Article

The Mediating Role of Disaster Policy Implementation in Disaster Risk Reduction and Sustainable Development in Sierra Leone

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Abstract: This research reports the role of disaster policy implementation achieving disaster risk reduction (DRR) and sustainable development (SD) in Sierra Leone. The factors were highlighted to help policymakers measure disaster risk perception (DRP), disaster adaptation (DA), community participation (CP), and disaster policy implementation (DPI) towards achieving disaster risk reduction and sustainable development. A questionnaire was administered to collect data from the respondents in six disaster-prone communities (Dwarzarck, Portee-Rokupa, Kroobay, Susan's Bay, Moyiba, and Colbot) in Freetown, Sierra Leone. Employing the structural equation model approach, we found that all the disaster risk reduction factors (DRP, CP, DA, and DPI) directly influence SD. Furthermore, disaster policy implementation serves as a channel through which disaster risk reduction influences sustainable development. This study suggests to policymakers to use the factors mentioned earlier to design effective disaster policy implementation to achieve disaster risk reduction and sustainable development in Sierra Leone.

Keywords: disaster risk perception; disaster adaptation; community participation; disaster policy implementation; sustainable development

Citation: Sawaneh, I.A.; Fan, L. The Mediating Role of Disaster Policy Implementation in Disaster Risk Reduction and Sustainable Development in Sierra Leone. *Sustainability* **2021**, *13*, 2112. <https://doi.org/10.3390/su13042112>

Academic Editor: Ashraf Dewan

Received: 22 January 2021

Accepted: 11 February 2021

Published: 16 February 2021

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1. Introduction

The concept of disaster has a wide range of interpretation with many different causes and consequences [1]. Generally speaking, disaster is a phenomenon that visits devastating effects on people, the economy, community, and infrastructure [2,3]. The United Nations Office for Disaster Risk Reduction (UNDRR) indicated that disasters seriously disrupt a community or a society's operation at any scale [4]. Disasters have caused significant loss to lives and infrastructure [5] and substantially contribute to increased poverty challenges [6]. The geographical location, land composition, and other environmental factors (rivers, monsoon climate) make Sierra Leone highly vulnerable to disasters [6]. The most common disasters in Sierra Leone include floods, landslides, and droughts [7]. Sierra Leone experienced one of the worst disasters in 2017 when it was hit by a massive landslide and floods in Freetown, causing colossal destruction that led to food insecurity, economic hardship, and disaster-related health hazards [7]. The country promptly responded to the crisis as effective crisis-response management made the government less dependent on humanitarian aid [7]. Economic hardship is a driving factor [8] that forces the less-privileged to dwell in high-risk areas, making them vulnerable to disasters [9]. These consequences can be mitigated through DRR via disaster policy implementation (DPI). On one hand, the DRR is an efficient method that identifies, assesses, and reduces disaster risk and curtails a community's vulnerability [10–13]. On the other hand, it is a proactive measure taken

to prevent or lessen the adversative effects of disaster risks, thereby enabling sustainable development (SD) action [14–16].

Sustainable development is defined as those needs that meet the present without hampering future generations' capability to meet their own needs [17]. The goals are to end poverty, protect our planet, and ensure that humans enjoy peace and prosperity. SD and DRR are thus closely linked. A single devastating natural disaster can cause catastrophes that would hinder sustainable development initiatives [17,18]. For instance, Sierra Leone was among the fastest-growing economies globally in 2012 before the deadly Ebola struck in 2014 [19–22], which greatly affected sustainable development. Sierra Leone's Agenda for Prosperity lists disaster risk and emergencies as a cross-cutting risk that undermines sustainable development [23]. The Government of Sierra Leone created a Disaster Management Department (DMD) and the Office of National Security (ONS) in 2006, charged with the responsibility of managing disasters nationally [6]. Unfortunately, the draft Disaster Management Policy of 2006 is yet to be enacted by the Parliament of Sierra Leone. The 2006 draft Disaster Policy stated the aims, objectives, strategies, roles, and responsibilities of disaster institutions and implementing agencies and highlights the need for an all-inclusive method and improvement on the integration of disaster risk management (DRM) into sustainable development programs and policies [6,24]. DRM is a policy formation that highlights the specific guidelines for reducing disaster risks and other related approaches to attain these objectives [4]. Sierra Leone has committed itself to review the National DRM Policy through a participatory process with a clear definition of strategic activities through the development of the National DRM Strategy and Action Plan [6]. The strategy should provide a straightforward approach and set national priorities for DRR [6,24]. The process should encourage complementarities, remove duplication, and ensure the mainstreaming of DRR into developmental planning [6]. A national DRM policy serves as a requisite institutional capacity tool for disaster reduction at all levels and increases the use of knowledge, education, training, innovation, and information sharing to build safe and resilient societies [6,24]. Therefore, the ONS implemented several activities to improve the country's institutional capacity on DRM comprehensively [6]. It seeks to recruit a DRM policy consultant to review and update the draft National Disaster Risk Management Policy [24].

Following the trend of DRR, the Third UN World Conference on DRR held in Japan (2015) established the Sendai Framework for Disaster Risk Reduction (SFDRR) for 2015–2030 [25]: implement a precise, focused, forward-looking and action-oriented post-2015 framework for DRR; complement the Hyogo Framework for Action (HFA) implementation 2005–2015 [8]. Therefore, it has provided an exceptional prospect for promoting strategic and systematic methods to mitigate vulnerabilities and risks [25]. Additionally, the SFDRR indicated that countries reiterated their obligation to address DRR and build disasters resilience with a transformed firmness within the perspective of SD and poverty annihilation.

The unplanned urbanization and climate change have triggered impaired disaster risks [23] in Freetown. Highlands surround the capital coast with limited land for the city to expand. People and infrastructure are highly exposed to landslides, floods, and sea-level rise [6,23]. Other factors include poor infrastructure, deforestation, and a poor drainage system [26]. The country is much overwhelmed by many natural and human-made disasters [6]. This is due to the civil conflict that collapsed the security infrastructure and led to massive environmental issues and infrastructural resources mismanagement [1].

Furthermore, the recurrent disasters such as the 2014–2016 Ebola crisis [27–29], the 2015 flood [27,28], and the 2017 landslide and floods [26,29,30] undoubtedly have created economic hardship among the bulk of the country's population, destroying human lives, properties, and livelihood [31,32]. Therefore, DRR is predominantly necessary for SD goals since it offers a safety net for underdeveloped countries' hard-earned development advantages [33,34]. It is a great challenge to manage Sierra Leone's disasters due to the lack of funds and material resources, and a comprehensive disaster policy implementation [24].

However, Sierra Leone has raised a robust DRP strategy through community participation and implementing disaster policy framework at community levels as shown on the ONS official website (<https://ons.gov.sl>) [accessed on 13 November 2020]. Therefore, the paper contributes to the disaster debate by exploring DRR and SD in the Sierra Leone context. To further enrich the discussion around disaster policy orientation, the role of DPI is also accounted for in the proposed model which is lacking in the extant literature.

2. Literature Review

Disasters significantly hinder sustainable development [35]. The annual floods that hit the capital, Freetown, result from the poor drainage system, poor infrastructural development, erecting temporary structures in hazardous and disaster-prone environments or water routes [7,23]. Some of the contributing factors of the 2017 catastrophe [36] include massive urbanization, unplanned urbanization–illegal housing development, and deforestation–exposing the soil to erosion and making it unable to absorb rain during high rainfall and increasing the risk of disaster [29,30]. The most problematic issue in responding to natural disasters is that there is no "silver bullet" solution [36]. Therefore, effective DRM policies will help mitigate disaster risks and build a sustainable community [24]. However, disasters are becoming a frequent norm, meaning any single dollar spent on DRM will potentially save the \$3 required for post-disaster recovery [36].

Sierra Leone has experienced multiple disasters in the last decade [37]. Some of the disasters include cholera, measles, and the deadly regional Ebola epidemic, which lasted for two years and infected more than 8000 people nationwide with a fatality of 3500 [37]. According to Sumati Rajput and Rui Xu (2020), the massive landslide and floods in 2017 approximately affected 6000 people and inflicted economic losses to the tune of 31.65 million US dollars, equivalent to 0.8% of the 2016 gross domestic product (GDP) [5,7]. Similarly, multiple floods hit six districts in Sierra Leone and damaged homes, temporarily displaced thousands, and caused significant long-term implications for food security in 2019 [37].

Disasters affected approximately 98.6 million globally, with more than 340 disasters in 2015, costing 66.5 billion US dollars damages to the global economy [38]. In 2019, 395 natural disasters with 11,755 fatalities affected approximately 95 million people, costing 130 billion US dollars in damages [38]. Research has recently shown that disaster risk impacts will continue to rise exponentially [39] and indicates that policymakers should focus more on building societal resilience for community participation and cohesive and effective disaster policy implementation [39]. The UNDRR Global Assessment Report (GAR) indicates that severe disparities exist between developed and underdeveloped countries [40]. Underdeveloped countries continue to suffer the highest relative disaster costs in damages [6,7]. The report further suggested that the loss of lives and properties on the GDP inclines higher in countries with the inadequate infrastructural capacity to prepare promptly, fund, and respond to disasters [6]. An effective DPI process is required to comprehensively analyze the direct loss and damage in understanding the impact of DRR holistically [6]. Previous GAR reports indicate further importance of the percentage of income or assets lost in the loss analysis. To achieve these demands, all parties considered specified, in the post-2015 agreements, goals and targets and design metrics for those dimensions of disaster impact to make communities less vulnerable [6]. Notably, this should be done by improving community participation at the household level [36]. A prompt effort is required to understand how shocks affect people's well-being in general. The necessary support can then be given to nations to strategize solutions and influence human behavior, to preventing the creation and propagation of risk, and as well as to recover from disasters [41].

If adequately designed and implemented, the DRM will successively form the support for national disaster awareness and adaptation policies to cope with the impacts of risk and maximize the available resources to respond and adapt to future challenges [4]. National and local government authorities perform a central role of networks and inter-

connectivity established through an increasingly globalized economy [42] and their ability to communicate information to local citizens [43]. However, Schipper and Pelling [44] suggested that "DRR is largely a task for local actors, although with support from national and international organizations." This is because DRR policies and approaches consider a comprehensive view of risks and hazards, mostly socio-economic and political in origin since "wider social, political, environmental and economic environments in which a hazard is situated" [45]. This suggests that institutional DPI support at national and international levels can enable local DRM adoption, but only if it is consistent at the local level through the supportive policies and approaches [46]. To achieve robust disaster risk resilience, Kappes et al. [47] proposed exploring the frameworks applied in risk management with collaborations between science and practice about knowledge transfer and applicability. Effective frameworks use applicable instruments to interconnect and transfer knowledge related to risk to numerous community leaders engaged in disaster decision-making [48].

There is an increasing consciousness among users, organizers, and experts that risk reporting should be improved, as "better risk reporting is fundamental to healthier governance" [49]. However, how best to balance what the community participants want to see in a risk report with what the organizations are willing to divulge remains unanswered [49]. In particular, organizations are unwilling to reveal anything that might impend a competitive advantage or discuss possible risks in detail if these alarms community participants. This report is typically a boilerplate-broad-risk report serving no nation's interest. Nevertheless, the risk assessment [50] should become an integral component of DRR management. DRM can be a powerful instrument to raise DRP, DA, CP, and DPI to improve a holistic approach to sustainable development [6]. Additionally, inadequate disaster policy implementation and cooperation among institutions, organizations, government departments, and the public are critical factors hampering DRR policy implementation in Sierra Leone [45].

Thus, based on the extant literature, we suggest that DRRs are positively related to DPI, which, in turn, acts as a mediating role in the relationship between DRRs and SD. The conceptual model of the study is depicted in Figure 1.

Figure 1. Proposed Research Model for the Study.

2.1. Hypothesis Development

2.1.1. Disaster Risk Perception, Policy Implementation, and Sustainable Development

Risk perception is a predecessor of mitigation behavior [51,52]. Mitigation behavior is practicing the limitation of adverse impacts of hazards and related disasters. Murphy et al. [53] in 2005 viewed disaster risk perception as a process that links individual judgments of the degree of risk with action. Disaster-related risks have an effect on millions of people globally [54,55]. Landslides and flooding have posed a great danger to humanity and subsequently affect sustainable development [54,56]. Some hazards were not part

of the HFA [57] and are not familiar. Nevertheless, they were included in SFDRR [25], including biological, nuclear/radiological, chemical/industrial, NATECH (natural hazards triggering technological disasters), and environmental hazards. Understanding how these hazards relate to exposure and vulnerability is crucial [58]. Disaster risk is the possible loss of life, injury, or damage done to infrastructure that will affect a system, or a community in a given time, which is probabilistically a function of hazard, vulnerability, exposure, and capability [59,60]. Disaster risk also depends on the type of community, economic status, policies, and politics and does not only depend on frequency, intensity, and duration of hazards [61]. A full understanding of the physical, cultural, societal, environmental, financial, and institutional dimensions of vulnerability to the most prevailing disasters in Sierra Leone (flood, mudslide, landslide, fire, road accidents, drought, epidemic diseases, and industrial accidents) must be carefully assessed [62]. The socio-economic disparities affect the marginalized communities, women, children, older adults, healthcare complications, and disabilities being the most vulnerable people to natural disasters [63,64].

Nevertheless, the researchers are not oblivious to the fact that other barriers would impede the relationship between DRP and SD. Still, the focus is to provoke future direction that merits discussion. This means stringent adaptation policies should be initiated into DRR via DPI. Policy-makers and CSOs should continuously raise disaster awareness programs to educate people on how to adapt and prepare for disasters. Therefore, the study proposed the following hypotheses.

Hypothesis 1 (H1). *Disaster risk perception positively influences sustainable development.*

Hypothesis 2 (H2). *Policy implementation mediates the relationship between disaster risk perception and sustainable development.*

2.1.2. Disaster Adaptation, Policy Implementation, and Sustainable Development

Adaptation is humans' ability to adjust to pressure [65]. Adaptations also refer to the changes in the disaster risk guidelines and governance, changes in the organizations' operation, and promotion of self-mobilization by civil society and private corporations [66]. Adapting to environmental changeability has been a focus since the early 1900s [67]. Humans need to learn to adjust to the social-ecological factors and their effects. Adaptation is a vital component in sustainability and disaster risk reduction fields [68–70].

Generally, adaptation is a process where an individual improves his/her inherent genetic or behavioral characteristics to better adjust to changes through social learning [71]. Adaptation can also curb harm, exploit potential benefits, minimize the adverse impacts, and maximize possible options to respond to disaster risk. The concept of adaptation means that humans should learn to adapt to natural disasters instead of controlling nature [72]. Therefore, the research proposes the following hypotheses.

Hypothesis 3 (H3). *Disaster adaptation positively influences sustainable development*

Hypothesis 4 (H4). *Policy implementation mediates the relationship between disaster adaptation and sustainable development.*

2.1.3. Community Participation (CP), Policy Implementation, and Sustainable Development

Some literature has indicated that most past successful DRR initiatives resulted from community participation when designing appropriate DPI risks [73–75]. Community participation is fundamental for DPI and DRR [76]. Disaster-prone societies better know the socio-environmental limitations, clearly describing the vulnerabilities and constraints determining the DRR policy's success. These communities have different interests, and therefore, their participation is needed to reach a compromise and achieve satisfaction [47]. This is because community-based disaster training and maneuvers involving community participants build local capacities by raising awareness and resilience among the disaster-prone communities. To achieve this goal, communication and collaboration at community

levels have proven fundamental to natural disaster preparation, response mechanism, and recovery phase [73–75]. People with better infrastructure and livelihood perceived themselves as more resilient, even if the available monetary resources are small [77]. Additionally, community participation guarantees transparency and disclosure of relevant information sharing, essential for DPI, and sustainable resource utilization equitably. Today, the top-down method practiced in several developing nations has failed to embrace developmental planning and vulnerability detection. On the other hand, community participation builds capacity and trust among the community's people and lessens partisan interference through different groups. Community participation can detect a vulnerability, also in trade-offs to achieve SD [78].

Moreover, community participation offers an integral instrument for disaster adaptation and control since the DRR is a dynamic process that adapts to innovations. Communities have used several application methods to mitigate disasters with local community participation [78]. Community participation builds partnerships with a standard plan. Therefore, it depends on hands-on instruments among key participants by identifying influential leaderships who understand the shared interests, establishing trust, and achieving commitment [79].

Therefore, we argue that community participation is positively related to sustainable development and DPI mediates the relationship between them:

Hypothesis 5 (H5). *Community participation positively influences sustainable development.*

Hypothesis 6 (H6). *Policy implementation mediates the relationship between community participation and sustainable development.*

2.1.4. Disaster Policy Implementation and Sustainable Development

DPI is crucial for DRR in Sierra Leone [80]. This requires a harmonious action by disaster agencies to implement effective national and global disaster policy. The disaster policy frameworks of recent times include the SFDRR [25,59,81], Paris Agreement on climate change [82], Agenda 2030 for Sustainable Development [83], the ACP-EU NDRR program [84], Sierra Leone Disaster Management Policy [1], and the EU Adaptation Strategy [85], which have all highlighted the importance of adaptation and DRR and the co-benefits that may arise from the aligned DPI actions [86–89]. Legal and established guidelines certainly create an enabling environment for alliances between relevant policies and policy documentations as the first step of integrating sustainable DRR policy [90]. However, the implementation of such processes in Sierra Leone mostly may depend on coordination among the various actors involved [91,92]. This process includes, among others, communication and teamwork among several institutions [91,92]. To achieve these, the DPI must underscore the relevance of promoting national disaster policies to strengthen the public education system by creating DRR awareness, sharing disaster risk information and knowledge through community-based organizations (CBOs) engagement, social networking sites, and community mobilization, targeting specific community's needs. [86]. Several efforts have supported DPI integration with DRR policies and agreements [93–101]. The 2014 Ebola crisis established a set of policy recommendations for disaster-related threats into DPI planning for sustainable development [86].

DPI is a system that enables increased political obligation to DRM, boosts local and national agencies to take the lead, and be supported by the national government and NGOs [102]. It also raises public awareness and indicates the funding sources [84], and reduces the bureaucracies to access disaster funds for effective disaster coordination and collaboration among key stakeholders. Thus, it can be hypothesized:

Hypothesis 7 (H7). *Disaster policy implementation positively influences sustainable development.*

3. Research Methodology

3.1. Research Design and Data Collection

Taking into account the needs of the research, data was collected across six disaster-prone communities (Dwarzarck, Portee-Rokupa, Kroobay, Susan's Bay, Moyiba, and Colbot) in Freetown, Sierra Leone (between August and November 2020). Moreover, during the initial stage of the survey and prior to the questionnaire development, the research team came in contact with the community heads of the communities that participated in the research, for two main reasons. Firstly, to discuss the disaster issues that the communities are facing, to clarify the research goals, and to confirm the participation of the communities in the research. Secondly, to help the research team narrow down the specific DRRs and their related policies that are currently implemented in disaster-prone communities in Sierra Leone.

Overall, after a substantial literature review, and meetings with the community stakeholders the questionnaire was developed using the proposed research model, as in Figure 1 above. The items (see Appendix A) in the questionnaire were designed with each section addressing a particular variable of the study. Finally, a few weeks after the initial contact, the community heads gave instruction for the data collection. The community heads made sure to inform all community members on the anonymity and the voluntary nature of participation in the survey, although this information was also provided on the front page of the relevant questionnaires. In total, 1500 respondents were targeted, and 814 filled in the complete questionnaire, yielding a response rate of 54.3%. Collected data was cleaned, coded and entered into SPSS and AMOS in readiness for analysis.

3.2. Measurement Item

3.2.1. Sustainable Development

Data on SD was collected using the sustainable development measure developed by [103]. This composed scale consisted of twenty items that all conceptualize sustainable development. A Likert five-point scale (from 1 to 5, 1 = strongly disagree, 2 = disagree, 3 = uncertain, 4 = agree, 5 = strongly agree) was used to measure the items. Examples of items include "Environmental protection and people's quality of life are directly linked" and "Biodiversity protected at the expense of industrial agricultural production."

3.2.2. Disaster Risk Perception

The measures on DRP were developed from an existing construct [8]. This composed scale consisted of four items on DRP with a Likert five-point scale (1 = strongly disagree, 5 = strongly agree) as a measurement metric. Examples of items include, "I am very sure that large-scale disasters will certainly occur in the next 10 years" and "I think my building is well designed and will withstand an earthquake event."

3.2.3. Community Participation

Data on CP was collected using the community participation measure developed by [104]. This composed scale consisted of fourteen items (eight items for attitude and six items for behavior) that all conceptualize community participation. The questionnaire used a Likert five-point scale (1 = strongly disagree, 5 = strongly agree) to measure the items. Examples of items include "I feel responsible for my community" for attitude items and "I am involved in structured volunteer position(s) in the community" for behavior items.

3.2.4. Disaster Adaptation

Data on DA was collected using the disaster awareness and adaptation measure developed by [8]. This composed scale consisted of seven items that all conceptualize disaster adaptation. A Likert five-point scale (1 = strongly disagree, 5 = strongly agree) was used to measure the items. Examples of an item include "I know the important of community activities for disaster risk reduction."

3.2.5. Disaster Policy Implementation

DPI has 15 self-reported items that were developed from [1,11,105]. The items were measured using a Likert five-point scale (1 = strongly disagree, 5 = strongly agree). Examples of items include “Proper environmental policy results in environmental improvement” and “Inclusive public disaster policies for disaster-prone areas reduce disaster risk.”

4. Analysis of the Results

4.1. Validity and Reliability Test

Prior to hypotheses testing, AMOS software version 24.0 was used to validate the questionnaire instrument’s validity and reliability. Employing the confirmatory factor analysis (CFA), steps were taken to check (i) unidimensionality and convergent validity, (ii) reliability, and (iii) discriminant validity. The model fit indexes were utilized to evaluate the unidimensionality of each measurement construct. Aligned with [103], we assessed the normed chi-square (χ^2), comparative fit index (CFI), Tucker–Lewis index (TLI), and root-mean-square error of approximation (RMSEA) for the model estimation. The following statistical values confirmed the good fit of the estimated model: normed- χ^2 less than 3.0, CFI greater than 0.70, TLI greater than 0.90 RMSEA less than or equal to 0.10 [106].

The result of the estimation instrument (Table 1) established that all item loadings were statistically significant, ranging from 0.709 to 0.879 and showing strong convergent validity of the measurement constructs of all the latent constructs; the composite reliabilities (CR) of the latent constructs ranged from 0.828 to 0.984, indicating an acceptable level of reliability (>0.70) [107]; and the estimates of average variance extracted (AVE) for the constructs were also adequate, ranging from 0.701 to 0.739 (>0.50) [108]. Lastly, the model fit was adequate ($\chi^2 = 279.839$; $df = 174$; $p < 0.001$; CFI = 0.986; TLI = 0.951; IFI = 0.972; RMSEA = 0.064).

Table 1. Instrument and statistical validation.

Construct	Research Variable	Factor Loading	Cronbach’s α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Sustainable Development	SD1	0.784	0.965	0.974	0.629
	SD2	0.762			
	SD3	0.738			
	SD4	0.786			
	SD5	0.724			
	SD6	0.796			
	SD7	0.780			
	SD8	0.824			
	SD9	0.812			
	SD10	0.775			
	SD11	0.847			
	SD12	0.832			
	SD13	0.750			
	SD14	0.804			
	SD15	0.709			
	SD16	0.811			
	SD17	0.845			
	SD18	0.823			
	SD19	0.850			
	SD20	0.788			
Disaster Risk Perception	DRP1	0.873	0.793	0.828	0.699
	DRP2	0.775			
	DRP3	0.870			
	DRP4	0.822			

Table 1. Cont.

Construct	Research Variable	Factor Loading	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Disaster Adaptation	DA1	0.802	0.895	0.904	0.628
	DA2	0.710			
	DA3	0.819			
	DA4	0.803			
	DA5	0.835			
	DA6	0.807			
	DA7	0.766			
Community Participation	CP1	0.807	0.962	0.984	0.695
	CP2	0.835			
	CP3	0.799			
	CP4	0.878			
	CP5	0.851			
	CP6	0.868			
	CP7	0.803			
	CP8	0.853			
	CP9	0.872			
	CP10	0.861			
	CP11	0.843			
	CP12	0.844			
	CP13	0.779			
	CP14	0.769			
Disaster Policy Implementation	DPI1	0.774	0.965	0.971	0.675
	DPI2	0.753			
	DPI3	0.797			
	DPI4	0.815			
	DPI5	0.815			
	DPI6	0.756			
	DPI7	0.852			
	DPI8	0.783			
	DPI9	0.861			
	DPI10	0.820			
	DPI11	0.879			
	DPI12	0.841			
	DPI13	0.859			
	DPI14	0.849			
	DPI15	0.852			

Note: DRP = Disaster Risk Perception; DA = Disaster Adaptation; CP = Community Participation; DPI = Disaster Policy Implementation; SD = Sustainable Development.

The Discriminant validity was tested to measure whether the AVE's square roots (starred variables on the diagonal in Table 2) were more significant than the squared multiple correlation values shown below the diagonal [109]. From the test result, all correlations satisfied this condition.

Table 2. Matrix of means, standard deviations, and correlation coefficients of latent constructs.

Variable	Mean	Std.	SD	DRP	DA	CP	DPI
SD	3.537	0.963	0.793				
DRP	3.261	0.996	0.651 **	0.836			
DA	3.114	0.833	0.540 **	0.495 **	0.793		
CP	3.726	0.953	0.801 **	0.666 **	0.785 **	0.834	
DPI	3.667	0.002	0.802 **	0.629 **	0.741 **	0.802 **	0.821

Note: DRP = Disaster Risk Perception; DA = Disaster Adaptation; CP = Community Participation; DPI = Disaster Policy Implementation; SD = Sustainable Development. Bold values are the square root of AVE. ** p -value < 0.01.

The result in Table 3 is a summary of the fit indices of the measurement model. Based on the recommended values, TLI, IFI, CFI, RMSEA, and χ^2 were adequate. Consequently, this model showed acceptance measures for the fit indices.

Table 3. Model fit result for CFA.

Model	χ^2	d.f	$\chi^2/\text{d.f}$	TLI	IFI	CFI	RMSEA
Measurement model	279.839	174	1.608	0.951	0.972	0.986	0.053
Recommended values			≤ 3.0	≥ 0.9	≥ 0.9	≥ 0.9	≤ 0.08

GFI: goodness of fit index, CFI: comparative fit index, TLI: Tucker–Lewis index, RMSEA: root mean square error of approximation.

4.2. Model Estimate and Test of Hypothesis

In SEM, the inner model denotes the path structure between constructs. According to the internal model, the hypothesis testing and path analysis results are presented in Figure 2.

Figure 2. Standardized path coefficients and significance of the model. *** p -value < 0.001, ** p -value < 0.01.

4.2.1. Hypothesis Testing

The Influence of Disaster Reduction on Sustainable Development

(1) Disaster risk perception has a significant and positive effect on sustainable development ($\beta = 0.319$, $p < 0.01$). Consequently, hypothesis 1 was supported by the study. (2) Disaster adaptation has a significant and positive effect on sustainable development ($\beta = 0.216$, $p < 0.01$). Therefore, hypothesis 3 was also supported by the study. (3) Community participation was found to have a significant and positive effect on sustainable development ($\beta = 0.484$, $p < 0.01$). So, hypothesis 5 was supported by the study.

The Influence of Disaster Reduction on Disaster Policy Implementation

(1) Disaster risk perception was found to have a significant and positive effect on disaster policy implementation ($\beta = 0.209$, $p < 0.01$). (2) Disaster adaptation significantly and positively affected disaster policy implementation ($\beta = 0.395$, $p < 0.01$). (3) Community participation was found to have significant and positive effect on disaster policy implementation ($\beta = 0.277$, $p < 0.01$).

The Influence of Disaster Policy Implementation on Sustainable Development

Disaster policy implementation was found to have a significant and positive effect on sustainable development ($\beta = 0.370$, $p < 0.01$). Consequently, hypothesis 7 was supported by

the study. The disaster policy frameworks of recent times, including the SFDRR [25,59,86], Paris Agreement on climate change [87], Agenda 2030 for Sustainable Development [88], and the EU Adaptation Strategy [89], have all highlighted not only the importance of adaptation and DRR but also brings co-benefits that may arise from the aligned disaster policies and actions [90–93]. A summary of the hypothesized results is presented in Table 4.

Table 4. Summary of hypothesized results.

Hypothesis Direction and Structural Path				Path Coefficient	t-Value	Inference
H1(+):	DRP	→	SD	0.319 ***	7.839	Supported
H3(+):	DA	→	SD	0.216 ***	11.522	Supported
H5(+):	CP	→	SD	0.484 ***	13.836	Supported
H7(+):	DPI	→	SD	0.370 ***	10.973	Supported
Explained variance for each dependent variable (R ²)						
DPI				SD		
0.734				0.852		

Note: DRP = Disaster Risk Perception; DA = Disaster Adaptation; CP = Community Participation; DPI = Disaster Policy Implementation; SD = Sustainable Development; *** *p*-value < 0.001.

4.3. Analysis of Mediating Effect

Traditionally, the mediating effects are mostly analyzed via the steps established by [110] and confirmed by the [111] z-test. However, as often suggested by empirical studies, the step-by-step method proposed by Baron and Kenny's has a shallow detection rate of mediating effects [112], and most of the mediating effects are not generally distributed as essential for the Sobel test. Consequently, using Sobel's (1982) z-test [113], this paper also employed the method proposed by [114] and more recently by MacKinnon et al. (2012) and applying the product of distribution approach (R-Mediation software provided by Tofighi and MacKinnon (2011) was used to study the confidence intervals of the mediating effects when calculating the product of distribution (<https://amplab.shinyapps.io/MEDCI/>) [accessed on 17 December 2020] to calculate the mediating effects of DPI, and its confidence intervals during the analysis.

The findings showed that disaster reduction significantly influenced sustainable development through disaster policy implementation. Mediating analysis was accomplished on all constructs. The outcomes are shown in Table 5. The Sobel-test was used to examine the influence of the mediating variables. Mediating effects exist when the z-score is better than an absolute value of 1.96 [111,113,115]. The product distribution method was used to calculate the confidence interval of the direct effects. At a 95% confidence level, zero was not included in the direct effects' confidence interval—hence, mediating effects were present in this study. From the results of these two approaches, all constructs' mediating effects in this study were statistically significant. Consequently, hypotheses 2, 4 and 6 were also supported by the study.

Table 5. Mediating effects of Disaster Policy Implementation.

Mediator Variable	Path	Sobel Test's z-Value	Product of Distribution			
			Mediation Effect	LL95%CI	UL95%CI	
Disaster Policy Implementation	DRP→DPI→SD	18.276 ***	μ = 0.466 *** (σ = 0.039)	0.054	0.174	
	DA→DPI→SD	12.748 ***	μ = 0.485 *** (σ = 0.034)	0.056	0.192	
	CP→DPI→SD	7.673 **	μ = 0.263 ** (σ = 0.028)	0.043	0.165	

Note: DRP = Disaster Risk Perception; DA = Disaster Adaptation; CP = Community Participation; DPI = Disaster Policy Implementation; SD = Sustainable Development; ** *p*-value < 0.01; *** *p*-value < 0.001.

Consequently, with Disaster Policy Implementation as a mediator, the Disaster Risk Perception, Disaster Adaptation, and Community Participation each had an indirect effect on Sustainable Development.

Moreover, Table 6 indicates that community participation impacts disaster policy implementation and sustainable development the most (0.484), followed by disaster risk perception (0.319) and disaster adaptation (0.216). These outcomes suggest that the research framework and hypotheses conform to the claims of previous research findings based on disaster management theory.

Table 6. Summary of the effects of disaster risk reduction on sustainable development.

Independent Variables	Sustainable Development		
	Direct Effect	Indirect Effect	Total Effect
Disaster Risk Perception	0.319	0.062	0.381
Disaster Adaptation	0.216	0.075	0.291
Community Participation	0.484	0.054	0.538

5. Discussion

The research findings indicate that disaster policy implementation is crucial to understand better the DRR and sustainable development process in Sierra Leone. Before estimating the model, good content validity was validated, as was the data supporting the study's construct validity. As stated earlier, the study explores four DRR issues to achieving SD. The study's constraint is that the survey mostly targeted Freetown residents as it is the most disaster-prone environment in the country instead of the whole country.

All the variables had significant and positive effects on disaster policy implementation and sustainable development, with DRP having the most influence, followed by community participation and disaster adaptation. These results suggest that DRP, DA, and CP play a key role in designing and implementing disaster policy and sustainable development in Sierra Leone. The results are designed to provide insights to the line ministries (governmental and non-governmental agencies) to adequately involve the community when designing and implementing disaster policy and sustainable development agendas nationwide. They better know what faced them in disaster-prone environments. Therefore, the study clearly shows the relevancy of DRR issues regarding disaster policy implementation and sustainable development and provides a sound basis for recommending the DRR and SD for disaster policy implementation by disaster agencies nationwide [6]. DRR via DPI policies and approaches encapsulate a comprehensive detail of risks and hazards, considering the socio-economic and political aspects in which a hazard is situated" [45]. Institutional DPI supports local and national DRM adoption through supportive policies and approaches [46].

Practical Implications

The study findings can help disaster policymakers effectively design disaster policy implementation for DRR and SD in Sierra Leone.

From the findings, given that DPI is found to serve as a channel through which DRR leads to SD, it should be integrated into DRR and sustainable development framework. Disaster risks affect millions worldwide, and therefore, people must be aware of their effects [54,55]. The postulation that local hazards may impact a community distinguishes risk knowledge from risk perception. Underlining the belief of being affected is the nature and features of local risks, intensity, and individual experience frequency [116]. Cultural theorists explore risk perception from a political economy and emotional perspective [117]. This theory states that socio-cultural factors control how people conceptualize risk. Furthermore, Pidgeon et al. [118] in 1992 indicated that risk perception includes personal heuristics on local hazards and broader social and cultural values and characters that people adopt towards risks and their benefits. Therefore, policymakers should comprehend the full understanding of risks nationally and provide adequate supports [62].

Implementing the disaster adaptation component within the DRR process can help achieve sustainable development in Sierra Leone [68–70]. The government must work with

all stakeholders to transform the existing socio-political structures to respond to community needs [47] and allow the flow of essential environmental information to disaster-prone communities [77]. In boosting the DRR process, key environmental subjects such as disaster management, disaster risk reduction, disaster policy implementation, risk mitigation, and other areas should be taught in schools, colleges, and universities to provide a foundation in environmental hazards. Additionally, policymakers should plan disaster awareness and adaptation programs on a long-term basis, with built-in tools and funding to achieve sustainability. This is verified as the study ascertained that disaster adaptation positively influences sustainable development. Additionally, disaster policy implementation mediates the relationship between disaster adaptation and sustainable development.

From the results, community participation positively influences sustainable development. The disaster policy implementation further mediates the relationship between community participation and sustainable development in developing countries, as evident in this paper's analysis. Consequently, disaster policymakers should closely work with the disaster-prone community members to establish the appropriate DPI in Sierra Leone [60,77]. These communities lived in different disaster-prone areas with other interests, and therefore, their participation is needed to identify and mitigate imminent environmental threats and achieve satisfaction [47]. Community participation establishes an efficient partnership with a focused common agenda. Therefore, policymakers should develop participatory instruments among key participants to identify trustworthy leaders who understand their plights and achieving goals [119].

A comprehensive understanding of the physical, cultural, social, environmental, financial, and institutional vulnerability dimensions of the predominant disasters in Sierra Leone (flood, mudslide, landslide, fire, road accidents, drought, epidemic diseases, and industrial accidents) should be carefully addressed [80]. A careful understanding of how these hazards interact with exposure and vulnerability is essential [58] for DPI. The study established that disaster risk perception positively influences sustainable development, with disaster policy implementation mediating the relationships.

Finally, policymakers should effectively design comprehensive DPI strategies, the key to DRR, and sustainable development [85]. The research results show that DPI positively influences sustainable development. However, the implementation of such processes in Sierra Leone mostly may depend on coordination among the various actors involved [95,96]. Therefore, this has implications for policymakers, where policymakers should actively communicate and collaborate with several institutions [95,96] to design and implement the DPI strategy nationally.

6. Conclusions

The study explored the effect of disaster risk reduction on sustainable development and accounted for the role of disaster policy implementation. The study survey has indicated that all the factors of disaster risk reduction (DRP, DA, and CP) significantly impact sustainable development via policy implementation. Even though the literature shows that Sierra Leone has not entirely implemented the DRR policy implementation initiatives, the results are encouraging. We propose that the DRR process be further integrated into the developmental agendas for disaster-prone communities across the nation. The country's disaster agencies need to provide relevant DRR information, such as if disaster struck, what people are expected to do, and who to consult for any additional support.

As in any other study, this research is not without limitations. The study did not consider other barriers that would impede the relationship between disaster risk reduction and sustainable development, but the focus is to provoke future direction that merits discussion. Therefore, future research can consider possible barriers. Another limitation is that the survey targeted communities within the Freetown municipality as it is the most disaster-prone environment in the country instead of the whole country.

Author Contributions: Conceptualization, I.A.S. and L.F.; methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, I.A.S.; writing—review, editing and supervision, L.F. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the University of Management and Technology Chan-cello’s Special Research Grant (UNIMTECH-CSR) Under Grant No. 2021pak-0001.

Institutional Review Board Statement: The research uses data collected from an online survey questionnaire randomly with anonymity, and the data are only used for academic research purposes. The respondents lived in the selected disaster-prone communities in the municipality of Freetown, Sierra Leone.

Informed Consent Statement: All the respondents who participated in the online survey questionnaire consented to provide the necessary information. This was vital for them because it is about providing a conducive environment for their survival. They know that any possible recommendations will be forwarded to the appropriate authorities concerned with preventing potential disasters in their communities.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments: The authors would like to thank all those who participated in the survey for their valuable inputs. Additionally, to Brima Sesay of the School of Economics at the Wuhan University of Technology for his comments and suggestions. We also like to thank Paul Kamara and Abie Paula Kamara of the University of Management (UNIMTECH), Freetown, Sierra Leone, for their continued supports. Special thanks go to Elizabeth Guma Sawaneh for her financial and moral supports. Finally, we would further extend our appreciation to the Chinese Scholarship Council (CSC) and the Wuhan University of Technology for awarding this prestigious scholarship to me through the Government of Sierra Leone (Ministry of Higher and Technical Education).

Conflicts of Interest: The authors declared no conflict of interest.

Appendix A

Part A: Sustainably development

When people interfere with the environment, they often produce disastrous consequences
 Environmental protection and people’s quality of life are directly linked
 Biodiversity should be protected at the expense of industrial agricultural production
 Building development is less important than environmental protection
 Environmental protection is more important than industrial growth
 Government economic policies should increase sustainable production even if it means spending money
 People should sacrifice more to reduce economic differences between populations
 Government economic policies should increase fair trade
 Government economic policies should act if a country is wasting its natural resources
 Reducing poverty and hunger in the world is more important than increasing the economic well-being of the industrialized countries
 Each country can do a lot to keep the peace in the world
 The society should further promote equal opportunities for males and females
 The contact between cultures is stimulating and enriching
 The society should provide free basic health services
 The society should take responsibility for the welfare of individuals and families
 Teacher in college should use student-centered teaching methods
 Teachers in college should promote future-oriented thinking in addition to historical knowledge
 Teachers in college should promote interdisciplinarity between subjects
 Teachers in college should promote the connection between local and global issues
 Teachers in college should promote critical thinking rather than lecturing

Part B: Disaster risk reduction

I am very sure that large-scale disasters will certainly occur in the next 10 years
 My locality is safe from all kinds of disasters
 I think my building is well designed and will withstand an earthquake event
 I am sure that my sleeping space is secure during and after disaster

Part C: Community participation

Attitude item

I feel responsible for my community
 I believe I should make a difference in my community
 I believe that I have a responsibility to help the poor and the hungry
 I am committed to serve in my community
 I believe that all citizens have a responsibility to their community
 I believe that it is essential to be informed of community issues
 I believe that it is important to volunteer
 I believe that it is important to financially support charitable organizations

Behavior item

I am involved in structured volunteer position(s) in the community
 When working with others, I make positive changes in the community
 I help members of my community
 I participate in discussions that raise issues of social responsibility
 I contribute to charitable organizations within the community

Part D: Disaster adaptation

I am aware of the shelter areas and open space in case of a disaster
 I have information about which government office needs to be contacted after the disaster
 I have knowledge about the disaster-prone area
 I am getting enough information from INGO/NGO about disaster adaptation
 I have knowledge about an evacuation area during a disaster
 I know the important of community activities for disaster risk reduction
 I know the life evacuation system in my locality

Part E: Disaster policy implementation

Proper land management policy reduces disaster risk
 Prohibition of population concentrations in hazardous areas reduces disaster risk
 Proper environmental policy results in environmental improvement
 Regulation enforcement reduces disaster risk
 Social justice reduces disaster risk
 Institutional capacity building reduces disaster risk
 Proper resource management reduces disaster risk
 Effective legislation of disaster reduces disaster risk
 Research and development on disaster knowledge reduces disaster risk
 Timely information dissemination on disaster reduces disaster risk
 Effective coordination among disaster agencies and disaster-prone communities reduces disaster risk
 Early warning and effective monitoring reduce disaster risk
 Inclusive public disaster policies for disaster-prone areas reduces disaster risk
 Mapping out disaster priority needs reduces disaster risk
 Strengthening decentralization of disaster risk reduction interventions reduces disaster risk

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