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DISASTER MANAGEMENT AND CLIMATE ADAPTATION ROADMAP FOR COASTAL CITIES BASED ON UNDRR'S TEN ESSENTIALS

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ABSTRACT: Disasters and natural hazards increasingly affect people in the most vulnerable communities in coastal cities, and low-lying areas are especially exposed in the context of increased urbanization, where the urban risk continues to rise. This paper endeavors to establish a Roadmap for Disaster Risk Management Planning for coastal cities based on the United Nations Office for Disaster Risk Reduction Ten Essentials (UNDRR, 2012). We report on local Disaster Risk Management (DRM) practices in a mid-Atlantic capital –the city of Praia, in Cabo Verde. DRM in coastal cities in island states turns out to be an intricate process due to the incorporation of socio-environmental anthropogenic exposure to physical, economic, population, political, and climate vulnerabilities. This paper contributes to the growing knowledge of the institutional framework's role in the facilitation of local adaptation, and design-thinking of urban-development planning processes in coastal cities and low-lying areas, by distinguishing arising opportunities for planned Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Small Island Developing States (SIDS) and describing a roadmap intended at further advances the discussions for the progress of risk-informed sustainable development pathways in the context of coastal cities. It advocates for the design of adaptative processes understood according to local initiatives, to foresee a possible expression of the growing engagement of different actors in the control and monitoring of risks and vulnerabilities in these areas.

Keywords: Planning Policy and Models, Government Policy, Climate Risk Management, Small Island Developing States (SIDS), West Africa.

RESUMO: *Os desastres e perigos naturais afetam cada vez mais as pessoas nas comunidades mais vulneráveis nas cidades costeiras, e as áreas baixas estão especialmente expostas no contexto de crescente urbanização, onde o risco urbano continua a aumentar. Este documento esforça-se para estabelecer um Roteiro para o planeamento de Gestão de Risco de Desastres para cidades costeiras com base nos Dez Essenciais da UNDRR, o Escritório das Nações Unidas para a Redução dos Riscos de Desastres (UNDRR, 2012). Reportamos boas práticas locais de Gestão de Risco de Desastres (DRM) numa capital meso-atlântica –a cidade da Praia, em Cabo Verde. A DRM em cidades costeiras de estados insulares acaba sendo um processo intrincado devido à incorporação da exposição antropogênica socioambiental a vulnerabilidades físicas, económicas, populacionais, políticas e climáticas. Nesse sentido, este artigo contribui para o conhecimento crescente do papel da estrutura institucional na facilitação da adaptação local e concepção de processos de planeamento de desenvolvimento urbano em cidades costeiras e áreas de baixa altitude, distinguindo oportunidades surgidas para planejamento da Redução de Risco de Desastres (RRD) e Adaptação às Mudanças Climáticas (AMC) em Pequenos Estados Insulares em Desenvolvimento (PEIDS), e descrevendo um roteiro destinado a promover ainda mais as discussões para o progresso de rotas de desenvolvimento sustentável informados sobre riscos no contexto de cidades costeiras. A análise defende o desenho de processos adaptativos entendidos de acordo com as iniciativas locais, de forma a antever uma possível expressão do crescente envolvimento dos diversos atores no controle e monitoramento dos riscos e vulnerabilidades nestas áreas.*

Palavras-chave: *Políticas e Modelos de Planejamento, Política Governamental, Gestão de Riscos Climáticos, Pequenos Estados Insulares em Desenvolvimento (SIDS), África Ocidental.*

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1. INTRODUCTION

Historically, the planning and development of most cities in the developing world had not consistently addressed the vulnerability of human settlements to the consequences of increased exposition to natural and human-made hazards and risks (WB, 2011; Elsharouny, 2016; Arshad *et al.*, 2020; Spaliviero *et al.*, 2020). The implication of these factors claims for governments (at all levels) to focus on the urban re-design towards safer cities for inhabitants based on the development of normative approaches to support disaster resilience, risk-informed policy implementation, and sustained transformation (UNDRR, 2015; Boulos, 2016; Satta *et al.*, 2017). Global and regional studies on the impacts of climate change on coastal urban systems are increasingly available (Ajibade, 2017; Pérez-Hernández *et al.*, 2020; Valenzuela *et al.*, 2020). Though, there is still a need to specify the socioeconomic and policy implications for the coastal zone and low-lying areas (Valenzuela *et al.*, 2020; Arshad *et al.*, 2020). In this regard, disaster-oriented urban management practices can be a powerful catalyst for reducing losses and damages from natural and human-made hazards events, while simultaneously helping to develop a resilient economy and society in a well-managed environment (Gencer, 2013; Spaliviero *et al.*, 2020). The study focuses on a roadmap for Urban Disaster Risk Reduction (UDRR) plan proposed for a mid-Atlantic SIDS capital –Praia, Cabo Verde, framed accordingly to the United Nations Disaster Risk Reduction policies (UNDRR, 2012). Therefore, the analysis and understanding of specific circumstances may support the establishment of Local Level Disaster Risk Management (DRM) roadmaps, helping policymakers, governments, and society to enhance local capacities and capabilities to reduce exposure to risks and hazards, and overall vulnerability.

2. METHODOLOGY

2.1. The Scenario Management Roadmap – The Municipality of Praia

As we can discern in Figure 1, the city of Praia, in the island of Santiago, is the capital of the Republic of Cabo Verde, located between latitudes 14º 28' N and 17º 12' N and longitudes 22º 40' W and 25º 22' W, 600 km far from the Senegal coast in West Africa (GoCV/MEA, 2007). Cabo Verde is defined by a unitary country, with a single level of sub-national governments composed of 22 municipalities (Text A in SI-I; Text B in SI-II), with an average municipal size of 23,356 inhabitants (OECD/UCLG, 2016). The country counts with a population of 543,767 people (2018), and rising population density (134.9 people per sq. km of land area in 2018), with a sustained annual population growth of 1,2% (1,9% when considering urban population growth) between 2015-18 (WB, 2019). Approximately 88% of the population lives on four islands (56% in Santiago; 15% in São Vicente; 9% in Santo Antão, and 8% in Fogo) (WB, 2018, p. 11). Besides, there is a relatively high population density in some islands (a little more than half of the population –236,000 people –live on the main island, Santiago; a little more than a quarter of the populace lives in the capital city, Praia (28,2%) (OECD/UCLG, 2016). The number of inhabitants has increased by 32% since 1990, reaching 132,317 people in 2014, under a current growing population of 3% per year (Lopes *et al.*, 2014). A total of 65% of its population lives in urban areas (GoCV/MEA, 2007; GoCV/MAHOT, 2013; OECD/UCLG, 2016).

Cabo Verde is a lower-middle-income country located in Sub-Saharan Africa, which according to the most recent Government estimates, has a Gross National Income (GNI) per capita around 3,450.00 USD, in 2018. Its absolute poverty line embraced 35% of the population in 2015 (WB, 2019). The accelerated pace of population growth in the capital has not been co-occurred by housing policies and programs capable of responding effectively to the housing demand. Therefore, the outcome of this correlation was the generation of unplanned communities on the outskirts of the capital city, with neighbourhoods without any sight of oversight, without obeying any type of planning and without providing essential services and infrastructure (Monteiro *et al.*, 2012).

Until the 1930s, the Plateau confined the city of Praia (Medina do Nascimento, 2010). Amid the 20th century, the surrounding hilltops were gradually occupied (Lopes *et al.*, 2014). During the 1970s, new neighbors filled the vacant spaces, due to spontaneous and unplanned land occupation, as happening in numerous African urban sprawl processes (Medina do Nascimento, 2010). Furthermore to the geographical area of 101.8 km^2 located within the perimeter of the island of Santiago (~1,000 km^2 in area), Praia has a coastline length of approximately 46 km, plus 1,800 m of the coastal perimeter of its only "Ilhéu" –islet – (Santa Maria –with about 6 hectares (ha), which is 150 m far from the coast, in the southern part of Praia bay, in the "Gamboa" area (PRAIA CITY COUNCIL 2016; 2016a).

The population built more than 70% of their residential districts without proper planning or municipal licenses: 19 of the 31 residential neighborhoods are predominantly unlicensed, and many considered "formal" (planned) city-districts have illegal

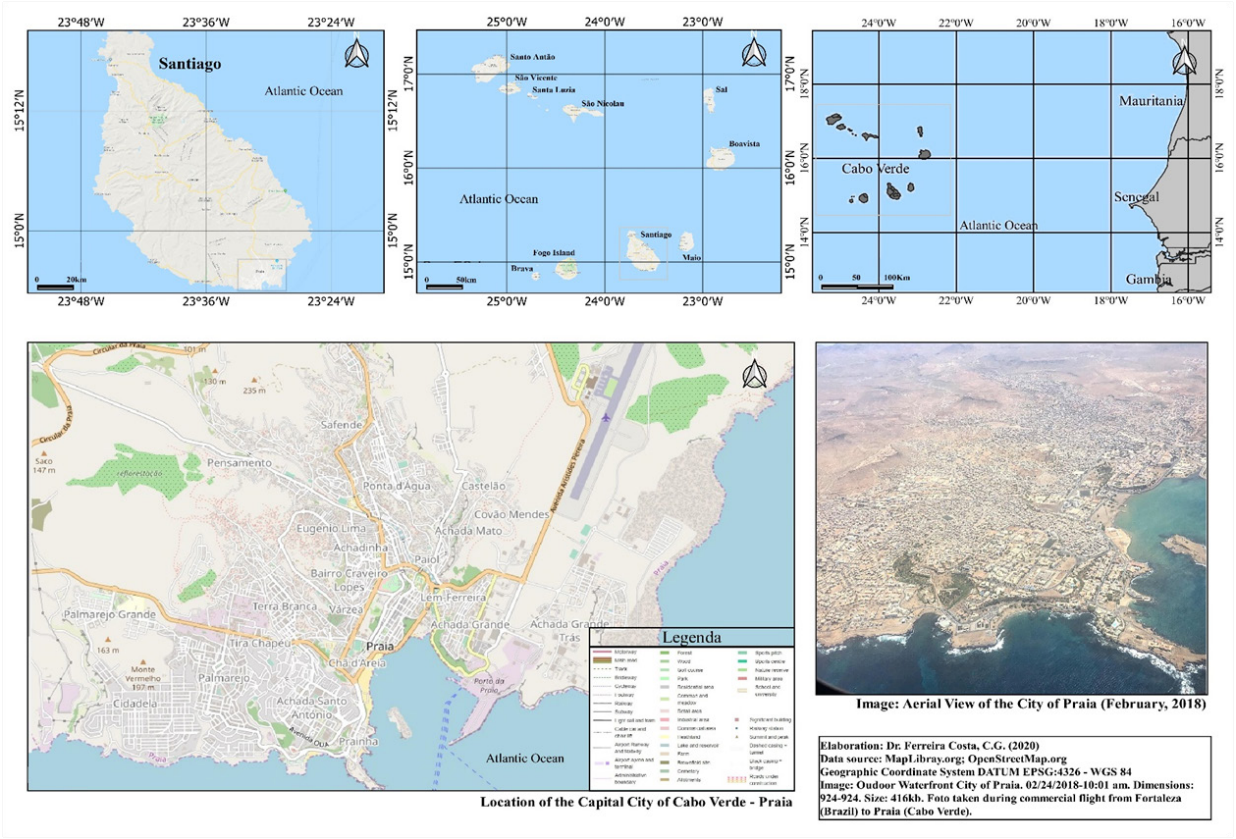

Figure 1. The city of Praia, on the island of Santiago, the capital of Cabo Verde. Software: QGIS-3.4.4-Madeira (2020). Res.:600x600. 7015x4960 pixels.

housing patches. The traditional rectangular grid of the "Plateau" (introduced during the Portuguese administration) was never implemented in many other areas. The new sprawling areas have an irregular shape (with a very differentiated urban occupation composition, street orientation, and width), determined by the space available between the buildings. Another common urban property of the city of Praia is the scarcity of green spaces. The environmental comfort in those areas is affected by the impoverishment of the air quality and thermal conditions in indoor and outdoor spaces (Lopes *et al.*, 2014).

Even though the city counts with a Basic Law of Spatial Planning and Urban Planning (LBOTPU, in Portuguese), oriented by the Legislative Decree No. 1/2006, with changes introduced by Legislative Decree No. 6/2010, which defined the Municipal Master Plan (PDM, for its acronym in Portuguese) as the planning (and management) instrument that governs the spatial organization of the entire municipal territory (PDM, 2016, PRAIA CITY COUNCIL, 2016). And the Ordinance No. 35/2016 (Text C in SI-III), which ratified the Land Use Master Plan of Praia (Text D in SI-IV) (PRAIA CITY COUNCIL, 2016a; MIOTH, 2016). Praia's municipality did not have a risk mapping. A problem that the International Project Preparedness for Disaster Recovery aimed to tackle, which adopted the municipality of Praia, as well as Mosteiros and Ribeira Brava as the Pilot sites to draw up an urban risk mapping and assessment (PRAIA CITY COUNCIL, 2016; 2016a; MIOTH, 2016).

Nevertheless, the Spatial Planning and Urban Planning (LBOTPU) identified the most problematic areas and points according to geological, geomorphologic, and hydrological risk areas in the municipality of Praia. The main environmental risks/hazards to which the municipality of Praia is subject are the following: (i) Drought and desertification; (ii) Floods; (iii) Mass movements in slopes (Landslides); (iv) Coastal erosion; and, (v) Sewage Pollution (Figure 2) (Praia City, 2016; 2016a).

2.2. Data and Methodology

It is a qualitative analysis based on Caboverdian government and administrative data regarding Disaster Risk Management (DRM) policy implementation, supported by third-party reports, such

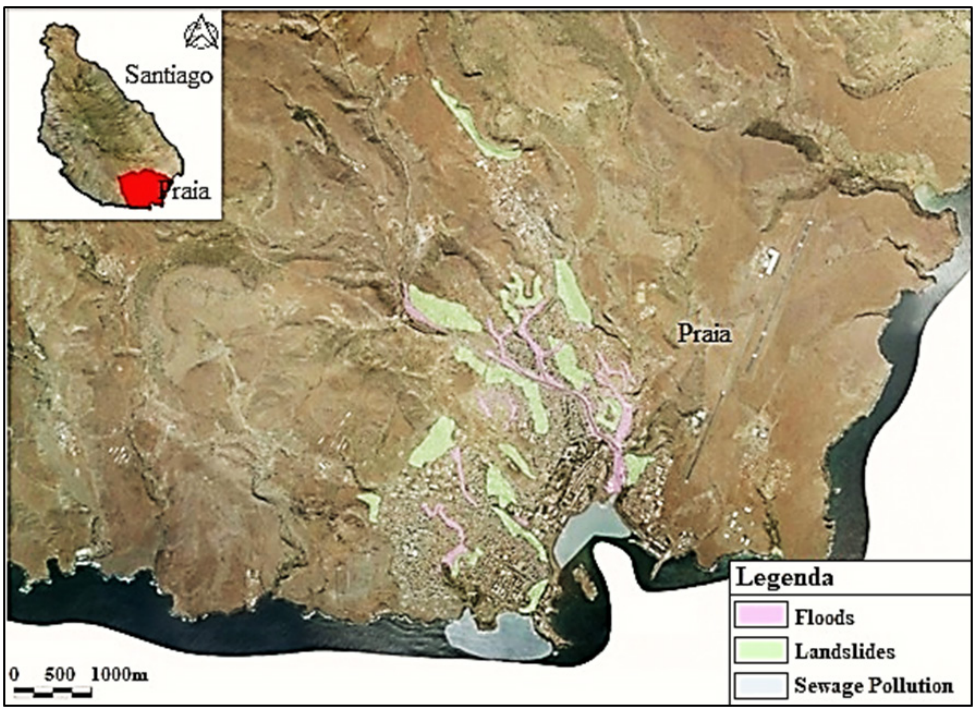

Figure 2. Areas Susceptible to Environmental Risks in the City of Praia. Source: Adapted from Praia City Council, (2016).

as case studies, audit reports, or development agency statistics, and in this way can be understood as "evidence-based" assessment for the design of a local Roadmap for Disaster Risk Management Planning for coastal cities. This study's efforts tend to be confined within the municipality of Praia, in Cabo Verde. However, as a mid-Atlantic coastal capital city in a Small Island Developing State (SIDS) located in West Africa, the findings can easily be incorporated in similar contexts.

It seeks to provide specific data on disaster management at the local level, according to the United Nations Disaster Risk Reduction (UNDRR) Ten Essentials (2012) (Text E in SI-V). Consideration of context and research goals helps determine a combination of methods to establish a Roadmap for Disaster Risk Management Planning for coastal cities, designed accordingly to the Ten Essentials of UNDRR. Moreover, the paper uses maps for the best visualization of essential issues. For this, the QGIS software, version 3.3.4-Madeira (2020), was used. The data source for shapefiles utilized was OpenStreetMap.org and MapLibrary.org. The reference system employed was the Geographic Coordinate System DATUM EPSG:4326-WGS84, composed of the aerial view of the city of Praia. General maps of the Cabo Verde's archipelago location, Santiago's island, and the city of Praia have the goal of facilitating identification and observation of the study area.

The paper is structured around four sections. The first introduces the background and highlights the main characteristics and difficulties encountered in disaster risk management in coastal cities. The second presents the principles, conceptual bases, methodological aspects, and policy structures of the roadmap by discussing the antecedents of relevant international DRM policy frameworks and its repercussions at the country level. In the third section, the paper describes the process of formulating the risk management planning roadmap, in light of previous DRR policy and practice developments. Finally, in the last section, the paper brings comments on the DRM roadmap capacity and consensus needed, regarding requirements, needs, and gaps for legitimacy, urgency, and ability to deliver the expected results drawing main lessons learned and exploring possibilities of application in other coastal cities and low-lying human settlements.

3. RESULTS

3.1. A Roadmap for Disaster Risk Management Planning in Coastal Cities

Formulation and Structure of the Roadmap

Accordingly, the Ten Essentials for Making Cities Resilient guides the roadmap as a vital element along with the review of national DRR and land-use planning legislation. This approach serves the analysis of actions aimed at defining, planning, implementing, coordinating, and controlling public management for disaster risk management in the complex environment of Praia, allowing its replicability in similar contexts (Figure 3).

The formulation and structure of the roadmap seek to integrate multi-level Climate Change Adaptation and Disaster Risk Reduction policies into local design-thinking, decision-making processes and plan implementation processes. It aims to support the governance of DRM policy instruments in coastal cities and low-lying human settlements in Cabo Verde and similar geographies.

3.2. Corporate Governance in Coastal Cities

3.2.1. Organizing for Disaster Resilience Building –Action 1

The ability of the local government to produce risk-informed public policies, decisions, or needed rules and regulations, is a significant indicator of capability (Kusumasari and Alam, 2012; Govindarajulu, 2020; Spaliviero *et al.*, 2020). The dynamic, interrelated, and multidimensional risks and vulnerabilities that exist in urban areas require systemic approaches that seek to understand the nature of interacting systems and adopt governance adapted to the context (Lassa and Sembiring, 2017; Arshad *et al.*, 2020). In this regard, taking these connections into account, See in Table 1, a summary of possible disaster risk governance settings for organizing for disaster resilience in Cabo Verde.

Nonetheless, present and future approaches to managing risks require an understanding of the systemic nature of risk governance and development choices. The inevitability of climate change highlights the greatness of adaptative efforts. Climate change adaptation through land-use planning strategies

Figure 3. City of Praia Disaster Risk Management Planning Roadmap, Built Upon the Ten Essentials. Source: Adapted from UNDRR, 2012.

Table 1. Organizational Settings for Disaster Resilience in Coastal Cities.

Steps	Work Areas/ Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**A permanent disaster risk management office is established in the municipality.**	Make sure the municipality of Praia counts with administrative resources, qualified staff, and infrastructure. Establish a designated office within the city administration to lad a coordination mechanism among departments and other actors.	Designated office within the city administration to lead a coordination mechanism among departments and other actors created. The number of formal protocols to maintain recognition of individual organizations and services (fire department, ambulance services, health services, police, NGOs, and others), increase inter-operability among these units (language, tools, communication). Generate scenarios for coordinated drills.	National and Local Civil Protection, and the Local Government.
2	**DRR is mainstreamed into local government planning and programs in the entire municipality.**	Establish a legislative framework for resilience and Disaster Risk Reduction (DRR). Make sure DRR is a formal and permanent priority within regular planning, governance, and local government programs.	The number of environmental, building, and planning standards as well as bylaws to support risk reduction, anchored in updated risk assessments, are created, and enforced by the government.	The Central and Local Government.
3	**Disaster prevention, preparedness, response, and resilient early recovery is coordinated at the local level.**	Define and review, regularly, the roles and responsibilities of departments and services involved.	The number of regulations for low-income residential areas created/improved, reinforcing safety. The number of regulations for commercial/industrial areas create/improved, reinforcing safety. The number of collaborative strategies to integrate and coordinate all existing units responsible for emergency response, relief, and recovery created and enforced –even if under the jurisdiction of various authorities.	Civil Protection.
4	**A Community-Based DRR approach – considering SIDS´ specificities –is elaborated and implemented at the local level.**	Involve different actors, such as volunteers, NGOs, the academia, the business community –encouraging the involvement of leading community-based organizations and associations as early as possible in this process. Clarify the limits of authority and the roles and responsibilities of actors/ stakeholders/communities.	Establish strategies and actions to increase the number of municipal ordinances that support Disaster Risk Reduction in all sectors (public and private). Increase and support the number of partnerships with local, regional, national, and international research centers, Universities, NGOs, and scientific-technical bodies that can provide data, expertise, research, and resources.	The Local Government/ International and national Partners/ Community.
5	**Residents, private and public institutions, and neighboring government landowners work collectively to reduce risks.**	Coordinate all emergency services within the urban zone. Make sure that citizens take action to improve livelihoods and create defensible spaces along the urban-wide land interface areas. Create alliances and networks beyond the city.	The number of alliances, incorporating a cluster approach among neighboring municipalities, with similar or interdependent risks to: (a) strengthen partnerships; (b) improve decentralized actions; (c) plan for common territorial risks; and, (d) sharable human and technical resources. The number of participants in regional and international for a, and in the Global Campaign "Making Cities Resilient (MCR)" to promote initiatives, exchange experiences, and increase local-regional-national-international cooperation.	The National, Regional, and Local Governments.

increases the resilience to risks, magnifies the economic and social conditions of inhabitants, and safeguards resources for the succeeding generations (Elsharouny, 2016; Ajibade, 2017).

3.2.2. Knowing, Understanding, and Managing Current and Future Risk Scenarios – Action 2

Human activity grows exposure; it increases the propensity for systems reverberations, setting up feedback loops with cascading consequences that are difficult to foresee (WB, 2011; UNDRR, 2019). Moreover, risks and vulnerabilities vary through time and across regions and populations dependent on a myriad of factors. Nonetheless, the concept of "risk" is complex (Satta *et al.*, 2017). While it can be reasonable to classify risks so that responsibility can be assigned, risk management should not be compartmentalized in different silos, organizations, institutions, or individuals for proper risk management (UNDRR, 2019).

With this in mind, understanding vulnerability and risks, establishing planning frameworks, and stepping up to prevent crisis and disasters is fundamental for coastal cities, especially for cities like Praia, including the place-born knowledge and cultural aspects of local populations. Ranging from the extent of adaptation and mitigation; and, especially, keeping close correlation with development and political choices, potentially linked to severe climate change impacts relevant to Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC), which refers to "dangerous anthropogenic interference with the climate system" (IPCC, 2014).

In the city of Praia, DRR data availability and its quality are steadily improving (GoCV/MAHOT, 2013). However, the realm of statistical capacity-building should be more welcoming to accommodate collaboration and synergies across increasingly complex data systems, supporting the International Community and participation of local populations. Data collection is, in this regard, often fragmented, non-universal, incommensurable, and biased. In this regard, Table 2 proposes a route to ensure the necessary technical support and the identification of capacities

and resources to involve stakeholders in establishing broader geographical information and monitoring systems.

There are examples of actions that attempt to solve these problems, designed at initial stages targeting data collection and the creation of management tools to gather data and information to assess the quality, completeness, and format of existing data to systematize and use of a spatial database (GoCV/MAHOT, 2013; GoCV, 2017). Even though these actions are still limited in scope and territorial coverage in Cabo Verde; the understanding of the local limitations, give us orientation on the feasibility of establishing new strategies, expanding existing actions, and plan accordingly to real circumstances to integrate further developments (UNDP, 2017). Bridging this gap to build resilience requires new decision-support tools that can operate on data that is not comprehensive but good enough (Spaliviero *et al.*, 2020).

Table 2. Essential Steps to Ensure the Identification, Understanding, and Precise Use of Current and Future Risk Scenarios in Coastal Cities.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**Risk, Capacity, and Vulnerability (physical and socio-economic assessments) are conducted to fill knowledge gaps, identifying hazards, exposures, and vulnerabilities in –at least –the "most probable" and "most severe" (worst-case) scenarios, considering the specificities of the urban settlements.**	Led by appropriate city departments, prepare comprehensive risk, capacity, and vulnerability assessments, as well as risk and vulnerability mapping, integrating loss and damage scenarios, considering climate change impacts, driven by technical expertise available through participant institutions. Make sure to consult and involve local stakeholders. Enlist, as necessary, technical support from national, regional, and international experts. Determine the degree of vulnerability (physical and socioeconomic) as well as the degree of exposure to hazards of the population, development actors, infrastructure, and planned and ongoing city-level projects. Map, inform, sensitize, and awareness raise populations at high-risk areas. Identify the capacities and resources institutionally available, at the city as well at the district level. Undertake baseline studies.	The number of comprehensive risks, capacity, and vulnerability assessments, as well as risk and vulnerability maps created including "damage and loss" scenarios. The number of training and capacity building activities undertaken. The number of PDNAs and p-DRP trainings and workshops undertaken. Creation of a roster of technical experts (local, regional, national, and international). Creation of a local-level committee to consult and include local stakeholders in the DRR decision-making process. The number of detailed urban risk assessments undertaken.	National, Regional, and Local governments, and the civil protection.
2	**A risk and vulnerability (physical and socioeconomic) database is built, including emerging hazards, exposures, and vulnerabilities in –at least – the 'most severe" (worst-case) scenarios.**	Prepare and maintain an updated database of disaster losses from past events and current potential hazards at the local level. Map the nature, local, intensity and establish the probability of hazards (including natural, human-made, and technological aspects). Update the risk, capacity, and vulnerability assessments, preferably annually. Make sure the data collected, and the DRR information generated is shared among interested counterparts (e.g., government institutions), to support evidence based DRR policymaking.	The establishment of an updated database of disasters, including damage and loss, from past events and current potential hazards, at the local level. Map the natures, local, intensity, and probability of events/hazards. The number of capacity and vulnerability assessments updated. Creation of communication channels among interested counterparts and stakeholders, with clear role and authority definition, for improved DRR decision-making and action, at the local level.	Civil protection, Local governments and institutions.
3	**A DRR Master Plan is developed.**	Identify corrective actions and plans to reduce risks, vulnerability, and exposure. Prioritize actions based on technical analysis according to the Urban Development Plan, land-use zoning (when available), private investment decisions, and worst-case scenarios (or related information) for emergency preparedness, planning, and simulations. Update the DRR Master Plan –Preferably every three (3) years.	The number of corrective actions and plans to reduce risks, exposure, and vulnerability created and implemented. The number of actions based on the analysis of the urban planning, land-use zoning, private investment decision, and worst-case scenarios (or related information), for emergency preparedness, planning, and simulation implemented. Existence of an updated DRR Master Plan at the local level.	Local civil protection, the Local governments, and Institutions.
4	**An Early Warning System (EWS) is designed**	Design a city-wide geographic information and monitoring system. Create geographic information and monitoring systems that include input data from –is accessible to –all interested actors/stakeholders, including the civil society, the productive sector (for example agriculture, commerce, and tourism, among others), and the scientific and technical community. Maintain outputs in the city´s Geographic Information System (GIS).	Creation of a city-wide Geographic Information and Monitoring System. The numbers of DRR decision-making and actions undertaken, fed with updated information from the local GIS.	National and Local Civil protection, and the National, Regional, and Local governments. Research Institutions and Universities (Local, National, and International).

Table 2. Essential Steps to Ensure the Identification, Understanding, and Precise Use of Current and Future Risk Scenarios in Coastal Cities (continuation).

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
5	**Risk Reduction measures and Awareness Campaigns are established.**	Encourage public and private sector participation in developing awareness campaigns and information that promote resilience building and improved DRR actions among the general public, homeowners, education and health workers industry, real estate developers, and others. Make the DRR information available to the public through websites, smartphone applications and other channels of communication and information. Make sure the information available to other public and private institutions, commerce, and industry through pre-established cooperation agreements, and communication channels.	The number of awareness campaigns and information that promote resilience building and improve DRR actions implemented. The number of formal communication and information channels targeting the general public, created. The number of formal communication and information channels targeting public and private institutions, commerce and industry created. The percentage of the local finance dedicated to the implementation of DRR actions (according to the Ten Essentials Framework, and Government planning). The number od risk reduction measures integrated into the local planning and in the local government budgeting. An exclusive –and professionally managed, with sufficient resources –budget for DRR actions, emergency response, communications, Early Warning Systems, and Risk/Exposure/Vulnerability/Capacity Assessments, created.	The National and Local governments.

3.2.3. Strengthening Financial Capacity for Resilience – Action 3

Increased losses and loss variability in various regions are to become more severe and frequent due to extreme weather events and hazard types, challenging public and private insurance schemes regarding their capacity to deliver affordable coverage while raising more risk-based capital, particularly in developing countries (WB, 2011; IPCC, 2014). In the city of Praia, national and local authorities consider risk management actions following the initial implementation of Urban Risk Assessments (URA). Such DRR practices are also informed through the evidence provided by Cost-Benefit Analysis (CBA), Cost-Effectiveness Analysis (CEA), based on the effectiveness and efficiency of improved DRM management (UNDP, 2017). Moreover, the ongoing policy reforms taking place in Cabo Verde stress the value of operations aimed at increasing long-term resilience to, and the ability to, recover from the adverse impacts of disasters, thereby helping support the sustainability of the government's development program and national and local efforts to eliminate extreme poverty and boost shared prosperity (Ferreira Costa, 2020). Table 3 emphasizes viable solutions to prioritize the integration of DRR and CCA, institutionalizing climate-resilient recovery efforts.

In this regard, The World Bank is supporting government policy areas aligned with the creation of resilience to climate change, (WB, 2018a), following the national Sustainable Development Strategic Plan 2017-2021, and strengthening the Disaster Risk Management (DRM) and Climate Change Adaptation (CCA) agenda through the Development of the Cabo Verde's National Disaster Risk Reduction Strategy, aimed at building its institutional capacity and improving coordination among stakeholders to behave adequately in the aftereffect of a natural or human-made catastrophe (UNDRR, 2017a, 2019a; GoCV, 2018).

Therefore, it is crucial to confront financial and institutional bottlenecks to invest in critical infrastructure to enhance urban resilience best suited for the types of climate risks we foresee in the coming years (Govindaranjulu, 2020). Countries and municipalities need to be aware of institutionally and financially constraints and become technically prepared to support public-private risk reduction initiatives to guarantee economic and fiscal resilience and reinforce sustainable adaptative processes.

3.3. Integrating Planning in Coastal Cities

3.3.1. Pursuing Resilient Urban Development and Design – Action 4

The actions to build healthier communities in Cabo Verde, especially in Praia, date back to 2009. The Central and Local Government authorities started the dialogues and established a partnership with UN-HABITAT (2015) on the implementation of the New Urban Agenda in the country and to identify the priority areas for cooperation, based on a roadmap for the elaboration of an urbanization program for the country, with five main components concerning the discussion of national urban policy; Improvement of informal settlements, urban resilience and capacity building; Implementation of the city prosperity index and finally the urban citizenship campaigns component. Especially outlining some strategies for future joint intervention in the framework of the Participatory Slum Upgrade Programme (UN-HABITAT, 2017). In the viewing of these advancements, a few years later (2017), the government started to conduct a pilot initiative on Detailed Urban Risk Assessments (DURA), in three municipalities –Praia, Mosteiros, and Ribeira Brava (UNDP, 2017). The DURA pilot program's overall purpose was

Table 3. Steps to Strengthen the Financial Capacity in Coastal Cities.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**A Local-level budget for DRR is established.**	Provide dedicated resources from service charges, taxes, fees, incentives, fines, and municipal bonds to ensure that DRR decision-making and actions are carried out at the local level. Integrate Risk Reduction measures into the local government budget to increase the resilience building of the city´s economy, natural, and human-made ecosystems, environment, and infrastructure (i.e., schools, hospitals, critical assets, water supply, drainage, and solid waste management, among others). Provide support for a municipal budget to maintain well-trained and equipped emergency response personnel and services, communications, Early Waring Systems, and Risk/Exposure/Vulnerability/Capacity assessments. Develop long-term capital investments to retrofit and replace the most critical emergency lifelines.	The percentage of local finance dedicated to the implementation of DRR decision-making processes and actions, according to the Ten Essentials Framework and national and local government planning, based on fiscal and budgetary situation. The number of risk reduction measures integrated into the local government budget to increase resilience building. Exclusive budget for emergency response, communication, Early Warming Systems, and Risk/Exposure/Vulnerability/Capacity assessments created.	Local government, Local civil protection, local institutions, and the civil society.
2	**Incentives for Risk Reduction are in place, addressing the private sector, local governments institutions, and the civil society.**	Provide incentives for the construction of safe housing and infrastructure for new houses/buildings, local business, government institutions, with a focus on disaster resilience and risk reduction.	The number and quality of fiscal incentives established for the construction of safe housing and infrastructure focusing on disaster resilience, risk reduction, strengthening, and retrofitting vulnerable and essential infrastructures.	The local government, commerce, industry, and the civil society.
3	**Penalties for low-risk reduction actions are in place, addressing the private sector, government institutions, and the civil society.**	Support safer standards by providing DRR information, options, and subsidized actions in high-risk areas. Encourage and incentivize local business and residents, financial institutions, government institutions, and insurance companies to reduce the cost of more sustainable building supplies and support low-income communities with micro-insurance, savings, and credit schemes. Consider differentiated penalties and sanctions for those –among the private sector, government institutions, and the civil society –who increase risks, exposure, vulnerability, and environmental degradation, by law. Give differentiated public recognition and awards for those –sector, private and public institutions, and the civil society –who take proactive action to reduce risks, exposure, vulnerability, and environmental degradation, by law, as well as promote good city practices that reduce risks and vulnerability to hazards.	The number of design options and subsidized actions in high-risk areas provided by the local government. Creation of a local-level program to reduce the costs of more sustainable building supplies. Support to low-income communities with micro-insurance, savings, and credit schemes. The numbers of functional environmental and DRR legislation and norms addressing penalties and sanctions for those who increase risks, exposure, vulnerability, and environmental degradation. Creation of a local level public recognition system and awards to good city practices that reduce risks, exposure, vulnerability, and environmental degradation.	The civil protection, and the local government and institutions.

to generate evidence on physical risks and socioeconomic vulnerability of at-risk-population to foster improved practices to allow risk-informed development as part of a national-led program to promote urban resilience in Cabo Verde. The main objectives sought to: (i) identify the physical vulnerabilities of buildings, critical facilities, and public infrastructure; (ii) to build a comprehensive Urban Risk Profile and Risk Management Portfolio and urban Development and disaster risk management; (iii) to inform and inspire revision of existing land-use planning by incorporating updated information and data regarding hazard mapping and results from these pilot initiatives in urban risk assessments; and finally, to develop national and local authority and capability to conduct detailed urban risk assessments integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) elements into local level planning and management.

These Urban Risk Assessments were part of the preparedness for a resilient recovery project to inform the development of disaster scenarios necessary for recovery planning processes, necessarily, to understand the types and scales of disaster events these municipalities need to prepare for –institutionally and financially (Table 4).

3.3.2. Safeguarding Natural Buffers to Heighten the Protective Functions Offered by Natural Ecosystems – Action 5

Climate change amplifies existing climate-related risks and creates new risks for natural and human systems. Many of these risks are no longer limited to a sector or region, and, usually, they present cascading effects (IPCC, 2014; Pérez-Hernández *et al.*, 2020). Notwithstanding, in the long run, countries and cities must re-shape the physical, economic, political, and socio-cultural risk scale (Ajibade, 2017), since risk reduction processes have multiple connections with environmental degradation, ill-adaptation, and poverty (Arshad *et al.*, 2020). Policy and decision-making processes, yet, fall short of taking these connections into account (Ferreira Costa, 2013). Table 5 summarizes actions to enhance the protective functions of natural ecosystems.

Table 4. Steps to Pursue Resilient Urban Development and Design.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**Strengthen critical infrastructure keeping them operating and functional before, during, and after the occurrence of events.**	Establish and implement DRR plans, programs, and actions to maintain the structural and physical resilience and robustness of essential infrastructure. Assess disaster risk in schools and hospitals and strengthen/retrofit those most vulnerable. Collect and assess data on the physical vulnerability of education and health facilities in disaster-prone areas. Assess and ensure compliance of key infrastructure, respecting safety standards, when deciding on the location, design, and construction of all new infrastructure. Create a DRR action plan to assess and reduce vulnerability and risks in existing critical infrastructure, such as roads, and communications, by selecting and retrofitting the most critical (and vulnerable) infrastructure and incorporating stringent maintenance and repair programs. Generate more comprehensive DRR action and more human resources by encouraging surveyors, engineers, and other built environment professionals, the private sector, and communities to participate in critical risk reduction planning and policy implementation at the local level.	The number of action plans and programs implemented to maintain the structural and physical resilience and robustness of the main infrastructure. The number of assessments addressing the geographical location and capacity requirements of new infrastructure. The number of assessments addressing DRR issues in education and health facilities and retrofitting the most vulnerable. The number of data collection activities concerning the physical vulnerability of schools and health facilities in disaster-prone areas. The number of assessments of compliance with safety standards concerning the location, design, and construction of new infrastructure. Existence of a DRR action plan to assess and reduce vulnerability and risks in existing crucial infrastructure. The number of retrofitting and stringent maintenance and repair, which are undertaken in critical infrastructure. The number of DRR actions and the volume of huma resources participating/addressing critical DRR decision-making and policy implementation at the local level.	The Local government and the Private Sector.
2	**Protect critical infrastructure, recognizing the relevance of priority services and operations before, during, and after events.**	Improve the safety of public health and education facilities that have crucial/complementary roles in emergency response and recovery. Plan for business continuity to ensure that lifelines and services are quickly restored. Strengthen –and financially motivate –private educational and health facilities that can contribute relief efforts and provide complementary services in the emergency and recovery phases. Increase the number of private institutions that become partners of the local government to deliver emergency relief, Early Recovery actions, and DRR implementation.	The number of public and private health and educational facilities that support emergency response, early recovery, and DRR implementation at the local level. Existence of plans/agreements to ensure quick restoration of lifelines and critical services. The number of financial incentives to motivate private sectors to support emergency response and recovery. The number of private institutions that are official partners of the local government.	The Local government and the Private Sector.

Table 5. Steps to Safeguard Natural Buffers to Enhance the Protective Functions Offered by Natural Ecosystems.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**Develop, Implement, Revise, and update the local´s Urban Development Plan, Land-Use zoning, and investments decisions based on worst-case scenarios risk, capacity, physical and socioeconomic vulnerability assessments.**	Incorporate DRR and CCA into the local´s Urban Land Use Planning process and sectoral regulations, based on updated risk assessments. Incorporate peripheral land around urban developments and the rural and natural environments in the land-use planning. Create plans to prevent control human settlements in high-risk areas, and integrate risks, exposure, and vulnerability in existing urban and peri-urban settlements. Prescribe restrictions on building type, use, occupancy, and density-based in watershed basins. Establish and spread-out the location of natural buffers, critical infrastructure, evacuation routes and shelters, emergency services, and lifelines. Establish and spread-out escape routes, and routes for the delivery of relief supplies. Maintain and updated inventory of land-use classification and vulnerability, and urban distribution and buildings database to monitor human settlement developments in hazard-prone areas.	The number of sectoral regulations and land-use plans incorporating DRR and CCA at the local level. The number of studies incorporating peri-urban issues into the city´s land-use pan. The number of plans created and implemented to control and limit urban expansion in high-risk and natural (buffer) areas. The number of restrictions on building types, uses, occupancy, and density in the covered areas. The number of critical infrastructures, evacuation routes and shelters, emergency services, and lifelines services available in the covered areas. Previous identification and location of escape routes, and routes for the delivery of relief supplies. Existence of an updated inventory of land-use classifications and vulnerability, and urban distribution and buildings database to monitor human settlement developments in hazard-prone areas.	National and local civil protection, and the national, regional, and local governments. Research institutions and Universities (Local, national, and international). The private sector, commerce, industry, among others.

3.3.3. Strengthening Institutional Capacity for Resilience – Action 6

The literature emphasizes the significance of national and local governments in agreeing and complying with standards and in managing the implementation of disaster risk reduction initiatives (Prabhakar *et al.*, 2008; WB, 2011; Kusumasari and Alam, 2012; Ferreira Costa, 2020; Spaliviero *et al.*, 2020). Community-Based Disaster Risk Management (CBDRM) is pivotal in the establishment of such a governance framework. It requires local capacity and a culture of decentralization so that the local community functions within a supportive structure of government and non-government organizations (Chen *et al.*, 2006; Valenzuela *et al.*, 2020; Govidarajulu, 2020). Furthermore, cooperation mechanisms can provide crucial support to local knowledge-sharing and Capacity-building among cities with similar risk profiles and development concerns. The reinforcement of key policy and legal revisions are required to establish all institutional frameworks and implementing context-specific mechanisms to build readiness for resilience (UNDP, 2017). Such frameworks are critical in empowering and including all stakeholders to establish the basis for gender equality and include people and groups more exposed and more vulnerable to disaster impacts (UNDRR, 2019a; Ferreira Costa, 2020). Investments in physical infrastructure, especially in the information technology sector, are required to ensure better online reporting and loss accounting at all administrative levels while also building capacities in cartography and geospatial data (GoCV/MAHOT, 2013). Cabo Verde needs to develop the capacity to analyze and use data, mostly because the country, and the municipality of Praia have the means to collect it (Table 6) (GoCV, 2017).

3.3.4. Understanding and Strengthening Societal Capacity for Resilience – Action 7

In the city of Praia awareness-raising, and capacity-building of local institutions on sustainable post-disaster recovery processes have been the central focus of international support. Especially by the conduction of workshops on Post-Disaster Needs Assessments (PDNA) and Pre-Disaster Risk Prevention (p-DRP) in all the 22 municipalities of the country (UNDP, 2017). Urban adaptation benefits from effective multi-level urban risk governance, alignment of policies and incentives, strengthened local government and community adaptation capacity, synergies with the private sector, and appropriate financing and institutional development (Table 7). Under these participatory processes, municipal staff and local experts learned how to analyze unsafe and vulnerable circumstances, find alternatives to resolve dilemmas, elaborate procedures for risk reduction, and set organizations to implement disaster management tasks (UNDRR, 2017). However, reducing fundamental service deficits, improving housing, and building resilient infrastructure systems could significantly reduce vulnerability and exposure in urban areas. It would require a broader and long-term strategy (Chen *et al.*, 2006; Valenzuela *et al.*, 2020). In this regard, increased capacity, voice, and influence of low-income and vulnerable communities and their partnerships with local governments also benefit adaptation (IPCC, 2014).

3.3.5. Increasing Infrastructure Resilience – Action 8

Many global risks related to climate change find coastal urban areas as its main sites (Satta *et al.*, 2017), mostly in the developing world (WB, 2011; Spaliviero *et al.*, 2020). Steps that build local resilience and enable urban and peri-urban sustainable development can accelerate successful climate-change adaptation globally (IPCC, 2014; Boulos, 2016). In Cabo Verde, the ACP-EU Natural Disaster Risk Reduction (NDRR) Program (2019-2020) is promoting an innovative project which aims to encourage the planning capacity of the Ministry of Education to secure the quality of interventions to school infrastructure, and to reduce exposure to natural hazards (GFDRR, 2017). The activities include: (i) an update of existing information on school infrastructure at the national level; (ii) the identification of schools exposed to different natural and climate hazards, taking into account existing disaster and climate risk information; (iii) identifying new priority interventions; (iv) a diagnostic of the construction technologies applied in Cabo Verde's schools and of relevant technical regulations; and, (v) capacity building to monitor the implementation of interventions in schools (Table 8).

3.4. Response Planning in Coastal Cities

3.4.1. Ensuring Effective Disaster Response – Action 9

Designing effective interventions requires an understanding of context (Table 9). Moreover, the needs of the population must be put in the center of these interventions, having the goal of establishing a fairer, inclusive, and equitable system, underpinned by the multidimensional understanding of vulnerability to address poverty and multidimensional inequalities (IPCC, 2014; UNDRR, 2017a). On this matter, the existing DRR national strategy complies with and respects all the basic principles and provisions of the Constitution and fundamental laws of the Republic of Cabo Verde, and the Sendai Framework, aligned with international, national, and local initiatives and projects to promote sustainable development, climate resilience, and risk reduction (GoCV/MEA, 2007; GoCV/MAHOT, 2013; PRAIA CITY COUNCIL, 2016a; GoCV, 2017; UNDRR, 2017a).

Table 6. Steps to Strengthen Institutional Capacity for Resilience.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**Enforcement of, and compliance with, risk-sensitive building codes and regulations in urban and peri-urban areas.**	Ensure that national and local laws and regulations include building codes that set standards for location, design, and construction to minimize disasters. Strengthen the local capacity building of residents to increase4 public awareness, using motivational and fiscal means to increase compliance. Ensure adequate clarity about the differences in building regulations for critical public and private infrastructures, engineered buildings, and more accessible and straightforward guidelines for smaller non-engineered constructions.	The number of local laws and regulations that include building codes, standards for locations, design, and construction guidelines. The number of actions to strengthen local capacity building. The number of building regulations addressing the specificities od different buildings.	The national and local governments, the national and local civil protection, the private sector, and the civil society.

Table 7. Steps to Understand and Strengthen Societal Capacity for Resilience.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**Disaster Risk Reduction is integrated into all levels of formal education at the local level.**	Work collaboratively with educational authorities and personnel, private and public institutions, to advocate for and include DRR at all levels of the school curriculum, and in all public and private institutions. Seek the necessary technical support for curriculum development from related institutional agencies. Collect and learn from past experiences, locally and abroad.	The number of school curriculums, at all levels, addressing DRR information and issues. The number od technical support provided for DRR curriculum development and proper re-alignment. The number of lessons learned exercises undertaken and disseminated.	The national, regional, and local governments, public and private sectors, public and private health and educational actors, research centers and universities, the national and local civil protection, as well the civil society.
2	**Awareness of the impacts of environmental and climate change, as well as degradation of ecosystems and biodiversity loss, influencing disaster risk and impacts, is raised at the local level.**	Recognize and communicate the multiple functions and services that protected ecosystems provided to a city, including protection from natural hazards and mitigation to climate change, to strengthen societal capacity for resilience. Increase public education and sensibilization about the negative consequences of human-made climate change and biodiversity loss.	The number od actions to recognize and communicate the function sod environmental services to strengthen societal capacity for resilience. The number of educational actions to raise awareness of human-made climate change and biodiversity loss.	
3	**Tabletop exercises and periodic drills are developed at the local level. These exercises are informed by updated local DRR data and information**	Carry out tabletop simulation exercises in key sectors (education, health, communications, among others), in which local actors evaluate a community, institution, or agency´s capacity and ability to respond and execute one or more parts of an emergency preparedness plan. Conduct exercises on a regular basis to test complex responses an evaluate plans, policies, and procedures. Stimulate the involvement of a wide range of organizations, including fire, law enforcement, emergency management and, when necessary, other agencies such as local public health, public safety, the Red Cross, and related NGOs.	The number of tabletop simulation exercises in key sectors undertaken. The number of weaknesses and resource gaps found in the DRR decision-making and implementation processes, and actions, at the local level. The number of actors involved and the level of engagement in the DRR process at the local level.	

Table 8. Steps to Increase Infrastructure Resilience.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**Protect critical infrastructure in urban and peri-urban areas**	Assess the risk, vulnerability, and exposure of infrastructures to natural and human-made hazards (if and when relevant). Undertake measures to prevent infrastructure damage and loss. Establish a plan for business continuity to ensure that lifelines and services are quickly restored. Develop special programs to protect historic buildings, landscape, and local cultural heritage.	The number of infrastructures at risk, in a vulnerable situation, and exposed to hazards assessed. The number of measures to prevent infrastructure, historic buildings, landscape, and local cultural heritage sites to be damaged or lost. The existence of an updated plan for business continuity implemented. The existence of special programs to protect the historic city center and buildings, landscapes, and local heritage sites implemented.	The national, regional, and the local governments; The national and local civil protection; the private sector, and the civil society.
2	**Develop resilient new infrastructure at the local level**	Establish minimum criteria and standards of resilience and safety, as part of the urban and peri-urban design. Promote actions to support and incentivize the private sector to invest, design, and construct new sustainable infrastructure in appropriate locations, and to higher standards of hazard and climate resilience. Create and implement strategies to support private companies, industries, commerce, and government institutions to function effectively during and after emergencies and disasters. Conduct assessments to prioritize maintenance improvements and repair programmes. Conduct assessments to prioritize retrofitting, capacity redesign, demolition, or replacement of damage, lost, or obsolete infrastructure. Implement activities to discourage occupation of building in as state of disrepair or obsolete, to avoid jeopardizing human and environmental safety. Demolish at-risk infrastructure if the infrastructure has no cultural or historical values, and that cannot be repaired.	The existence of minimum criteria, rules, and standards of resilience as part of urban design. The number of investments, valuation, design, and construction of new sustainable infrastructure by the private sector. The number of strategies to support private companies, industries, commerce, and government institutions to function during emergencies created and implemented. The number of assessments concerning repair programs. The number of assessments addressing retrofitting, capacity redesign, demolition, or replacement of damaged, lost, or obsolete infrastructure and buildings. The number of preventive measures addressing damaged, lost, and obsolete infrastructures and buildings. The number of activities implemented to discourage irregular occupation of areas, infrastructures, and buildings. The number of at-risk infrastructures and buildings demolished.	The local government, the private sector, and the civil society.

Functional and technical capacities act as significant factors for disaster risk governance and appear to ensure practical disaster response (UNDRR, 2015a). In this regard, the central Government of Cabo Verde established its National Disaster Risk Reduction framework to enforce a series of national instruments and policies relevant to the implementation of the various elements and dimensions of Disaster Risk Reduction nationwide (Ferreira Costa, 2020).

In this regard, according to the Resolution No. 115/2018, approving the Post Disaster Recovery Framework (QRP), the National Disaster Risk Reduction is interconnected and supported by other national policies, plans, and national legislation relevant to disaster risk reduction (GoCV, 2018; 2018a; 2019). Moreover, the policy provides a framework for the systematic and cross-cutting integration of disaster risk reduction into national and sectoral policies and plans (UNDP, 2016; 2017; UNDRR, 2015; 2017a; Lassa and Sembiring, 2017; GoCV, 2018; 2018a; Ferreira Costa and Holanda, 2019; Ferreira Costa, 2020). All related to decentralization, development, and local governance, signing the government's commitment to the combination of disaster risk reduction and adaptation to climate change in a coherent way

Table 9. Steps to Ensure Effective Disaster Response.

Steps	Work Areas/ Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**City-wide disaster safety initiatives are established.**	Remember the anniversary of locally memorable disasters with a "disaster safety day". Establish a memorial in the city, and organize a small exhibition/disaster museum, to preserve the memory of the impact of disasters. Participate in the International Day for Disaster Reduction, celebrated each year on 13th October, and in other related events, such as the World Meteorological Day, World Health Day, World Habitat Day, events commemorating major national disasters.	Establish, by Law, a Disaster Safety Day, in the work calendar of the municipality, on the date of 13th October. Establish and fund a DRR memorial and/or museum.	The local government, and the private and public sectors.
2	**Recovery is part of disaster reduction planning and public policies at the local level.**	Consider recovery and reconstruction 9Build Back Better) as an opportunity for risk reduction and sustainable development. Identify and establish the need for resources as well as it amounts. Plan accordingly to secured resources (human, technical, financial).	The number of actions and mechanisms to ensure green recovery as an integral part of urban and peri-urban sustainable development processes.	The local government.
3	**Include the vulnerable populations, as well as the affected populations in the definition of needs and barriers.**	I all phases of the reconstruction process, please focus on the needs of survivors and affected populations. Promote the participation of these populations in the decision-making processes about the design and execution of actions that guarantee climate-resilient pathways and sustainability. Always consider the concepts of Build Back Better. Ensure that actions and programs include counseling to support prompt economical and productive recovery in the aftermath of an event.	The number of mechanisms including and promoting the needs and barriers perceived by vulnerable and affected populations. The number of activities carried out that enable the local government, the local economy, and the society to return to a better state, based on Build Back Better concepts. The number of counseling centers to help the private sector and citizens to recovery from disaster events.	The local government, the civil protection, and the civil society.
4	**The concept of "Build Back Better" is implemented in the urban- and peri-urban development processes at the local level.**	Evaluate the local development/strategic plan, applying Disaster Risk Reduction criteria as a cross-cutting measure. Formulate programs and projects as needed, strengthening activities that lead to climate-resilient pathways. Define mechanisms, Laws, and norms to reinforce Institutional and Political Early Recovery Frameworks at the local level. Create and strengthen local capacities –with an emphasis on DRR –developing local knowledge and resources applying historical knowledge. During the recovery process, avoid overlooking the protection of natural resources, biodiversity, and cultural values. Focus your attention on the people and their needs. Pay special attention to transitional shelters, ensuring that they are safe, resilient, and compliant with regulations, taking priority action to avoid them to become permanent slums.	The number of mechanisms applying Disaster Risk reduction criteria as a cross-cutting measure in development/strategic planning. The number of programs and projects formulated to strengthen activities that lead to climate-resilient pathways, and green recovery implementation. The number of mechanisms, Laws, and solid institutional and political early green recovery frameworks at the local level. The number f actions to consider the protection of natural resources and cultural values adequately. The number of mechanisms, incentives, and penalties to ensure that transitional shelters are compliant with regulations, and they DO NOT develop into slums.	The national, regional, and local governments.
5	**Resources and alliances that ensure sustainability are strengthened at the local level.**	Prepare a response management strategy to initiate sustainable reconstruction processes based on green recovery concepts. Convene national and international cooperation agencies, business, and partners in potential. Create new, and strengthen existing, partnerships and networks to contribute to green recovery and sustainable reconstruction efforts, looking at ways to create new capacities and take advantage of technical and scientific innovation to reduce future risk and increase resilience, focusing on the establishment of climate-resilient development pathways.	The number of resources e management strategies to initiate green recovery and sustainable reconstruction processes. The number of actions to convene communities in coastal cities and low-lying areas, in the country and in other SIDS, international and national cooperation agencies, NGOs, interested actors, business and other potential partners, around DRR and green recovery concepts driven by climate-resilient development pathways. The number of mechanisms to strengthen existing partnerships and networks, and new ones created to contributed to green recovery, sustainable reconstruction, and better preparedness in SIDS.	The national, regional, and local governments and institutions; the national and local civil protection; Research institutions and Universities (local, national, and international); The private sector, commerce, industry; The civil society, communities in low-lying areas; International and national cooperation agencies, NGOs, interested actors, business, and other potential partners.

in national, sectoral, and local development plans and policies (PDM, 2016; UNDRR, 2017), as adaptation gaps, behavioral barriers, and market failures, hold back effective adaptation requiring coherent policy intervention (Fankhauser, 2017). They concretize the planning integration in instruments such as the Strategic Development Plan for Sustainable Development (PEDS, for its acronym in Portuguese). It lays the foundations for an efficient cross-sectoral and sectoral legal framework for disaster risk reduction to be promoted by critical sectors and partners and promulgated by the Parliament to provide the necessary authority for its implementation (GoCV, 2017; 2018; 2019; UNDRR, 2019a).

3.4.2. Expediting Recovery and Building Back Better – Action 10

A national coordination mechanism for various public agencies and support of the international community and the private sector, mandatory in sectors such as agriculture, water resources, and health is necessary for municipalities in Cabo Verde to expedite recovery and build back better in its coastal areas (Table 10). In this regard, the International Community has been the principal player in recovery processes by funding and supporting the progress and implementation of pre- and post-disaster events frameworks. Moreover, it plays an essential role in developing local capacities to manage, technically and, financially help the country (UNDP, 2017). However, the questions we approach here should not be read as a critique or endorsement of the one-best-way model that seems to persist in development or the idea that international organizations are shaping the government solutions in place (Andrews, 2013). Nevertheless, we certainly add substance to existing studies, giving an evidentiary basis to support those who have raised critiques and fuel the discussion of whether international organizations are over-reaching their mandates providing some leeway for responding to pressures, and for managing shared resources driving a collaborative convergence of processes for DRR and CCA through policies, plans, strategies, and programs (GoCV, 2018; 2019; Mall *et al.*, 2019). It is highly regarded as effective in promoting the reduction of losses and mitigation of risks from natural hazards and climate extremes requiring integrated actions at different levels of governance (Lassa and Sembiring, 2017), as adaptation varies according to the system in which they occur (Smit *et al.*, 2018).

Table 10. Steps to Expedite Recovery and Build Back Better in Coastal Cities.

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
1	**The upgrade of informal urban and peri-urban settlements and the promotion of safe construction of non-engineered buildings and structures strengthened.**	Establish a participatory mechanism to identify and reduce risks city-wide, especially in vulnerable settlements. Increase the number of needs assessments and the identification of barriers to change, regarding building practices. Relocation of informal settlements to safer locations and conditions –based on negotiated and agreed-upon participatory decision schemes –, while improving the quality of life, addressing livelihoods needs and patterns, and seeking innovative ways to finance improved services on the new locations. Promote resilient design, safer construction and strengthening of non-engineered buildings and structures, using low-cost techniques, and locally available materials, resources, and solutions. Share know-how built through public campaigns and demonstrations of safer construction techniques.	The number of participatory mechanisms to reduce risks in vulnerable areas in place. The number of needs assessments and barriers identified to support behavioral change regarding building practices. The number of informal communities relocated to safer areas (high-risk/high-price/high-reward). The number and functionality of innovative financial mechanisms based on improved public services in place. The number and functionality of available low-cost techniques to support resilient design and safer construction. The number of workshops and activities to know-how sharing in public campaigns.	The local government, private and public institutions (including educational sectors); the local civil protection; the civil society;
2	**Build local capacities and strengthen public participation in urban and peri-urban planning and land-use;**	Build the technical capacity and competence of local enforcement officials, builders, tradesmen/tradeswomen, and practicing professionals to promote compliance with DRR, environmental plans, norms, regulations, land zoning, building codes, and green recovery efforts to promote/develop innovative plans, technologies, and structures at the local level. Build local citizen awareness to monitor and report unsafe building practices and constructions to improve compliance and safety. Create a special technical task force to conduct independent periodic DRR inspections city-wide.	The number of training, workshops, and capacity building activities to promote compliance with DRR and environmental laws, regulations, norms, land zoning, and building codes. The number of training, workshops, and capacity building activities to raise citizen awareness, monitoring, and reporting or unsafe building practices. Creation of a DRR task force for periodic inspection.	The local government, private and public educational institutions; the local civil protection;
3	**Raise public awareness at the local level.**	Promote and conduct public awareness campaigns on citizen safety and DRR, with messages on local hazards and risks, and the steps the local government is taking to tackle and manage these factors, including the actions to respond to the potential effects of climate change, and green recovery processes. Encourage local citizen groups, schools, the mass media, and the private sector to join/support Global campaigns spreading DRR awareness and related messages.	The number of public awareness campaigns on citizen safety and DRR. The number of local citizens groups supporting Global campaigns at the local level.	The local government, private and public educational institutions; the local civil protection;

Table 10. Steps to Expedite Recovery and Build Back Better in Coastal Cities (continuation).

Steps	Work Areas/Objectives	Actions	Indicators	Institutional Arrangements (Governance)
4	**Develop Risk Reduction training and capacity building at the local level.**	Establish sustained and permanent training programs for critical local government and institutions personnel, in partnership with communities and a variety of actors from the social and economic sectors. Work with local resources such as NGOs, research centers, Universities, and communities. Focus on training priority target groups such as municipal emergency personnel (staff, management, and authorities).	The number of permanent training programs on DRR, in partnership with communities established. The number of partnerships with NGOs, research center, Universities, and communities established. The number of training activities undertaken focusing on target groups. The number of tailored short courses and other trainings addressing and distributing the Global Campaign Handbook and locally created DRR guidance material.	The national and local government; the national and local civil protection; and the civil society.
5	**Strengthen and improve preparedness and prevention at the local level.**	Establish institutional and legislative mechanisms to ensure that emergency and preparedness actions mainstream DRR and Climate Adaptation policy into planning and decision-making at the local level. Prepare, review, and enhance city-wide inter-agency institutional preparedness and response plans, using credible scenarios. Integrate the results of local-level risk analysis into the design of communications and disaster preparedness strategies. Ensure that the local level preparedness plan has effective systems for the delivery of immediate relief and survivor support in partnership with pre-identified local citizen´s organizations.	The number of institutional and legislative mechanisms to ensure that DRR/CCA are mainstreamed into planning and decision-making processes. Creation and implementation of a city-wide inter-agency institutional preparedness response plan. The number of plans and norms integrating the results of local-level risk analysis into the design of communication and disaster preparedness strategies, allowing immediate delivering of relief and survivor support. The number of partnerships with pre-identified citizen organizations established.	The national and local governments; The international community.
6	**An accessible multi-hazard Early Warning System is finally created and operative at the local level.**	Establish an Early Warning System (EWS) and a Disaster Communication System (DCS) that include protective measures and clear evacuation orientation, as part of the preparedness plan. Strengthen local capacity to avoid, or reduce, dependence on external resources and to encourage participation, and local knowledge creation and sharing. Clearly define roles and institutional decision-making and implementation responsibilities for updating risk information and initiate EWS and DCS. Simulate contingency plans to test the effectiveness of proposed responses and public information and education on the reduction of risk exposure.	Creation of an Early Warning System (EWS) and Disaster Communication System (DCS). The number of mechanisms to strengthen local capacity to avoid, or reduce, dependence on external resources, and to encourage population´s engagement in place. The number of established mechanisms that clearly define roles and institutional decision-making responsibility for updating risk information and the initialization of EWS and DCS. The number of contingency simulations undertaken every year –at least one (1) for each key sector/institution.	The national government, the local government; The national and local civil protection; the International community;
7	**Local capacity to plan for green recovery before a disaster strikes is reinforced at the local level.**	Before a disaster event, tackle the challenges of planning and implementing a successful post-disaster recovery, aimed at green recovery, in collaboration with the general public, experts, as well other actors. Build consensus on green recovery goals and strategies, based on critical and updated information to support sustainable recovery efforts aligned to Human Rights and protection of the environment. Define roles and responsibilities, while develop the necessary capacity to manage green recovery implementation efficiently at the local level.	Creation and implementation of a post-disaster framework, considering green recovery, in close collaboration with different actors at the local level. The number of actions and mechanisms to build consensus on green recovery goals and strategies. The number of actions and mechanisms to gather updated and reliable information to support green recovery decisions as well as actions. The number of actions and mechanisms to define new roles and new responsibilities based on new developments at the local level.	The national government, the local government; The national and local civil protection; the International community;

4. DISCUSSION

4.1. Origin and Principles

This roadmap had its origin in the idea that national policy development does not always result in local implementation or policy (Keskitalo *et al.*, 2013). Besides, it addresses environmental issues such as Climate Change Adaptation and Disaster Risk Reduction, and it is based on the need to address knowledge gaps in the newly born Cabo Verde's DRM framework (GoCV, 2017; 2018; 2019). It seeks to capture and present sound local DRR pilot practices, following the UNDRR's Ten Essentials for Making Cities Resilient. The roadmap developed previously seeks, then, to unite, define, plan, inform implementation, and facilitate the monitoring and controlling of public interventions in the field of Disaster Risk Management. Commonly, urban planners seeking to enhance resilience contend with the complexity of interdependent systems. Nonetheless, they usually face severe gaps in data and information. In this context, resilience-building requires new decision-support tools that reinforce local government capacity, attract additional investment, commit to longer-term processes of legislative reform, producing cooperation between communities, local and national governments, and; work across influence dynamics (Spaliviero *et al.*, 2020; Govindarajulu, 2020).

The roadmap advances institutional mechanisms for further implementation of a series of studies to identify and understand physical risks, socioeconomic vulnerability, and exposure at the local level, paying considerable attention to publicly available data sets relevant to assess adaptation and resilience measures. In this regard, a pilot program funded by the Governments of Japan and Luxembourg and UNDP was crucial to address the need for a better understanding of risks and vulnerabilities at the local level (UNDP, 2016; 2017). The roadmap allows the design, development, and implementation of a well-informed and comprehensive DRR planning process, around a negotiable and consensus-building set of policies, well-defined objectives, feasible and realistic risk management projects to support adaptation under the next ten years national development strategy time-frame (UNDRR, 2017a; 2019a). Nonetheless, the implementation of such framework, taking into consideration, territorial development plans, management plans and infrastructure development in coastal cities community turns out to be an intricate task considering the mix of social, socio-economic-natural, and technological risks and their territorial and populational characteristics adversely affected by a changing world (Boulos, 2016; Satta *et al.*, 2017; Valenzuela *et al.*, 2020; Arshad *et al.*, 2020). In this regard, the management scenario defined in the roadmap, in the context of Small Island Developing States (SIDS) addresses the unit of analysis and intervention of a network of international, national, and local actors under conventional and unsustainable processes of occupation and transformation of the territory and population growing (territorial scenario), in close correlation with unsafe land-use change, as critical factors in the understating and reduction of natural disaster risk in the city of Praia. In each reality, human populations have characteristic natural forms, dynamics, and representations of occupation of the territory (Kusumasari and Alam, 2012; WB, 2011; Ferreira Costa and Sá Freira, 2014; Ferreira Costa and Holanda, 2019). Therefore, the differentiated definition and application of public risk management policies are constrained by context-dependent scenarios. In response to such specificity, seeking to influence each one's crucial variables is based on the existing social capital and the associated processes (territorial and socioeconomic) (Medina Do Nascimento, 2009). Moreover, the roadmap aligns with the management efforts described by Ramirez *et al.* (2005), which pays considerable attention to government choices, the environmental and socioeconomic vulnerabilities, and impacts and effects of disasters. In this regard, the conceptual and methodological subdivision facilitates the identification of organizational and administrative application of public risk management strategies and policies to the extent that it explains the chain of generation, accumulation, impact, and risk control within specific contexts, taking into consideration variables that explain the scenario management roadmap in coastal municipalities.

4.2. Recommendations

The proposed Disaster Risk Management planning roadmap encompasses a framework of standards, conventions, processes, terminologies, and guidelines that are admitted as DRR best practices. The paper expects to transcend its conceptual scope by offering instrumental aspects to facilitate the application of DRR best practices in coastal cities and low-lying areas, especially in SIDS. It advocates for the design of adaptative processes understood according to local initiatives, to foresee a possible expression of the growing engagement of different actors in the control and monitoring of risks and vulnerabilities in these areas. To define, plan, implement, coordinate, and control public management for disaster risk management in complex environments, the risk management planning roadmap seeks to facilitate the targeting, identification, and prioritization of public disaster risk management policies in the specific reality of coastal cities.

5. CONCLUSIONS

This paper contributes to the growing knowledge of the institutional framework's role in the facilitation of local adaptation, and design-thinking of urban-development planning processes in coastal cities and low-lying areas. The DRR Roadmap for Coastal Cities described above can be understood as a conceptual tool that facilitates the representation of complex relations of authority, capabilities, and control of resources. Every action identified, along with its indicators and correlated institutional arrangements – agreeing to each of the Ten Essentials - is described as accurately as possible to inform and correlate to ongoing policy developments. It contains and gives form to the overall processes of Disaster Risk Reduction planning that can happen in any urban coastal system and anthropized low-lying areas.

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SUPPLEMENTARY INFORMATION (SI)

SI-I_Text A. Administrative Characterization of the Study Area

Decentralization has been set in the country since 1991 –laws on local governments and local elections and strengthened with the constitutional amendment of 1999. Municipalities are enshrined within the Constitution, as well as deconcentrated State entities (concelhos) sub-municipal entities ("freguesias"), which match to administrative subdivisions of municipal territories. The country is subdivided into 32 "freguesias" according to the Constitution of 1992 (art. 230 and 232).

SI-II_Tex B. Local Level Responsibilities According to Specific Legislation

According to the "Estatuto dos Municipios" (Law 134/IV, 1995), municipal responsibilities include functions closer to the population: municipal planning, sanitation, healthcare, housing, education, road transportation, culture, sports, tourism, municipal police, rural development, among others.

SI-III_Text C. Reference to Official Documentation

Official Bulletin I. Series, No. 56, of October 04, 2016 (MIHOT, 2016).

SI-IV_Text D. Praia's Land Use Master Plan Reference

Despite the history of the beginning of the Land Use Master Plan of Praia (PDMPR, in Portuguese) elaboration process going back to 1994, the document is governed by the application a much later legislation, more specifically under the "hat" LBOTPU (amended by DL No. 6/2010) and RNOTPU (Decree-Law No. 43/2010).

SI-V_Text E. The Application of the UNDRR Ten Essentials (2012)

The Essentials application serves as an enabling tool to establish a baseline measurement regarding the current level of disaster preparedness at the local level, considered accordingly to each Essential. It guides the research to identify priorities for investment and action and track national and local progress in improving disaster resilience. It informs towards optimal resilience and challenges complacency, recalling authorities, and stakeholders that more must be continuously done to guarantee enduring resilience.

ABBREVIATIONS

ACP-EU NDRR –Natural Disaster Risk Reduction Program

CBA – Cost-Benefit Analysis

CBDRM –Community-Based Disaster Risk Management

CCA – Climate Change Adaptation

CEA – Cost-Effectiveness Analysis

DRM – Disaster Risk Management

DRP – Disaster Risk Prevention

DRR –Disaster Risk Reduction

DURA –Detailed Urban Risk Assessments

ENRRD –National Disaster Risk Reduction Strategy

GFDRR –Global Facility for Disaster Reduction and Recovery

GNI – Gross National Income

IPCC – Intergovernmental Panel on Climate Change

LBOTPU – Basic Law of Spatial Planning and Urban Planning

NDS – National Development Strategy

PDM –Municipal Master Plan

PDNA – Post-Disaster Needs Assessment

PEDS – Strategic Development Plan for Sustainable Development

SIDS – Small Island Development State

UDRR –Urban Disaster Risk Reduction

UNDRR – United Nations Office for Disaster Risk Reduction

UNFCCC – United Nations Framework Convention on Climate Change

URA – Urban Risk Assessments