Effectiveness of Risk Management Factors aligned Sustainability Development Goal: A Case Study of Developing Country Pakistan.

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Abstract:
United nation developed the Goal of Sustainability and risk management is playing pivotal role through mitigating uncertainty and threats which are accord in financial, environmental, economical, and social systems. long-term sustainability development essential by effective risk management. This research paper exploring the risk management framework with Sustainability Development Goal, quantitative analysis provide empirical study assessing risk factors and their impact on SDGs, risk management strategies is fostering about climate change, financial in-stability and social-economics disparity. Statistical modeling analysis through Smart – PLS version 4 & SPSS version 25 Software. Total 400 Questionnaire distributed among the micro level business enterprises and gathered 317 which are suitable for data analysis, research's Data analysis provides, risk assessment matrices and alleviate poverty. Results showing that the employees mixed method approach valuable due to incorporating regression analysis, findings explain proactive risk management approach positively enables sustainability development outcomes by reducing poverty and improve adapting capacity. This research also point-out policy implication to governments policy makers, corporations and international development organization to strengthen risks governance with align decision achieving sustainability objectives and goals. The study highlights best practices and innovative solutions for managing risks related to poverty, health, education, and environmental protection, ultimately contributing to a more resilient and sustainable future.

Keywords: Risk Management, Sustainable Development Goals (SDGs), Climate Risk, Financial Stability, Risk Governance

1. Introduction:

1.1 Background Study

This United-Nation's Sustainability Developments Goal (S.D.G.) provides as globe's blueprint to achieving socio-economies as well as environments sustainable by 2030. However, developing countries like Pakistan face systemic challenges in aligning national priorities with these goals, exacerbated by risks explains climates changes, economic volatility, and social. Inequality. Risk management (RM) has emerged as a critical tool to mitigate threats to SDG implementation, yet empirical evidence on its effectiveness in developing contexts remains limited.

1.2 Research Problem

Pakistan, a lower-middle-income country, struggles with poverty (24.3% population below the poverty line), climate vulnerability (ranked 8th on the Global Climate Risk Index), and unstable financial systems. Micro-enterprises, which contribute 40% to Pakistan's GDP, are disproportionately affected by these risks, undermining progress toward SDGs. This study addresses gaps in understanding how RM frameworks can be tailored to support SDGs in resource-constrained settings.

1.3 Research's Objective:

1. Evaluate this impact's RM practices upon SDG outcomes within Pakistan's micro-enterprise sector.
2. To identify key risk factors (climate, financial, socio-economic) hindering SDG achievement.
3. To propose policy recommendations for integrating RM into national sustainability frameworks.

1.4 Research Questions

1. How do risk management strategies influence SDG-related outcomes such as poverty reduction and climate resilience?
2. What are the most significant risk factors impeding SDG progress in Pakistan's micro-enterprise sector?
3. How can risk governance frameworks be optimized to align with SDGs in developing economies?

1.5 Hypotheses

- H_1: Proactive risk management practices positively correlate with progress toward SDGs 1, 8, and 13.
- H_2: Climate risk mitigation strategies significantly improve adaptive capacity and environmental sustainability (SDG 13).
- H_3: Financial risk management directly reduces poverty (SDG 1) by stabilizing micro-enterprise incomes

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2. Review of Literature:

2.1 Theoretical Foundations of Risk Management and SDGs

The integration of RM into sustainability frameworks is rooted in systems theory, emphasizing interdependencies between economic, social, and environmental systems. This United Nation's (Senda- Framework) to Disaster's Risks Reductions (2015) highlights RM as a cross-cutting enabler of SDGs.

The Concept of Sustainability Development's Goal (S-D-G.s):

This Sustainability Development's Goal (S-D-G.s) was adopts into UNs into 2015 as a general entitle into action's for closing stages poor quality, protect this planets, as well as make sure prosperity for all by 2030. These 17 goals encompass economics, socials, as well as environmental dimensions of sustainable, aiming into created a balanced and inclusive approach to global development. This Sustainability development Goals (SDGs) build on these Millennium's Developmental Goal (M.D.Gs) by addressing broader and more interconnected challenges, including climate change, economic inequalities, and institutional governance (United Nations, 2015). The concept of SDGs is rooted in the principle's sustainable, those emphasize meetings these desires presents' with-out compromise these abilities for upcoming generation into meeting there basic desires and wants (Brundtland Report, 1987). Achieve these Sustainability Development Goals (SDGs) required mutual hard work commencing government, businesse, civil-society, and individual. Key frameworks such as this-2030 Agenda's to Sustainability Developments provides guideline to integrating these goals into national policies and strategies (Sachs, 2012).

Research highlights that effective implementation of SDGs depends on robust governance structures, financial resources, technological innovation, and stakeholder engagement (Griggs et al., 2017). Studies also emphasize the need for measuring progress through indicators and data-driven decision-making to track achievements and identify areas requiring policy interventions (OECD, 2018). In the context of developing countries like Pakistan, SDGs played as serious function within addressing socio-economics disparities, enhancing environment resilience, as well as fostering economic growth. However, challenges such as financial constraints, policy misalignment, and inadequate institutional capacities hinder their progress (Pakistan Planning Commission, 2020). Risk management strategies, including climate adaptation, financial inclusivity, and social protection programs, are essential for aligning national development priorities with the SDGs (UNDP, 2021).

Risk Management in the Context of SDGs
Risk management is a fundamental approach to addressing uncertainties and mitigating potential threats that may hinder these achievements Sustainability Developments Goal (SDGs). Effective risk management frameworks contribute to sustainable economics, environment, as well as social resilience from identifying, assessing, as well as responding to risks in a proactive manner (World Bank, 2019). According to research by Kaplan and Mikes (2012), risk management plays a critical role in ensuring stability across various sectors by fostering informed decision-making, improving resource allocation, and enhancing institutional governance. In the context of SDGs, risk management strategies are essential for tackling challenges such as climate change, economic instability, health crises, and social inequalities (United Nations Development Programme, 2020). Climate-related risks, such as natural disasters, rising global temperatures, and extreme weather events, pose significant threats to sustainable development. Studies emphasize the importance of climate risk adaptation through sustainable infrastructure development, policy interventions, and innovative financial mechanisms (IPCC, 2018). Similarly, financial risks, including market volatility and economic downturns, require robust financial governance and regulatory measures to ensure long-term stability (OECD, 2021). Furthermore, social and economic disparities in developing countries necessitate integrated risk management strategies that focus on social protection programs, capacity-building initiatives, and inclusive economic policies (World Economic Forum, 2020). Effective risk management enhances national resilience by strengthening institutional frameworks, fostering partnerships, and promoting technological advancements that support sustainability objectives (Rockström et al., 2017). A systematic review of risk management literature suggests that incorporating risk governance mechanisms into policy planning and decision-making enhances the ability of governments and organizations to navigate uncertainties while ensuring sustainable growth (UNEP, 2019). Implementing proactive risk management strategies aligns with the SDGs by fostering resilience, reducing vulnerabilities, and promoting long-term sustainability.

2.2 Risk Management in Developing Economies
Developing countries face unique RM challenges, including informal economies, weak governance, and resource scarcity. Studies in India and Bangladesh link RM to SDG progress through microfinance and disaster preparedness.
Theoretical Underpinnings
1. **Institutional Theory**: Weak governance structures in LMICs hinder formal RM adoption. North (1991) argues that institutions shape economic behavior, and in developing contexts, informal norms often override formal risk policies.
2. **Resource-Based View (RBV)**: SMEs in LMICs lack financial and human capital to invest in RM (Barney, 1991). For example, only 12% of Nigerian SMEs have disaster recovery plans due to cost barriers (World Bank, 2021).

3. **Systems Theory**: Interconnected risks (climate, economic, social) in LMICs require integrated RM frameworks (Aven, 2016).

Key Risks in Developing Economies

1. **Climate Risks**:
   - o Developing countries bear 90% of climate-related disaster losses (UNDRR, 2022).
   - o Bangladesh's micro-enterprises lose 20–30% of annual revenue due to floods (Islam et al., 2020).
2. **Financial Risks**:
   - o Currency volatility, inflation, and limited access to credit destabilize SMEs. In Pakistan, 68% of micro-enterprises lack insurance (State Bank of Pakistan, 2023).
3. **Socio-Political Risks**:
   - o Corruption, regulatory unpredictability, and conflict deter long-term RM investments. In Sub-Saharan Africa, political instability reduces FDI by 40% (IMF, 2022).

Case Studies

1. **Bangladesh's Cyclone Preparedness Program (CPP)**:
   - o Community volunteers trained in evacuation and first aid reduced cyclone deaths by 90% since 1991 (Paul, 2009).
2. **Kenya's Livestock Insurance Program (KLIP)**:
   - o Satellite-indexed insurance for pastoralists cut drought-induced poverty by 25% (Janzen et al., 2021).
3. **Pakistan's Flood Risk Governance**:
   - o Post-2022 floods, Punjab's RM policy integrated SDG 13 but excluded marginalized communities (Ali & Gioli, 2023).

2.3 Pakistan's Context

Pakistan's RM landscape is fragmented, with limited institutional coordination. The 2022 Pakistan Economic Survey identifies energy shortages, inflation (13.8%), and floods (2022 losses: $30 billion) as critical risks.

2.4 Research Gaps

Few studies explore RM-SDG linkages in Pakistan's micro-enterprise sector, particularly using advanced statistical tools like Smart-PLS

2.5 Critiques and Research Gaps

1. **Over-Reliance on Informal Systems**:
   - o Informal RM (e.g., ROSCAs) lacks scalability and exacerbates inequality (Platteau, 2014).
2. **Data Limitations**:
   - o Only 30% of African nations have granular risk exposure data (UNECA, 2022).
3. **Neglect of Intersectionality**:
   - o Most RM frameworks ignore how gender, class, and ethnicity shape risk vulnerability (Cutter et al., 2003).

3. Methodologies of Research

3.1 Design of Research

As quantitative-surveys of 400 micro-enterprises in Punjab and Sindh provinces, selected via stratified random sampling.

3.2 Collections of the Data

- **Instruments**: Semi-Structured questionnaires (5-points Likerts scales) assessing RM practices and SDG indicators.

- **Sample**: 317 valid responses (79% response rate) from retail, agriculture, and manufacturing sectors.

3.3 Analytical Tools

- **SmartPLS-4**: "Partial Least Squares Structural Equation Modeling (PLS-SEM)" into test hypotheses.
- **SPSS 25**: Descriptive statistics, regression analysis, and reliability testing (Cronbach's $\alpha = 0.82$).

3.4 Variables

- **Independent Variables**: Climate risk preparedness, financial diversification, social safety nets.
- **Dependent Variables**: Poverty reduction (SDG 1), employment stability (SDG 8), carbon footprint (SDG 13).

4. Data Analysis and Findings

4.1 Demographic Profile

- 65% respondents from Punjab; 58% small enterprises (<10 employees).
- 72% reported exposure to climate risks (floods, heatwaves).

4.2 Hypothesis Testing

- **H₁ Supported**: RM practices explained 38% variance in SDG outcomes (β=0.41, p<0.001).
- **H₂ Partially Supported**: Climate strategies improved adaptive capacity (R^2=0.27) but had weak impact on carbon reduction.
- **H₃ Supported**: Financial RM reduced poverty likelihood by 19% (p<0.05).

4.3 Risk Assessment Matrices

- High-risk SDGs: SDG 1 (poverty) and SDG 13 (climate action).
- Micro-enterprises prioritized financial risks over environmental risks.

4.4 Measurement Model for PLS-SEM

These measureable models evaluated this relation among valuable latent's variable (constructs) as well as these observations indicates, ensured **reliabilities**, **convergent validities**, and **discriminant validity**. For this study, the constructs include:

1. **Risk Management Practices (RMP)**
2. **Sustainable Development Goal Outcomes (SDG_Outcomes)**
3. **Climate Risk (CL_Risk)**
4. **Financial Stability (F_Stability)**
5. **Socio-Economic Disparity (SE_Disparity)**
6. **Risk Governance (RG)** (Moderating Variable)

1. Constructs and Indicators

Each latent variable is measured using multiple observed indicators (questionnaire items on a 5-point Likert scale).

Construct	Indicators	Source/Adaptation
Risk Management Practices (RMP)	RMP1: My enterprise has a formal risk assessment process.	UN SDG Guidelines (2015)
	RMP2: We allocate resources for risk mitigation (e.g., insurance, emergency funds).	Hair et al. (2017)
	RMP3: Employees receive training on risk management.	Pakistan Economic Survey (2022)
Climate Risk (CL_Risk)	CL1: My enterprise faces frequent disruptions due to extreme weather (floods, heatwaves).	Global Climate Risk Index (2023)

Construct	Indicators	Source/Adaptation
	CL2: Climate risks have increased operational costs in the past 5 years.	
Financial Stability (F_Stability)	FS1: My enterprise maintains diversified income sources.	World Bank (2022)
	FS2: Access to credit/loans has improved financial resilience.	
SDG Outcomes (SDG_Outcomes)	SDG1: Poverty reduction (e.g., increased household income).	UN SDG Indicators (2023)
	SDG8: Employment stability (e.g., no layoffs in past 12 months).	
	SDG13: Reduced carbon footprint (e.g., adoption of renewable energy).	
Risk Governance (RG)	RG1: Government policies support risk management in micro-enterprises.	OECD Risk Governance Guidelines (2021)
	RG2: International organizations provide RM training programs.	

2. Reliability and Validity Tests

a) Internal Consistency (Reliability)

- **Cronbach-Alpha(α)**: every construct exceed these entry as **α > 0.70** (Table 1).
- **Composite Reliability (CR)**: All CR values > **0.70** (Hair et al., 2017).

Construct	Cronbach's Alpha	Composite Reliability (CR)
Risk Management Practices	0.85	0.88
Climate Risk	0.78	0.82
Financial Stability	0.76	0.80
SDG Outcomes	0.89	0.91
Risk Governance	0.73	0.77

b) Convergent Validity

- **Average Variance Extracted (AVE)**: All constructs met the threshold of **AVE > 0.50** (Fornell & Larcker, 1981).

Construct	AVE
Risk Management Practices	0.64
Climate Risk	0.58
Financial Stability	0.55
SDG Outcomes	0.67
Risk Governance	0.53

c) Discriminated Validity

- **Fornell-Larcker Criterion**: The square root of AVE for each construct (diagonal values) exceeded inter-construct correlations (off-diagonal values).
- **HTMT Ratio**: All values < **0.85**, confirming distinctiveness between constructs.

Construct	RMP	CL_Risk	F_Stability	SDG_Outcomes	RG
RMP	**0.80**	0.32	0.41	0.55	0.28
CL_Risk	0.32	**0.76**	0.19	0.27	0.15
F_Stability	0.41	0.19	**0.74**	0.48	0.33

Construct	RMP	CL_Risk	F_Stability	SDG_Outcomes	RG
SDG_Outcomes	0.55	0.27	0.48	**0.82**	0.39
Risk Governance (RG)	0.28	0.15	0.33	0.39	**0.73**

3. Factor Loadings

All indicator loadings exceeded **0.70**, confirming strong relationships between indicators and their constructs (Hair et al., 2017).

Construct	Indicator	Loading	t-value	p-value
Risk Management Practices	RMP1	0.82	12.34	<0.001
	RMP2	0.78	10.89	<0.001
	RMP3	0.75	9.67	<0.001
Climate Risk	CL1	0.81	11.21	<0.001
	CL2	0.73	8.95	<0.001
Financial Stability	FS1	0.79	10.12	<0.001
	FS2	0.71	8.34	<0.001
SDG Outcomes	SDG1	0.85	13.45	<0.001
	SDG8	0.83	12.78	<0.001
	SDG13	0.76	9.89	<0.001
Risk Governance	RG1	0.77	9.12	<0.001
	RG2	0.69	7.45	<0.001

5. Discussion

5.1 Theoretical Implications

The study validates RM as a driver of SDGs in line with institutional theory, emphasizing governance and stakeholder collaboration.

5.2 Practical Recommendations

- **Government**: Mandate RM training for micro-enterprises via provincial SDG units.
- **Corporations**: Adopt green financing mechanisms (e.g., climate bonds).
- **International Agencies**: Fund RM-SDG pilot projects in flood-prone regions.

5.3 Policy Innovations

- **Digital RM Platforms**: Mobile apps for real-time risk monitoring.
- **Community Insurance Pools**: Mitigate climate risks for farmers.

5.4 Interpretation

1. **Risk Management Practices (RMP)** is strongly measured by formal risk assessments (RMP1: 0.82) and resource allocation (RMP2: 0.78).
2. **SDG Outcomes** show the highest reliability ($\alpha = 0.89$, CR = 0.91), with poverty reduction (SDG1: 0.85) as the strongest indicator.
3. **Climate Risk** and **Financial Stability** have moderate discriminant validity, confirming they measure distinct concepts.

6. Conclusion

Proactive RM is pivotal for SDG achievement in Pakistan, particularly in stabilizing micro-enterprises and building climate resilience. Limitations include geographic bias and cross-sectional data. Future research should explore sector-specific RM models and longitudinal impacts. The measurement model confirms robust psychometric properties, validating the use of Smart-PLS 4 for hypothesis testing. All constructs meet reliability and validity thresholds, ensuring confidence in subsequent structural model analysis.

References

United Nations. (2015). Transforming Our World: The 2030 Agenda for Sustainable Development.

Hair, J. F., et al. (2017). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). Sage.

Pakistan Bureau of Statistics. (2022). Pakistan Economic Survey 2021–22.

Aven, T. (2016). Risk assessment and risk management: Review of recent advances. Risk Analysis.

Cole, S. et al. (2013). Barriers to household risk management: Evidence from India. American Economic Journal: Applied Economics.

Dercon, S. (2014). Risk pooling, networks, and contracts in Africa. Journal of Development Economics.

World Bank (2021). SME Resilience in Fragile Economies.

UNDRR (2022). Global Assessment Report on Disaster Risk Reduction.