Wall (2007), the aid allocation has a negative relationship with per capita GDP and positive with infant mortality, rights, and government effectiveness whereas Alesina and Dollar (2000) assessed that foreign aid allocations were linked to political and strategic considerations of donor countries. Given that these countries are also characterized by the issues related to institutional capacity, corruption, and show relatively low score of HDI, it is likely the inverse relationship between domestic and foreign investment and so the different relationship with the VI. Nevertheless, FDI can play an important role in supporting the diffusion of low-carbon technologies. The different relationship between GDP and CO_2 emission with the vulnerability index can explained by theory of Environmental Kuznet Curve (Angeon and Bates, 2015; Zaman et al. 2016; Feng at al., 2017). SIDS cannot support the adaptation policies, however the economic growth supported by external financing can become green and thus can led to decrease the environmental impact. This trade-off between GDP and CO_2 emission can explain the different impact on vulnerability in these countries. Moreover, the contribution to global warming of SIDS is very low in term of total aggregated CO_2, although they are most likely to suffer the adverse effects of climate change (Kline et al. 2016).

Regarding the variable related to social development, the coefficient has the expected negative sign, and it confirms the inverse relationship between the social well-being development and the environmental vulnerability. When the environmental awareness increases, the vulnerability decreases. That is to say, the sensitivity or capacity to cope and adapt is understood from population themselves. The slope coefficient of the remoteness is consistent with the expected negative relationship between relative vulnerability and isolation. As argued by Briguglio (2014) and Becker (2012) the geographic isolation increases their economic vulnerability due to their strong dependence of narrow resource from main world markets.

5. CONCLUSION

The aim of this paper is to analyze the effectiveness of climate funds to combat the vulnerability in SIDS. We investigate whether the flow of funds committed to promote the environmental protection and increase the deployment of renewable energy sources can help these countries to contrast their vulnerability.

This issue is particularly interesting for these countries as they are dependent from foreign markets having limited capacity to manage and use their natural resources due to high costs of transportation and to build their resilience. Furthermore, these countries suffer the impacts of climate change.

The vulnerability is a phenomenon that includes multidimensional aspects different from the resilience concept.

In this paper we implement a twostep analysis on a dataset of 33 SIDS, worldwide distributed and heterogeneous, and 32 variables observed in 2012-2014. In the first step, we propose a vulnerability index (VI) based on the methodology of composite indicators. The results of this analysis show that there are countries with a particular vulnerability (indicator score greater of 0.5) and that are stable in their ranking in the three years. While Barbados and Singapore is less vulnerable than other countries. The VI can show the path of countries towards a sustainable development. By observing the four dimension of VI we can also identify the major vulnerable sector to better address the adaptation policy. However, the VI cannot help to identify the underlying determinants. Thus, we analyzed the SIDS' vulnerability with regard to adaptation and mitigation policy employing a panel regression model. This analysis allows to formulate the policy implication based on the dimensions of the VI and to evaluate the significance of some variables than other variables. In particular, the results of panel regression analysis show that the human development variables and the foreign aid are crucial in promoting adaptation policies. Therefore, we can confirm the effectiveness of funds in reduction of vulnerability. On the contrary, the domestic resource cannot help these countries due to the costly policies to create resilience.

Appendix A

Country	2012	2013	2014
Barbados	0.14	0.12	0.14
Singapore	0.15	0.12	0.12
Aruba	0.22	0.21	0.21
Trinidad and Tobago	0.22	0.23	0.23
Mauritius	0.24	0.23	0.24
St. Kitts and Nevis	0.26	0.28	0.30
Grenada	0.27	0.26	0.27
St. Lucia	0.27	0.28	0.28
Antigua and Barbuda	0.27	0.29	0.29
Cuba	0.28	0.28	0.29
Bahrain	0.29	0.29	0.28
Dominica	0.30	0.30	0.31
St. Vincent and the Grenadines	0.31	0.31	0.32
Bahamas, The	0.31	0.32	0.32
Dominican Republic	0.32	0.32	0.34
Jamaica	0.32	0.33	0.33
Suriname	0.33	0.34	0.34
Belize	0.34	0.33	0.34
Tonga	0.35	0.34	0.35
Guyana	0.36	0.35	0.34
Fiji	0.38	0.38	0.40
Seychelles	0.38	0.41	0.41
Cabo Verde	0.39	0.41	0.42
Comoros	0.40	0.43	0.42
Samoa	0.43	0.43	0.43
Maldives	0.44	0.45	0.45
Vanuatu	0.47	0.48	0.49
Sao Tome and Principe	0.48	0.50	0.51
Guinea-Bissau	0.49	0.50	0.51
Haiti	0.50	0.51	0.54
Solomon Islands	0.53	0.55	0.56
Papua New Guinea	0.54	0.55	0.55
Kiribati	0.59	0.61	0.62

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ABSTRACT

Climate finance is an alternative policy instrument that incentives poorer countries to achieve climate-resilient and low-emission development pathways which involving funds from developed to developing nations.

To investigate whether the climate funds affect the support of Small Island Developing States (SIDS) towards more environmentally sustainable development by increasing the resilience, we analyze the international funds intended to promote “General Environment protection” and those planned to “Energy”. We analyze the flow of funds among countries and the relationship between climate finance and determinants of countries’ environmental performance to evaluate the effects on mitigation, and their vulnerability to assess the effectiveness of green funds in climate adaptation of SIDS countries.

Our analysis contributes to the debate on vulnerability and sustainability of SIDS countries, and suggests that the climate funds have to be addressed to countries that are more vulnerable to promote a path towards sustainability and that the human development and the foreign aid are crucial in promoting adaptation policies.