

Assessment of risks relating to climate change within public organizations in the Oriental region of Morocco

Evaluation des risques relatifs aux changements climatiques au sein des organisations publiques de la région de l'Oriental du Maroc

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Abstract

Obviously, the climate has changed and will continue to change during the 21st century. In the context of climate change, an organization whose areas of activity are sensitive to climate change may be more sensitive to climate risks in the future. There are several reasons why it makes sense to start thinking about and making progress on climate change adaptation.

In this article, we propose to shed light on the concepts « Risk » and « Climate Risk » through a synthesis of the various theoretical and empirical works dealing with these notions. Additionally, a study was conducted among a sample of Moroccan public organizations to determine their perception of risk, as well as the specificities of their risk management approaches, and particularly the risks related to climate change. Indeed, the main objective of our work is to study the implementation of the second component of internal control, which is 'risk assessment,' within 50 public organizations in the Oriental region. We adopted a quantitative method and collected responses from 35 public organizations in the Oriental region, achieving a response rate of 70%.

Keywords: Risk ; Risk assessment ; internal control; climate change ; public organization.

Résumé

De toute évidence, le climat a changé et continuera de changer au cours du XXI^e siècle. Dans le contexte du changement climatique, une organisation dont les domaines d'activité sont sensibles aux changements climatiques peut être plus sensible aux risques climatiques à l'avenir. Il existe un certain nombre de raisons pour lesquelles il est judicieux de commencer à réfléchir et à progresser en matière d'adaptation au changement climatique. Nous proposons dans cet article de mettre la lumière sur les concepts « Risque » et « Risque Climatique » à travers une synthèse des différents travaux théoriques et empiriques traitant de ces notions. Aussi, une enquête a été menée sur un échantillon d'organisations publiques marocaines afin de déterminer leur perception du risque ainsi que les différentes spécificités de leur démarche de gestion du risque et particulièrement les risques liés au changement climatique.

En effet, l'objectif principal de notre travail consiste à étudier la mise en œuvre de la deuxième composante du contrôle interne qui est « l'évaluation des risques » au sein de 50 organisations publiques de la région de l'Oriental.

On a adopté une méthode quantitative, nous avons recueillis des réponses, soit 35 organisations publiques de la région de l'oriental avec un taux de 70%.

Mots clés : Risque ; évaluation des risques ; contrôle interne ; changement climatique ; organisation publique.

Introduction

Climate change poses a threat to the sustainable development of African countries, including Morocco, with significant impacts on the livelihoods of the poorest populations. According to the brochure from the Ministry of Interior titled "The National Strategy for Natural Disaster Risk Management 2020-2030," Morocco is aware of the economic and social impact of natural disasters. Consequently, it has strengthened its policy in the field of reducing the risks of natural disasters over the last decade. This policy is based on the concept of sustainable development and aims to make risk consideration a key factor in the country's economic and social development.

The Oriental region of Morocco, like many other regions worldwide, faces increasingly urgent challenges posed by climate change. In this context, public organizations play a crucial role in assessing, managing, and mitigating the risks associated with shifting environmental patterns. Given the diverse socio-economic and geographical characteristics of the Oriental region, understanding how public institutions within this area navigate climate-related risks is essential. Therefore, this study seeks to explore the strategies employed by public organizations in the Oriental region of Morocco to assess and manage climate change risks. Specifically, it aims to investigate the effectiveness of these strategies and identify potential avenues for enhancing resilience in the face of mounting environmental pressures. By addressing these questions, we can better comprehend the current state of climate risk management in the Oriental region and propose informed strategies for fostering adaptive capacity within public institutions.

This article attempts to answer this question :

« How do public organizations in the Oriental region of Morocco assess and manage risks associated with climate change, and what are the most effective strategies to enhance their resilience in the face of these growing environmental challenges? ».

To systematically explore this question, the article adheres to a structured plan. Firstly, it embarks on a comprehensive Literature Review, delving into the realms of Internal Control and Risk Management, unpacking the Concept of Risk, scrutinizing Risk Assessment methodologies, and probing into The Integration of Climate Risk into Risk Management in the Public Sector.

Following this, the Research Methodology section unveils the approach taken to investigate these phenomena. Finally, the Results and Discussion section unveils the insights gleaned from the research, engaging in a nuanced dialogue about the effectiveness of current strategies and offering recommendations to fortify resilience amidst escalating environmental upheavals.

Through this structured approach, the article aims to shed light on the intricacies of climate risk management within public organizations in the Oriental region of Morocco, offering valuable insights for policymakers and practitioners alike.

Indeed, the main objective of our work is to study the implementation of the second component of internal control, which is 'risk assessment,' within 50 public organizations in the Oriental region. We adopted a quantitative method and collected responses from 35 public organizations in the Oriental region, achieving a response rate of 70%.

1. Literature Review

Both public and private entities are exposed to internal and external risks. The conditions of the external context will also influence the perception of performance: circumstances, contingencies, environmental factors, and risks (Voyer, 2006). In the absence of mechanisms to detect, analyze, and address these risks, they can result in detrimental consequences such as economic losses or harm to security and reputation. Effective internal control and risk management systems are essential to safeguard the integrity of public sector entities.

The field of activity of an organization's activities undergoes constant changes. New risks emerge, and those already identified evolve; this should lead to an adaptation of controls. The effectiveness of internal control can only be ensured if risks are continuously assessed, and appropriate measures are implemented. It is beneficial to continuously adjust the internal control system to align with a changing environment.

The issue of sustainable development has experienced significant growth over the past three decades and is now a major concern for policymakers, economic operators, and the scientific community. The associated threats and challenges (depletion of natural resources, pollution, etc.) contribute to ecological, economic, and social imbalances. The concept of sustainability is closely linked to the resilience of organizations and ecosystems. Its analysis is framed within ecological and economic approaches.

The imperative for adaptation in a context marked by various shocks and trends toward scarcity (of natural resources) calls for sustainable management and climate risk management. This involves a structured approach aimed at integrating environmental, social, and economic considerations into decision-making and operations to achieve long-term viability and ethical responsibility.

1.1. Internal Control and Risk Management

According to Tao, L., Wei, X., & Wang, W. (2023), one of the objectives of internal control is to ensure a company's compliance with applicable laws and regulations. In order to promote sustainable development, various countries have established corresponding environmental laws and regulations.

Enterprise Risk Management, also known as COSO II, is an extension of the "Internal Control – Integrated Framework" (COSO). Risk Management is a corporate policy aimed at ensuring business continuity at all costs. It is essential for it to have a comprehensive view of current business activities and their relationship to extreme situations to provide practical solutions. Risk Management relies on self-identification of risks to establish self-prevention measures for these risks. Internal Control versus Risk Management is therefore an essential tool in developing a risk control policy.

As mentioned earlier, the COSO framework identifies five elements to establish effective internal control and three objectives of internal control:

- Achievement and optimization of operations,
- Reliability of financial information,
- Compliance with applicable laws and regulations.

Enterprise Risk Management adds a Risk Management component to COSO. Indeed, Risk Management should build on Internal Control. Enterprise Risk Management identifies eight elements and four objectives of internal control. The eight elements are: internal environment, setting objectives, event identification, risk assessment, risk treatment, control activities, information and communication, monitoring. The four objectives are categorized as follows: Strategic, Operational, Reporting and Compliance.

1.2. Concept Of Risk

The International Organization for Standardization (ISO 31000, 2009) defines risk as: "the effect of uncertainty on objectives." Uncertainty expresses our inability to be certain about the outcome of a given event, particularly concerning its magnitude and timing (Walker et al., 2003).

Major risks encompass all phenomena that can threaten the territorial environment and whose severity is calculated based on significant human, economic, and environmental stakes. These risks pose a major challenge for the future and are currently at the heart of development issues BERKCHI, S. (2021).

1.3.Risk assessment

The risk assessment component is the most demanding, requiring significant improvements. As per the COSO framework (1992; 2004), risk assessment involves the identification and analysis of risks pertinent to achieving objectives, forming the foundation for determining risk management strategies (Ujkani, 2019).

Risk assessment involves detecting and analyzing factors that may disrupt the achievement of objectives. It is a continuous and repetitive process. The risks considered encompass both internal and external aspects, with special attention given to specific risks and changes (Bernard, F., Gayraud, R., & Rousseau, 2008).

1.4.The Integration of Climate Risk into Risk Management in the Public Sector

According to the Institute of Francophonie for Sustainable Development, in a methodological guide titled "Integration of Climate Change in Environmental and Social Assessment" published in 2021, extreme climate events worldwide, with increasing intensities and frequencies, compel us to recognize that addressing climate change is no longer optional for our nations and already vulnerable communities. It has become imperative to mitigate the increasingly intense and unforeseen consequences and, above all, to enhance our adaptive capacity. According to the OECD (2016), the responsibility lies with public authorities, as well as all social actors, citizens, and businesses, to ensure Morocco's resilience to major risks. This is crucial to ensure security, well-being, promote sustainable economic growth, and maintain trust in public institutions and the economy. According to the OECD (2018), the Kingdom is highly exposed to natural risks such as floods, droughts, landslides, earthquakes, storms, heatwaves, or the risk of a tsunami. These natural disasters can impact the national territory and result in significant human and economic losses.

According to Bowyer, P., Schaller, M., Bender, S., and Jacob, D. (2014), anthropogenic climate change and the associated risks are now widely recognized as a reality and a serious threat to both private and public sector organizations, as well as society as a whole. These risks range from negative impacts on ecosystems and biodiversity to water resources, food production, and infrastructure. As the Earth continues to warm, these risks are likely to become more significant.

As such, organizations whose activities are sensitive to climate-related risks will need to adapt to this changing environment to reduce or avoid any negative consequences and capitalize on any positive outcomes.

Adapting to the risks posed by climate change and variability is a complex and relatively new process for many organizations. For an organization, the impacts of climate change can introduce new risks and/or make the management of existing risks more challenging. These impacts can be observed in various areas of an organization's business activities, including processes, finance, and logistics.

Every risk assessment requires some form of causal model that connects changes in climatic and non-climatic factors to how risks are generated. The risk assessment process involves three stages in which risks are identified, analyzed, and evaluated. These three stages are described below.

The first stage of the risk assessment phase is risk identification, which involves searching, identifying, and describing risks. This step aims to identify sources of risks, impact zones, as well as their causes and potential consequences. It should also consider all possible repercussions or dependencies between risks and consequences, as this will be crucial later when reviewing risk treatment and adaptation options. The key to this phase is to develop or identify causal relationships between risk sources and their consequences.

Risk identification may involve a comprehensive assessment of all climate risks an organization faces, or it may involve identifying key sources of risks relevant to a specific risk.

Analyzing past climate and meteorological events and records of incidents leading to a specific risk also serves as a potentially powerful source of information. Literature reviews, meta-analyses, and professional and industry publications summarizing the likely impacts in a given sector could form the basis for a preliminary risk identification step.

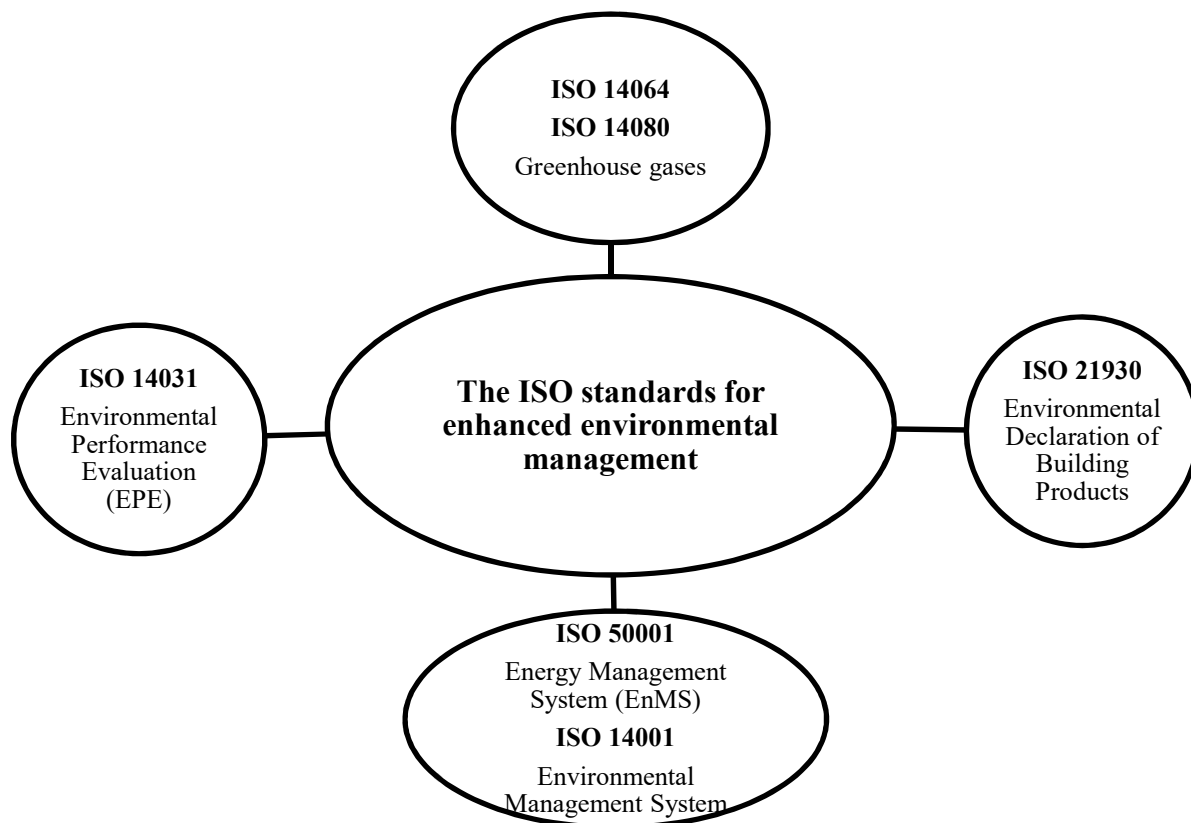
Once the risks have been identified, the next step is to generate information for analyzing and understanding the various risks. This involves considering the causes and sources of the risk, determining their negative and positive consequences, as well as their likelihood.

After analyzing the risks, the next step is to assess what measures are necessary, if any, or in other words, should we adapt?

According to the OECD, shortcomings in assessments and risk mapping occur at the local level to inform policies related to urban planning and local development, the development of risk scenarios for emergency preparedness planning, as well as the development of corresponding

response plans. In general, a risk assessment process should harmonize all existing mechanisms and meet the information needs regarding risks.

Figure 1 :Summary of ISO Standards for Enhanced Environmental Management



Source: Authors

External audits are conducted to provide assurance to stakeholders, especially clients, that the company meets their expectations. These audits are conducted as part of ISO 14001 certification.

A taxonomy of environmental audit forms is then highlighted: environmental analysis, internal EMS audit, ISO 14001 certification audit/external EMS audit, regulatory compliance audit, life cycle analysis, and environmental report audit Renaud, A. (2017).

2. Research Methodology

Indeed, the main objective of our work is to study the implementation of the second component of internal control, which is "risk assessment," within 50 public organizations in the Oriental region. We adopted a quantitative method and collected responses from 35 public organizations in the Oriental region, achieving a response rate of 70%.

Based on this component of internal control, which is "risk assessment," and its principles within the COSO framework, we aim to verify the implementation of this component within the public organization in the Oriental region:

H1: Risk assessment is not yet sufficiently implemented.

To examine this hypothesis, we present, in the table below, all the variables representative of the second component of internal control, which is "Risk Assessment." The table with variables related to risk assessment would be included here.

Table1 : Variables

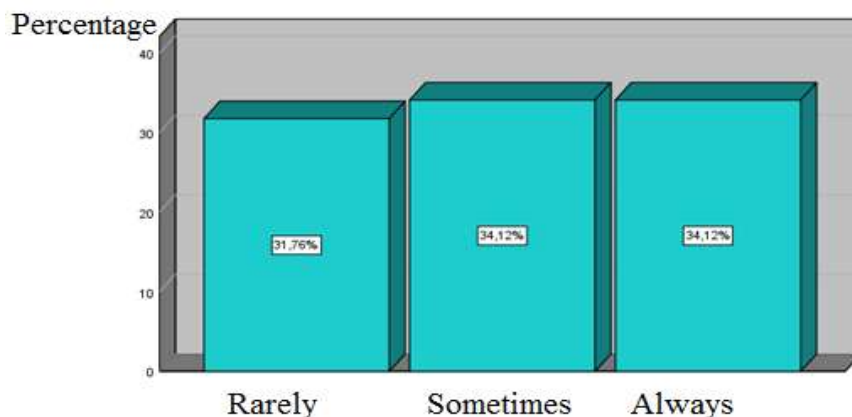
the second component of internal control	Variables
Risk Assessment	The risks that may affect the achievement of objectives are identified by the organization.
	The risks that may affect the achievement of objectives are assessed by the organization
	Implementation of Control Activities to Mitigate Risks

Source: Authors

3. Results and Discussion

According to the OECD (2019), shortcomings in assessments and risk mapping occur at the local level to inform policies related to urban planning and local development, the development of risk scenarios for emergency preparedness planning, as well as the development of corresponding response plans. In general, a risk assessment process should harmonize all existing mechanisms and meet the information needs regarding risks.

Graph 1 : Risk Identification



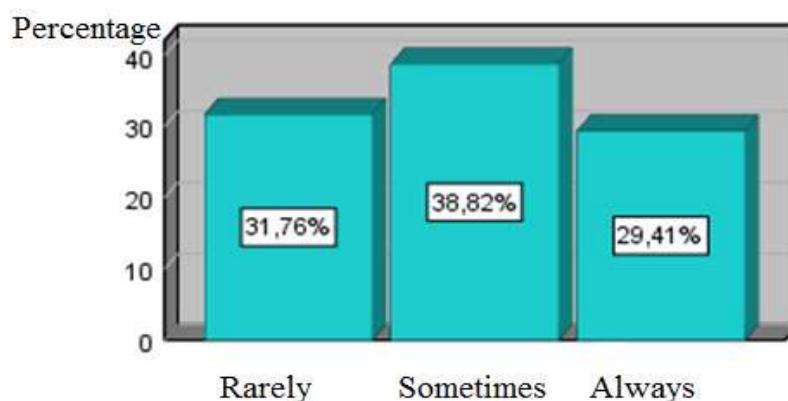
Source: Source: Authors

According to the above graph, we can observe that approximately a quarter of our surveyed officials report that within the public organization in the Oriental region, risks that may affect the achievement of objectives are "Rarely" identified, accounting for 32%. Additionally, almost 35% of the surveyed officials stated that the identification of risks affecting the achievement of objectives happens "Sometimes." In contrast, about 34% of the surveyed officials affirmed that within their organization, risks that may affect the achievement of objectives are always identified.

As a summary of these analysis results, we find that 66% of the respondents stated that the public organization does not always identify risks that may affect the achievement of objectives, while 34% declared that the organization always identifies such risks. Therefore, we could conclude that, in general, the public organization in the Oriental region identifies risks that may affect the achievement of objectives insufficiently.

The graph below presents descriptive statistics for the variable "Risk Assessment."

Graph 2: Risk Assessment



Source: Authors

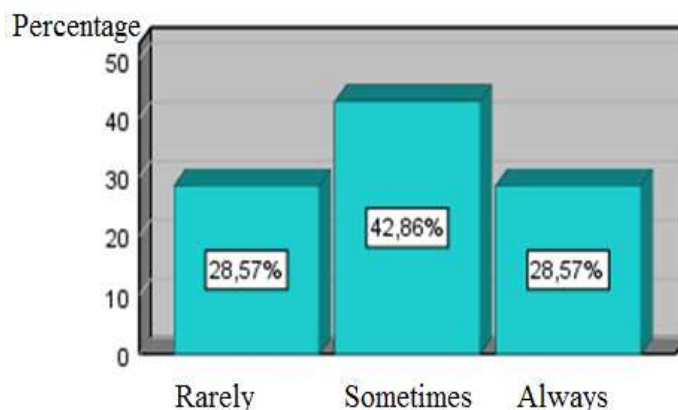
According to the above graph, we can observe that 32% of the surveyed officials report that within the public organization in the Oriental region, risks that may affect the achievement of objectives are "Rarely" assessed. Additionally, almost 39% of the surveyed officials stated that the assessment of risks affecting the achievement of objectives happens "Sometimes." In contrast, about 29% of the surveyed officials affirmed that within their organization, risks that may affect the achievement of objectives are "Always" assessed.

As a summary of these analysis results, we find that 71% of the respondents stated that the public organization does not always assess risks that may affect the achievement of objectives, while 29% declared that the organization always assesses such risks. Therefore, we could

conclude that, in general, the public organization in the Oriental region assesses risks that may affect the achievement of objectives insufficiently.

The graph 3 presents descriptive statistics for the variable "Implementation of control activities to mitigate risks."

Graph 3 : Implementation of Control Activities to Mitigate Risks



Source: Authors

Following this graph, we observe that over 28% of officials from public organizations in the Oriental region stated that the implementation of control activities to limit risks associated with goal achievement is "Rarely" carried out, and 43% mentioned that it happens "Sometimes." Therefore, only 29% of officials declared that the implementation of control activities to limit risks associated with goal achievement is "Always" carried out.

It can be deduced that 71% of the surveyed officials confirmed that the implementation of control activities to limit risks associated with goal achievement is not always done, while 29% confirmed that it is always implemented. Therefore, we could assert that within the public organization in the Oriental region, the implementation of control activities to limit risks is not yet sufficiently carried out.

According to these three graphs, it is evident that the three variables are not sufficiently applicable in public organizations in the Oriental region. Regarding risk assessment, the study has shown that these public organizations face a range of external and internal risks.

Table 2 : Summary of the results: Risk Assessment

Variables	Sufficient implementation	Insufficient implementation
The risks that may affect the achievement of objectives are identified by the organization.		
The risks that may affect the achievement of objectives are assessed by the organization		
Implementation of Control Activities to Mitigate Risks		

Source: Authors

At the end of our survey, it was observed that, in general, risks that may affect the achievement of objectives are not sufficiently identified and assessed by public organizations in the Oriental region. In other words, there is a lack of an appropriate risk management system. However, we have noticed that there are individual cases.

4. Recommendations

We recommend:

- A risk management framework is highly beneficial for addressing adaptation and the consequences of climate risks.
- The potential for effective climate risk management, and consequently adaptation, is enhanced by considering all relevant climate and non-climate factors related to a specific adaptation issue and by integrating climate risks into business risk management strategies.

In this table , we have attempted to summarize the main climate risks that can have a negative impact on the performance of public organizations in the Oriental region.

Table 3 : Climate risks

Climate risk	Frequency of observation in the organizational environment	Sectoral impact	Adaptation measures
Floods	(N: none; L: low; M: medium; H: high)	<ul style="list-style-type: none"> • Potential damage to facilities and loss of production. • Possible disruption of the communication system with the targeted entity 	<ul style="list-style-type: none"> • Implementation of an early warning system for flood risks.

		(impacts on the ability for urgent intervention).	
Strong winds and violent storms	(N: none; L: low; M: medium; H: high)	<ul style="list-style-type: none"> • Destruction of facilities 	<ul style="list-style-type: none"> • Implementation of an early warning system for storm risks
High temperatures	(N: none; L: low; M: medium; H: high)	<ul style="list-style-type: none"> • Increase in energy consumption for air conditioning 	<ul style="list-style-type: none"> • Avoidance of energy waste. • Environmental education. • Use of solar energy for cooling. • Home construction promoting good ventilation.
intense cold	(N: none; L: low; M: medium; H: high)	<ul style="list-style-type: none"> • Increase in energy consumption for heating 	<ul style="list-style-type: none"> • Equipping organizations with heating appliances. • Promotion of the use of renewable energy for heating in organizations.
Rising sea level	(N: none; L: low; M: medium; H: high)	<ul style="list-style-type: none"> • Floods 	<ul style="list-style-type: none"> • Implementation of an early warning system for the risks of sea level rise

Source: Authors

The managerial implications of this research are profound. Firstly, it underscores the critical importance for organizations and policymakers to prioritize risk assessment and management strategies that account for the multifaceted nature of major risks, particularly those with significant environmental implications. Implementing robust risk management frameworks can help businesses navigate uncertainties associated with these risks, safeguarding their operations, reputation, and long-term viability.

Furthermore, this research emphasizes the need for proactive and collaborative approaches to address major risks. Managers must recognize the interconnectedness of environmental, economic, and social factors in shaping risk landscapes and engage stakeholders from diverse sectors to develop comprehensive risk mitigation strategies. By fostering partnerships and knowledge-sharing initiatives, organizations can enhance their resilience and adaptive capacity in the face of emerging challenges.

Moreover, effective risk management requires continuous monitoring and evaluation to identify emerging threats and adapt strategies accordingly. Managers should invest in data-driven decision-making processes and leverage technology and analytics to enhance risk assessment capabilities. By staying abreast of evolving risk dynamics and leveraging innovative solutions,

organizations can mitigate the potential impact of major risks and capitalize on emerging opportunities in a rapidly changing environment.

The managerial implications of this research underscore the imperative for organizations to adopt a proactive and holistic approach to risk management, integrating environmental considerations into their strategic decision-making processes. By embracing innovation, collaboration, and adaptive management practices, businesses can enhance their resilience and sustainability in an increasingly complex and uncertain world.

Conclusion

Climate change poses a systemic risk that transcends borders, impacting all nations regardless of their geographic location or economic status. The rapid pace of its manifestations underscores the nonlinear and unpredictable nature of its dynamics, presenting a formidable challenge to traditional risk assessment methodologies. Despite this urgency, the integration of robust risk assessment frameworks within public organizations remains inadequate. This deficiency undermines the capacity of governmental institutions to anticipate and effectively mitigate the myriad threats and vulnerabilities posed by climate change.

The imperative for enhanced risk assessment mechanisms within the public sector cannot be overstated. By identifying weaknesses and vulnerabilities proactively, such systems are pivotal in fortifying the resilience and stability of public entities. Moreover, they facilitate informed decision-making processes, enabling governments to allocate resources efficiently and prioritize interventions where they are most needed. Embracing a proactive approach to risk management not only safeguards public interests but also fosters a culture of preparedness and adaptability in the face of evolving environmental challenges.

In conclusion, while the challenges posed by climate change are multifaceted and complex, a concerted effort to bolster risk assessment capabilities within public organizations holds significant promise. By doing so, governments can better safeguard their populations, enhance their responsiveness to emerging threats, and contribute to the collective global effort towards building a sustainable future.

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