

Final Report

Conducting Surveys on Climate Change Vulnerability of SMEs in Punjab



Submitted to:
**Research, Regulatory Insight & Advocacy Assistance for SMEs
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List of Acronyms

Acronym	Description
BCP	Business Continuity Planning
CBAM	Carbon Border Adjustment Mechanism
CCVI	Climate Change Vulnerability Index
CRI	(Global) Climate Risk Index
DFI	Development Finance Institution
DRR	Disaster Risk Reduction
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
FAO	Food and Agriculture Organization
FGD	Focused Group Discussion
GHG	Greenhouse Gases
GLOF	Glacial Lake Outburst Floods
GOP	Government of Pakistan
HKH	Himalaya Karakoram Hindukush
HVAC	Heating, Ventilation, and Air Conditioning
KII	Key Informant Interview
KPI	Key Performance Indicator
MOIP	Ministry of Industries & Production
NDC	Nationally Determined Contributions
NJHR	Nauman Javed Hasnain Rashid, Chartered Accountants
OHS	Occupational Health and Safety
RFP	Request for Proposal
RRI&A	Research, Regulatory Insights and Advocacy Assistance for SMEs
SDGs	Sustainable Development Goals

SME	Small and Medium Enterprise
SMEDA	Small and Medium Enterprises Development Authority
SOP	Standard Operating Procedures
SOW	Scope of Work
TOR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change
UNOCHA	United Nations Office for Coordination of Humanitarian Affairs
UPS	Uninterrupted Power Supply
VFD	Variable Frequency Drive

1.0 EXECUTIVE SUMMARY

Backdrop

Climate change has emerged as one of the severest challenges confronting Pakistan, threatening its environment, economy, and society. Despite contributing less than one percent to global greenhouse gas emissions, Pakistan consistently ranks among the most vulnerable countries to climate risks. Its geographical location, heavy dependence on climate-sensitive sectors, and socio-economic conditions expose it to recurrent floods, heatwaves, droughts, and erratic rainfall. These disruptions not only damage infrastructure and ecosystems but also undermine livelihoods, productivity, and economic stability. The consequences are particularly severe for small and medium enterprises (SMEs), which form the backbone of Pakistan's economy, contributing over 40 percent to GDP, nearly a quarter of exports, and providing employment to more than 80 percent of the non-agricultural labor force. However, SMEs' limited financial resources, informal operations, and lack of specialized expertise make them disproportionately vulnerable to climate shocks. Recognizing this, the Small and Medium Enterprises Development Authority (SMEDA), through one of its PSDP projects, Research, Regulatory Insight and Advocacy (RRI&A), initiated a comprehensive study to assess the climate change vulnerability of SMEs in Punjab using a structured Climate Change Vulnerability Index (CCVI) and a large-scale survey.

Study Design

The study had two primary objectives: first, to conduct a survey of 200 SMEs across four districts of Punjab, capturing sectoral and geographic variations in vulnerability; and second, to design a web-based interactive dashboard capable of storing, analyzing, and visualizing climate vulnerability data on a continuous basis. The survey covered four major sectors—manufacturing, agriculture/livestock/dairy, services, and trading—while districts were selected to represent both relatively less vulnerable areas (Lahore and Faisalabad) and more vulnerable areas (DG Khan and Rahimyar Khan). A total of 206 SMEs were surveyed, exceeding the target sample, with proportional representation across size, sector, and business age. Enterprises were selected using the SME definition outlined in the SME Policy 2021, ensuring inclusion of both small and medium-sized firms. Enumerators conducted structured interviews, supported by pilot testing of questionnaires to ensure clarity and reliability. Data was analyzed using the CCVI framework, which measures vulnerability through three dimensions: exposure, sensitivity, and adaptive capacity. The survey results were compiled into a comprehensive report and also linked to a digital dashboard, built in Google Looker Studio, that enables visualization, comparison, and monitoring of vulnerability scores across multiple dimensions.

Key Findings

Findings reveal that external climate change factors significantly affect SME operations, with rising temperatures emerging as the most critical factor. With an average score of 2.09, SMEs perceived temperature increases as having a severe impact on business continuity, labor productivity, and energy demand. Floods, storms, and precipitation followed as the next important risks, perceived to cause moderate disruptions to logistics, infrastructure, and supply chains. Heatwaves, droughts, and contamination of air, water & soil were also reported as relevant but of comparatively lower severity. District-level analysis confirmed that SMEs in DG Khan and Rahimyar Khan—southern Punjab districts prone to floods and heat extremes—face higher vulnerability, validating their classification as more climate-sensitive zones.

Comparisons across business size and sector showed that smaller enterprises, agriculture-based businesses, and startups are less resilient and more exposed, while larger enterprises and manufacturing units benefit from relatively stronger infrastructure and adaptive capacity.

Internal business vulnerabilities were equally pronounced. On average, SMEs rated the effect of climate change on internal operations at 3.92, within the moderate range. The most affected indicators were labor absenteeism and efficiency, which together undermine productivity during extreme heat or flooding events. Sales revenues and overall expenses were also reported as highly sensitive, indicating that climate shocks translate quickly into financial instability. Profitability metrics such as Earnings before Interest, Taxes, Depreciation & Amortization (EBITDA) and retained earnings were moderately affected, while investment, R&D, and location-related indicators were perceived to be less exposed. District comparisons underscored that SMEs in Rahimyar Khan faced the highest internal stress, with labor-related indicators crossing into the severe impact range, while SMEs in Lahore and Faisalabad perceived lower impacts, with DG Khan lying in between. Sectoral analysis highlighted agriculture, livestock, and food processing as the most vulnerable sectors due to their direct dependence on climatic conditions, while trading and light engineering enterprises were relatively insulated to climate shocks. Business age also played a role: startups reported higher sensitivity to shocks, reflecting their weaker financial buffers, while more established enterprises had moderate but still significant vulnerability scores.

SME readiness to deal with climate risks was found to be generally low. Many enterprises lacked climate-risk insurance, early warning systems, or contingency planning. Awareness of adaptation strategies such as energy efficiency, water conservation, and diversification was limited, and investment in climate-smart technologies remained minimal. Smaller firms were particularly constrained in financial and technical capacities, while medium enterprises showed relatively greater ability to absorb shocks but still lacked structured adaptation mechanisms. The findings indicate a pressing need for institutional support, capacity building, and policy frameworks tailored to SME resilience.

The Climate Change Vulnerability Index (CCVI) provided a structured and quantitative way of assessing how climate risks affect SMEs across Punjab. By combining indicators of exposure, sensitivity, and adaptive capacity, the CCVI generated composite scores that allowed for meaningful comparison between enterprises, sectors, and districts. Results revealed that SMEs in the more vulnerable districts of DG Khan and Rahimyar Khan consistently scored higher on vulnerability, reflecting their greater exposure to floods, heat extremes, and water stress. Agriculture, livestock, and food processing SMEs were found to be the most vulnerable, with CCVI scores approaching the severe range due to their direct dependence on climatic conditions. Smaller enterprises and startups, constrained by limited financial and technical resources, also displayed higher CCVI vulnerability compared to medium enterprises that had stronger buffers. Meanwhile, manufacturing and services SMEs, though less directly exposed, still showed moderate levels of vulnerability due to supply-chain disruptions and labor productivity losses. The CCVI therefore not only confirmed the geographic and sectoral disparities in climate vulnerability but also highlighted the structural weaknesses within SME systems that reduce their adaptive capacity.

SME Climate Dashboard

A central innovation of this project was the development of the SME Climate Dashboard, a digital tool designed to institutionalize climate vulnerability monitoring. The dashboard integrates survey data into a dynamic platform built in Google Looker Studio, linked with Google Sheets and Forms to enable real-time data entry and visualization. It allows users—including policymakers, industry associations, financial institutions, and SMEs themselves—to track vulnerability scores across multiple dimensions such as enterprise size, sector, location, and type of climate stressor. Through interactive charts, filters, and analytics, the dashboard provides a comprehensive view of how external and internal climate factors are affecting SMEs in Punjab. Its key value lies in enabling continuous data updates: as more SMEs are surveyed or as new data are added, the system automatically refreshes insights, ensuring up-to-date evidence for decision-making. The tool also supports policy simulation, helping authorities anticipate which sectors or regions are most at risk and prioritize interventions accordingly. Beyond Punjab, the dashboard provides a scalable template for national-level SME climate monitoring, offering an institutionalized approach for integrating climate vulnerability into Pakistan’s broader Monitoring, Reporting, and Verification (MRV) frameworks.

Recommendations

Based on these results, the report advances several key policy recommendations. First, climate risks must be mainstreamed into SME policy and industrial strategies, ensuring that resilience becomes a core criterion for competitiveness and sustainability. Second, targeted financial instruments—including concessional loans, insurance products, blended finance, and a resilience window within SME banking—should be developed to enable businesses to invest in adaptation. Third, capacity-building initiatives are essential to raise SME awareness and provide access to affordable climate-smart technologies, energy-efficient equipment, and waste management systems. Fourth, procurement and supply-chain policies should incentivize climate disclosure and resilience practices, for example through simplified SME Climate Disclosure Lite frameworks. Fifth, sector- and district-specific interventions must be designed, focusing on agriculture and food processing in southern Punjab, where vulnerabilities are higher. Finally, institutional mechanisms for monitoring and reporting should be strengthened through the operationalization of the web-based dashboard, allowing real-time vulnerability tracking, evidence-based policymaking, and continuous improvement of resilience strategies.

This initiative also aligns with Pakistan’s international obligations and long-term climate commitments. By generating granular, sector-specific data, the project supports implementation of the country’s Nationally Determined Contributions (NDCs) under the Paris Agreement, the National Adaptation Plan, and the Sustainable Development Goals, particularly SDG 13 (Climate Action), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation, and Infrastructure). The methodology piloted in Punjab has strong potential for scaling nationwide, enabling harmonized SME vulnerability assessments across provinces and strengthening Pakistan’s voice in global climate negotiations. In addition, the interactive dashboard institutionalizes climate data systems, creating opportunities for integration into national MRV frameworks and alignment with global transparency standards.

In conclusion, the study underscores that climate change is already affecting the operations and sustainability of SMEs in Punjab, with variations across sectors, sizes, and districts. Rising temperatures, floods, and labor productivity disruptions pose the greatest threats, while readiness and adaptive capacity remain weak. Without timely interventions, these

vulnerabilities threaten to erode the resilience of SMEs, deepen poverty, and weaken Pakistan's economic base. However, the findings also open pathways for targeted, evidence-based action. By mainstreaming climate risk into SME development, investing in adaptation finance, enhancing capacity, and institutionalizing monitoring systems such as the SME Climate Dashboard, Pakistan can safeguard its SMEs, protect livelihoods, and ensure sustainable economic growth in the face of climate change. The report therefore calls for urgent collaboration between government, financial institutions, industry associations, and SMEs themselves to build a resilient, inclusive, and competitive SME sector that can withstand the intensifying challenges of climate change. Strengthening SME resilience is not only an environmental or economic imperative but also a social one, as it will determine the well-being of millions of people who rely on these enterprises across Pakistan.

2.0 INTRODUCTION

2.1 Background

Climate change in Pakistan is among the most pressing environmental, social, and economic challenges. Although the country's emissions are relatively low, Pakistan faces disproportionate risks due to its geographic location and high vulnerability to extreme weather events. Recurrent floods and heatwaves consistently place Pakistan among the top ten most affected countries worldwide. In 2022, the Global Climate Risk Index (CRI) ranked Pakistan as the most vulnerable country to climate change, and it currently stands as the fifth most vulnerable.

This vulnerability manifests in multiple ways, including frequent flooding, unpredictable agricultural and livestock output, water scarcity, droughts, health crises, and economic slowdown. Climate change directly disrupts infrastructure, livelihoods, and productivity. Small farmers, small and medium enterprises (SMEs), and informal workers are especially at risk, often being pushed further below the poverty line.

SMEs are a cornerstone of national economic development, yet they are highly exposed to climate risks. Their limited resources and lack of specialized expertise restrict their ability to adapt and respond effectively. It is therefore critical to provide SMEs with robust institutional support mechanisms to strengthen their resilience against climate change.

The Government of Pakistan has taken significant steps to address climate risks. The Ministry of Climate Change and Environmental Coordination was established, and the Pakistan Climate Change Act was enacted in 2017. Internationally, Pakistan is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and its major agreements, including the Kyoto Protocol and the Paris Agreement. The country has also submitted its Nationally Determined Contributions (NDCs) to the UNFCCC, setting out its climate action commitments. In addition, Pakistan has developed a National Adaptation Plan to build resilience, with particular focus on agriculture and vulnerable communities.

Building upon these national initiatives, SMEDA has initiated targeted efforts to identify and address the climate-related challenges facing SMEs. The Research, Regulatory Insight & Advocacy Assistance for SMEs (RRI&A), one of SMEDA's PSDP projects, has taken the lead in this regard and has conducted in-depth studies to generate reliable data on the impacts of climate change on local SMEs.

An important initiative in that regard was SMEDA's research study on the *Climate Change Vulnerability Index of SMEs in Pakistan*. The objective was to develop a comprehensive index (Climate Change Vulnerability Index) (CCVI) using the Weighted Average Index method, assessing both external and internal factors to determine the potential impacts of climate change. The study classified SMEs by levels of vulnerability or readiness, highlighting those at risk and those demonstrating resilience. It accounted for sectoral and geographic variations, as well as adaptive capacities such as financial resources, technology, and institutional support. By identifying key drivers of vulnerability, the study provided actionable insights for governments, policymakers, and businesses to design targeted resilience strategies.

Building on this foundation, SMEDA has launched a cross-sectoral research study to assess the vulnerabilities of SMEs in Punjab. This initiative relies on a quantitative survey designed to capture data on sector-specific climate challenges, with a pilot survey already completed. The results of this study are expected to deepen understanding of how climate change impacts SMEs across sectors. By analyzing vulnerabilities through a comparative lens, the initiative will enable the formulation of targeted, sector-specific policies and strategies. This strategic approach will play a vital role in mitigating climate risks while supporting the sustainable growth and resilience of SMEs in Pakistan.

2.2 Introduction to the Project

2.2.1 Key Tasks

The project aimed to complete two key tasks, listed below:

- Conduct a survey of 200 SMEs across Punjab using the developed online survey to gather data that reflects the vulnerability of SMEs
- Develop an interactive web-based dashboard to present the results of climate change vulnerability of SMEs

2.2.2 Target Sectors

As per the requirement of the RFP, SMEs for survey were selected from the following four sectors:

- Manufacturing
- Agriculture/Dairy & Livestock
- Services
- Trading (Retail & Wholesale)

The distribution of 200 SMEs between the four sectors is shown in Table 1.

Table 1 – Sectoral Distribution of the Survey Sample

Sector	Share in Sample	No. of SMEs in Sample
Manufacturing	55%	110
Agriculture/Livestock and Dairy	15%	30
Services	15%	30
Trading	15%	30
Total	100%	200

2.2.3 Geographical Scope

Survey was conducted in four districts of Punjab, categorized on the basis of their vulnerability to climate change:¹

¹ This categorization of districts is based on the study, "Climate Change Vulnerability Index for Punjab," conducted by the Punjab Economic Research Institute.

- The two less vulnerable districts were Lahore and Faisalabad.
- The two more vulnerable districts were DG Khan and Rahimyar Khan.

The proposed distribution of 200 SMEs² between the two types of districts is shown in Table 2.

Table 2 – Geographical Distribution of Survey Sample

District Vulnerability Status	Share in Sample	No. of SMEs in Sample
Less Vulnerable districts	50%	100
More vulnerable districts	50%	100
Total	100%	200

The data, collected through this survey, was analyzed to derive insights on SMEs' climate change vulnerability with respect to their size, geographical location, business nature, age and sector. The research findings were compiled in the form of a comprehensive report, which provides details about the climate vulnerability of SMEs, and policy insights to effectively cope with climate change impact on the local small and medium businesses.

2.2.4 Web-based Interactive Dashboard

The assignment also covered developing a web-based interactive dashboard, compatible with the developed excel-based 'Climate Change Vulnerability Index'. This dashboard, developed as part of this assignment, is capable of continually storing and visualizing data, performing advanced analytics and generating reports, assessing, analyzing and monitoring the climate vulnerability of SMEs over time and facilitating the development of targeted policies to enhance SMEs resilience against climate change impact.

2.2.5 Project Methodology

The project was completed in three phases; the three outputs being Inception Report, Interim Report and Final Report.

2.2.5.1 Inception Phase

2.2.5.1.1 Kickoff Meeting

The Project Award and the Kickoff meeting was held between the Project Manager (Managing Partner) of NJHR and the SMEDA / RRI&A team on 11th April, 2025. The main objective of the meeting was having a formal introduction and developing a common understanding of the assignment's objectives and methodology.

2.2.5.1.2 Collection and Review of Secondary Information

For developing an understanding of the project, the consultant collected the relevant documents, available with RRI&A, including the report on 'Climate Change Vulnerability Index of SMEs in Pakistan'. The collected documents were reviewed to draw useful insights which were integrated into the project's framework to ensure contextual relevance.

² The total number of SMEs surveyed during this project was actually higher (206).

2.2.5.1.3 Review of Survey Questionnaire

The questionnaire to be used for conducting SME survey was provided by SMEDA, which included all the details of the components constituting CCVI. The questionnaire had the following three sections:

1. External Factors: Climate Change Indicators & Effects
2. Internal Factors: Potential Impact of Climate Change on SMEs
3. Internal Factors: Readiness of SMEs for Climate Change Impacts

The information obtained through this questionnaire is aligned with the information used in the design of the Climate Change Vulnerability Index of SMEs. The data collected through this survey can therefore be directly used to calculate the vulnerability indices of the individual SMEs as well as those of the target sectors or the target districts.

2.2.5.1.4 Submission and Approval of Inception Report

The Consultant developed and submitted the Inception Report which provided details of all the activities and a detailed work plan indicating all the activities and tasks. The Inception Report was approved by RRI&A team.

2.2.5.2 *Interim Report Phase*

2.2.5.2.1 Survey Sample Distribution for Two Less Vulnerable Districts

During the Interim Phase of the project, the Consultant executed survey by conducting structured interviews with selected SMEs in two less vulnerable districts, Lahore and Faisalabad, covering 50% of the total sample size. 100 questionnaires were filled from the target four types of businesses (manufacturing, agriculture/livestock, services and trading). Distribution of 100 questionnaires between the two districts and four types of businesses is shown in Table 3.

Table 3 – Distribution of 100 SMEs Surveyed in Two Less Vulnerable Districts

District	No. of SMEs for Survey				Total
	Manufacturing (55%)	Agriculture/ Livestock (15%)	Services (15%)	Trading (15%)	
Lahore	26	8	8	8	50
Faisalabad	26	8	8	8	50
Total	52	16	16	16	100

2.2.5.2.2 SMEs Selection Criteria

SMEs for the survey were selected with the approach of increasing the overall representativeness of the sample. The selected SMEs fell within the SME definition as provided in SME Policy 2021. The sample included both small enterprises (SEs) (annual turnover of up to PKR 150 million) and medium enterprises (MEs) (annual turnover from PKR 150 million to PKR 800 million). Sample from each sector had representation of major subsectors. SMEs were identified through the representative industry and trade associations of the target sectors/subsectors.

2.2.5.2.3 Survey Execution

The Consultant conducted pilot testing of questionnaire to identify need for any change. Survey was conducted by the team of well-experienced enumerators who were trained before the start of the survey. Questionnaires were filled by the enumerators by going door to door to the selected SMEs. Quality of the collected information was ensured by carrying out effective process monitoring.

2.2.5.2.4 Data Analysis & Report Development

The data of 100 SMEs was entered and analyzed to draw key findings and useful insights. Based on the results of the field survey, the consultant prepared the Interim Report.

2.2.5.3 *Development of Operational Version of Web-Based Interactive Dashboard*

As the second part of the Interim Report phase, the Consultant developed an initial operational version of the web-based interactive dashboard which allowed the users to view and interact with data by tracking, analyzing and monitoring the key metrics of climate change vulnerability of the local SMEs. It was developed using ‘Looker Studio’ by Google, which is connected to Google Sheets at the backend. Data is entered through Google Forms into Google sheets and converted into desired forms and presentations by Looker Studio.

2.2.5.3.1 Submission of Interim Report and Initial Version of Interactive Dashboard

Interim Report and an operational version of the Web-based Interactive Dashboard was submitted to the Client.

2.2.5.4 *Final Report Phase*

2.2.5.4.1 Survey Sample Distribution for Two More Vulnerable Districts

For this phase of the project, the consultant conducted survey in the other two districts, DG Khan and Rahimyar Khan. A total of 100 questionnaires were filled during this phase. Distribution of the target respondent SMEs between the two districts and four types of businesses is shown in Table 4.

Table 4 – Distribution of 100 SMEs Surveyed in Two More Vulnerable Districts

District	No. of SMEs for Survey				Total
	Manufacturing (55%)	Agriculture/ Livestock (15%)	Services (15%)	Trading (15%)	
DG Khan	29	7	7	7	50
Rahimyar Khan	29	7	7	7	50
Total	58	14	14	14	100

The approach of SME selection, survey execution, data entry and analysis for these two districts was the same as was adopted for the first two districts. Based on the data analysis, the consultant formulated actionable policy recommendations tailored to SME resilience against climate change. Recommendations were aligned with existing policies and global best practices in SME climate adaptation and resilience-building.

After the completion of survey in the four target districts, the total number of SMEs was 206 which exceeded the requirement of the TOR. The distribution of total surveyed SMEs in four districts and four types of businesses is shown in Table 5.

Table 5 – Distribution of Total SMEs Surveyed in Four Target Districts

District	No. of SMEs for Survey				Total
	Manufacturing (55%)	Agriculture/ Livestock (15%)	Services (15%)	Trading (15%)	
Lahore	29	8	8	9	54
Faisalabad	29	8	7	8	52
DG Khan	26	8	8	8	50
Rahimyar Khan	26	8	8	8	50
Total	110	32	31	33	206

Based on the results of the SME CCVI survey, the consultant has developed this Comprehensive Final Report. It includes a set of policy insights and key recommendations to address the issues of SMEs in dealing with impacts of climate change, based on the results of the research study.

2.2.5.4.2 Development of Full-Fledged Version of Web-Based Interactive Dashboard

Building upon the basic version developed during the Interim Report phase, the Consultant has delivered a full-fledged operational version of the web-based interactive dashboard. This dashboard is fully capable of continuously storing data and generating analytics reports of climate vulnerability across enterprise size, nature of business, sector, geography, with respect to the impact of each climate indicator.

Comprehensive Final Report and a full-fledged operational version of the Web-based Interactive Dashboard have been submitted to the Client.

3.0 CLIMATE CHANGE SCENARIO

In order to better understand the need to immediately initiate targeted actions against climate change effects, it is useful to understand the severity of the situation and its effects on our planet and ultimately on our lives. The following discussion provides a quick glance of the situation.

3.1 Global Impacts of Climate Change

Climate change is not just an environmental phenomenon; it is a global crisis affecting the stability of ecosystems, economies, public health systems, and human security. Driven primarily by anthropogenic greenhouse gas (GHG) emissions originating from fossil fuel combustion, deforestation, industrial processes, and unsustainable land use, global warming has intensified over the last century. According to the Intergovernmental Panel on Climate Change (IPCC Sixth Assessment Report, 2023), the Earth's average surface temperature has already increased by 1.1°C compared to pre-industrial levels, with devastating consequences worldwide.

3.1.1 Key Global Impacts

- **Extreme Weather Events:** The intensity and frequency of climate-related disasters such as hurricanes, floods, droughts, and wildfires have increased significantly. These events are responsible for massive infrastructure damage, agricultural losses, displacement of communities, and economic disruptions globally. For example, in 2023, the United States, Europe, and Asia experienced historic heatwaves and flooding, underscoring the growing unpredictability of global weather patterns.
- **Sea-Level Rise:** Global sea levels have risen by approximately 20 cm since 1900, and the rate of rise is accelerating. Melting polar ice caps and glaciers, coupled with the thermal expansion of seawater, threaten the existence of low-lying island nations and coastal megacities such as Jakarta, Miami, and Dhaka. According to IPCC projections, sea levels could rise by up to 1 meter by 2100 under high-emissions scenarios, displacing millions.
- **Food and Water Insecurity:** Changing precipitation patterns, erratic monsoons, and prolonged droughts are reducing agricultural productivity across regions like sub-Saharan Africa, South Asia, and parts of Latin America. This endangers global food supply chains, increases market volatility, and contributes to malnutrition and hunger. The Food and Agriculture Organization (FAO) estimates that climate change could reduce global agricultural yields by up to 30% by 2050 in vulnerable regions.
- **Loss of Biodiversity and Ecosystem Collapse:** Rising temperatures and habitat fragmentation are pushing thousands of plant and animal species toward extinction. Coral reefs, which support over 25% of marine life, are undergoing mass bleaching events due to ocean acidification and warming. Terrestrial ecosystems are also under threat, with deforestation and land degradation exacerbating biodiversity loss.
- **Public Health Emergencies:** According to the World Health Organization (WHO), climate change is projected to cause approximately 250,000 additional deaths per year

between 2030 and 2050 due to malnutrition, vector-borne diseases (such as malaria and dengue), heat stress, and waterborne illnesses. Poor air quality caused by wildfires and urban pollution further aggravates respiratory illnesses and cardiovascular diseases.

- **Economic and Geopolitical Instability:** Climate-induced disasters have led to rising insurance costs, disrupted global trade, and damaged critical infrastructure. The World Bank estimates that climate change could push over 130 million people into poverty by 2030 without urgent mitigation and adaptation actions. Moreover, competition over dwindling natural resources (e.g., freshwater) has increased the risk of climate-related conflicts, particularly in fragile and conflict-prone regions.

3.2 Climate Change Impacts in Pakistan

Despite being responsible for less than 1% of global greenhouse gas emissions, Pakistan is disproportionately vulnerable to the impacts of climate change. Its geographic position, socio-economic structure, and high dependence on climate-sensitive sectors particularly agriculture, water, energy, and forestry compound its exposure. According to the German Watch Global Climate Risk Index (CRI, 2021), Pakistan ranked among the top 10 most climate-impacted countries over the past two decades. Key national impacts are summarized below:

- **Glacial Melting and Water Stress:** Pakistan lies at the foothills of the Hindukush-Karakoram-Himalaya (HKH) region, which contains more glaciers than anywhere outside the polar zones. Accelerated glacial melt, driven by rising temperatures, is increasing the risk of Glacial Lake Outburst Floods (GLOFs) while reducing long-term water availability in the Indus River Basin, the lifeline for Pakistan's agriculture and drinking water.
- **Erratic Weather Patterns:** The monsoon system has become increasingly unpredictable. Pakistan has experienced prolonged dry spells followed by sudden, intense rainfall, contributing to flash floods and droughts. The 2022 floods, triggered by a combination of torrential monsoon rains and glacial melt, inundated one-third of the country, directly affecting 33 million people and causing over USD 30 billion in losses and damages (UN OCHA, 2022).
- **Agricultural Vulnerability:** Over 35% of Pakistan's labor force is employed in agriculture, a sector highly exposed to climate risks. Changing weather patterns are shortening growing seasons, reducing crop yields, and facilitating the spread of pests and diseases. Staple crops like wheat, rice, and cotton are at risk, endangering national food security and export revenues.
- **Heatwaves and Health Crises:** Pakistan has repeatedly recorded some of the world's highest temperatures exceeding 50C in cities like Jacobabad and Nawabshah. These extreme heat events have led to increased cases of heatstroke, dehydration, and even deaths, particularly among vulnerable populations such as the elderly, outdoor laborers, and low-income groups without access to cooling infrastructure.
- **Urban Flooding and Infrastructure Collapse:** Major urban centers like Karachi, Lahore, and Rawalpindi experience regular urban flooding due to poor drainage

systems and unregulated construction. These events lead to property damage, transportation disruptions, and loss of livelihoods, especially in informal settlements.

- **Disproportionate Impact on SMEs and Informal Workers:** SMEs, which make up over 90% of Pakistan's businesses, lack the financial resilience and technical knowledge to withstand climate shocks. Similarly, informal workers and smallholder farmers face chronic vulnerability due to inadequate social protection, limited access to climate-resilient infrastructure, and lack of early warning systems.
- **Rising Socioeconomic Inequality:** Climate change is deepening pre-existing social inequities by disproportionately affecting women, children, the elderly, and marginalized communities, particularly in rural and peri-urban areas.

3.3 Governmental and Policy Response

Pakistan has made taken important initiatives over the past years in institutionalizing climate action. Some key initiatives are listed below:

- Pakistan Climate Change Act (2017) and the establishment of the Ministry of Climate Change and Environmental Coordination
- Submission of its updated Nationally Determined Contributions (NDCs) to the UNFCCC in 2021
- Launch of the National Climate Finance Strategy (2024) to enhance access to domestic and international climate finance
- Introduction of the National Carbon Market Policy (2024) aimed at creating a regulatory framework for carbon trading
- Enactment of the Single-Use Plastics Prohibition Regulations (2023) and the National Hazardous Waste Management Policy (2022)
- Adoption of Article 9A of the Constitution (2024), recognizing the right to a clean and healthy environment
- Engagement with global platforms such as COP29 to promote climate justice and secure funding under mechanisms like the Loss and Damage Fund and the IMF's Resilience and Sustainability Trust

3.4 Climate Change Impact on SMEs and Relevance to the Current Project

SMEs contribute over 40% to the GDP, account for nearly 25% of exports, and employ more than 80% of the non-agricultural labor force. Despite their critical economic and social importance, these enterprises are highly vulnerable to climate change, particularly in developing countries like Pakistan. Climate-induced disruptions such as floods, storms, droughts, heatwaves, and shifts in seasonal cycles have profound implications for SME operations, profitability, and long-term sustainability.

Climate change affects SMEs through multiple direct and indirect channels:

- **Operational Disruption:** Flooding, extreme heat, or supply chain disruptions lead to temporary closures, property damage, and increased maintenance costs.

- **Rising Input and Energy Costs:** Fluctuating temperatures, water scarcity, and disrupted logistics increase costs of raw materials, water, energy, and cooling systems.
- **Decreased Productivity and Market Access:** Climatic variability reduces workforce productivity, delays deliveries, and erodes market competitiveness.
- **Credit and Investment Constraints:** SMEs often lack access to climate risk insurance, concessional finance, and technical assistance, making them more vulnerable to insolvency after climate shocks.
- **Sector-specific Threats:** SMEs in agriculture, livestock, manufacturing, and trade are particularly exposed to environmental risks such as erratic rainfall, livestock disease outbreaks, and perishability of goods.

These risks are compounded by the limited adaptive capacity of SMEs. Most SMEs operate informally or with minimal infrastructure, lack institutional support, and are often excluded from national climate strategies. Their awareness of climate risks is typically low, and they have limited access to climate-smart technologies, early warning systems, and risk assessment tools.

3.5 Relevance of the Current Project

In this context, the RRI&A has launched a vital project titled “*Conducting Surveys on Climate Change Vulnerability of SMEs in Punjab*”, designed to systematically gather primary data from 200 SMEs across four districts (Lahore, Faisalabad, DG Khan, and Rahimyar Khan) representing both high and low climate-vulnerability zones.

The project employs a structured Climate Change Vulnerability Index (CCVI) to analyze three dimensions of vulnerability:

- **Exposure** to climate hazards
- **Sensitivity** of the business to climate impacts
- **Adaptive capacity** to respond and recover

The relevance and strategic importance of this project lies in several key aspects:

Evidence-based Vulnerability Assessment: By deploying a scientifically developed Climate Change Vulnerability Index (CCVI), the project quantifies SME vulnerability across three dimensions exposure, sensitivity, and adaptive capacity. This granular data will enable sector-specific and location-specific analysis, allowing policymakers to tailor interventions to the needs of different enterprise groups.

Cross-sectoral Coverage: The survey includes SMEs from manufacturing, agriculture/livestock, services, and trading ensuring that insights reflect the full spectrum of climate vulnerabilities across different value chains and business models.

Data-Driven Policy Formulation: The project directly supports national climate resilience planning by bridging the information gap on how climate change affects SMEs. It lays the

foundation for targeted policy development, such as climate-proofing industrial zones, offering climate-resilient financial instruments, and improving SME access to early warning systems and adaptation finance.

Capacity Building for Climate-Smart Business Practices: Through the identification of gaps in SME readiness and resilience, the project highlights opportunities for business capacity enhancement, such as introducing energy-efficient technologies, waste management systems, and climate-risk insurance.

Interactive Monitoring Tools: The development of a web-based interactive dashboard as part of the assignment will institutionalize climate data collection and visualization, allowing real-time tracking of vulnerability indicators and strengthening monitoring and evaluation mechanisms.

Alignment with National Priorities: The project contributes directly to Pakistan's obligations under the UNFCCC, supports the goals outlined in the National Adaptation Plan, and aligns with commitments under the Declaration on Children, Youth and Climate Action (COP29), particularly by focusing on economic inclusion and resilience for future generations.

Pilot for Nationwide Scaling: The methodology and tools developed under this pilot in Punjab can serve as a scalable model for assessing SME climate vulnerability across other provinces, enabling a nationally harmonized SME climate action agenda.

By building a disaggregated understanding of SME vulnerabilities, the project directly supports national climate goals and promotes inclusive, climate-resilient economic growth. It also reinforces Pakistan's commitments under the Paris Agreement, the Sendai Framework for Disaster Risk Reduction, and the Sustainable Development Goals (SDGs) particularly SDG 13 (Climate Action), SDG 8 (Decent Work and Economic Growth), and SDG 9 (Industry, Innovation and Infrastructure).

4.0 SAMPLE PROFILE

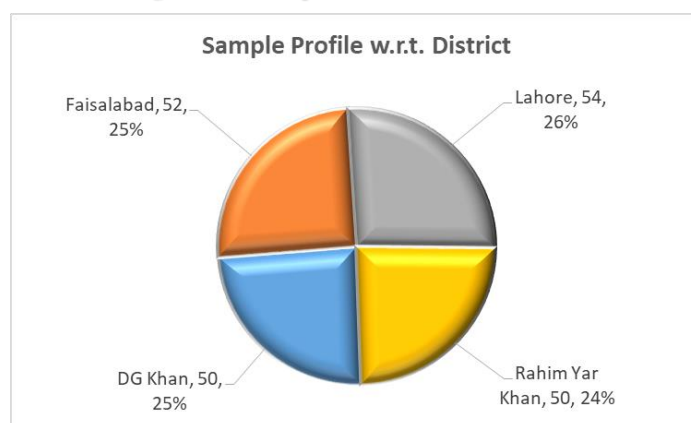
4.1.1 Province-wise Breakup

As per the project's TOR, the geographical scope of the survey included four districts from Punjab.

4.1.2 District-wise Breakup

The survey sample size was 206 which was almost equally divided between four districts. Lahore and Faisalabad were classified as less vulnerable districts and D.G. Khan and Rahimyar Khan were classified as more vulnerable districts. Of the total 206 SMEs interviewed, 54 were from Lahore, accounting for 26% of total survey size. Sample distribution between the four target districts is shown in Figure 1.

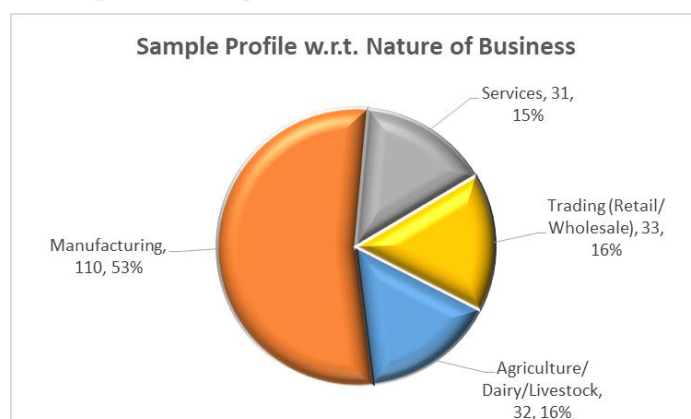
Figure 1 – Sample Profile w.r.t. Districts



4.1.3 Nature of Business-wise Breakup

The distribution of the responding SMEs in the sample with respect to their nature of business required around 55% manufacturing SMEs, with the balance 45% divided equally between Agriculture/Dairy Livestock, Services and Trading sectors (15% each). The distribution of the total 206 surveyed SMEs is shown in Figure 2. 53% SMEs were selected from manufacturing sector, 16% from trading, 16% from agriculture/livestock dairy and 15% from services sectors.

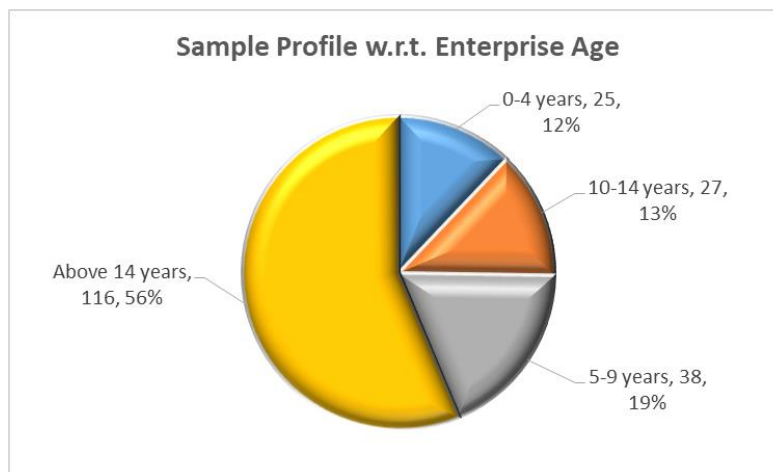
Figure 2 – Sample Profile w.r.t. Nature of Business



4.1.4 Enterprise-Age-wise Distribution

The sample was also segregated with respect to the enterprise age. Four categories were defined for that purpose. Enterprise selection process during the survey ensured that the sample included SMEs from all the four categories. The split of the sample of 206 surveyed enterprises with respect to age is shown in Figure 3.

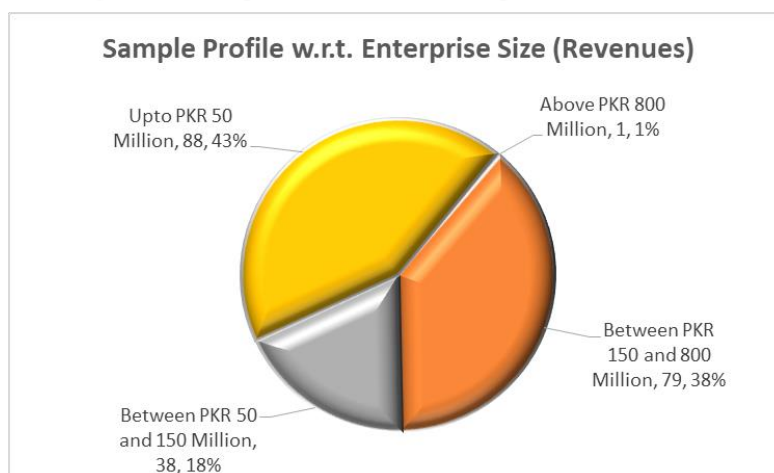
Figure 3 – Sample Profile w.r.t. Enterprise Age



56% of the sampled SMEs were more than 14 years old. 13% SMEs fell in the age group of 10 to 14 years, whereas 19% fell in the range from 5 to 9 years. The last category of age, which represented the startups (up to 4 years age) included 25 SMEs, accounting for 12% of the total sample.

4.1.5 Enterprise Size-wise Breakup

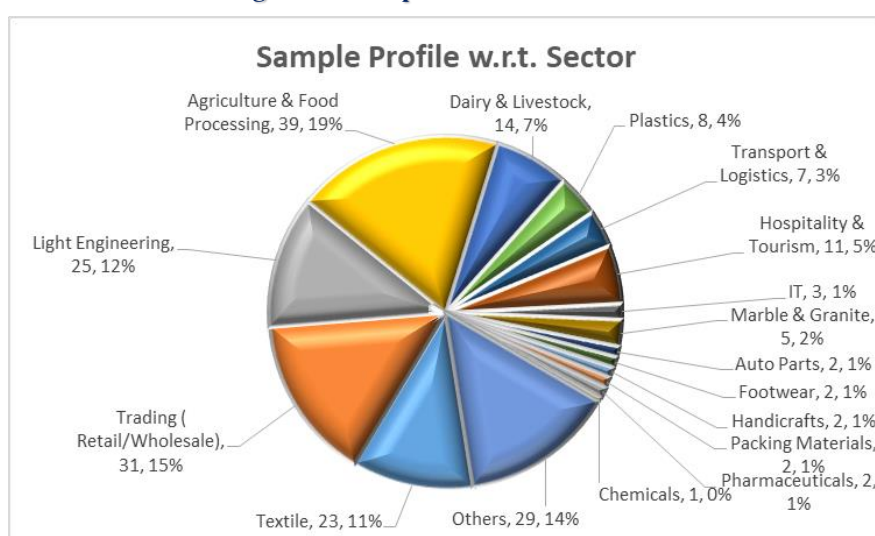
The research design also included studying the impact of climate change with respect to the enterprise size, which was defined by its annual revenue. The survey questionnaire mentioned four revenue ranges to define the size, and the sample included SMEs of all four sizes. Distribution with respect to enterprise size is shown in Figure 4.

Figure 4 – Sample Profile w.r.t. Enterprise Size (Revenue)

As per the national SME definition, 61% of the total surveyed enterprises were ‘small’. 43% of these enterprises had an annual revenue of up to PKR 50 million, and 18% had a revenue in the range PKR 50-150 million. 79 SMEs, constituting 38% of the total surveyed SMEs, were medium, with their annual revenue falling in the range PKR 150-800 million. There was one enterprise which was large, having an annual revenue of more than PKR 800 million.

4.1.6 Sector-wise Breakup

The survey process ensured that the sample included SMEs from diverse sectors so as to assess the overall average impact of climate change. Agriculture & Food Processing was the largest sector in the sample accounting for 19% of the total surveyed SMEs. Trading accounted for 15%, Light Engineering 12%, Textile 11%, Dairy & Livestock 7% and Plastics 4% of the total 206 surveyed enterprises. The balance 32% was accounted for by other sectors.³ Sector-wise split of the sample is shown in Figure 5.

Figure 5 – Sample Profile w.r.t. Sector

³ Other sectors included packaging, glass, automobile paints, rubber products and stationery.

5.0 EXTERNAL CLIMATE CHANGE FACTORS VULNERABILITY ANALYSIS

The survey questionnaire mapped the perceptions of the responding SMEs about their climate change vulnerability with respect to external factors. There were nine external factors in the questionnaire about which the surveyed SMEs shared their perceptions by choosing one response from the four available responses. Each response was also associated with a score, with higher score designating higher vulnerability. The responses and the associated scores are shown in Table 6.

Table 6 – External Factors Rating Options and Assigned Scores

Response	Explanation	Score
Significant Effect	Very likely to impact	3
Moderate Effect	Likely to impact	2
Minor Effect	Less likely to impact	1
No Effect	Not likely to impact	0

The potential impact of climate change due to external factors was analyzed by defining ranges of the final vulnerability score. The four types of potential effects are listed in Table 7.

Table 7 – External Factors Effect Options and Effects

Total Score Range	Effect
0	No Effect
Up to 1.0	Minor Effect
Greater than 1.0 and Up to 2.0	Moderate Effect
Greater than 2.0 and Up to 3.0	Severe Effect

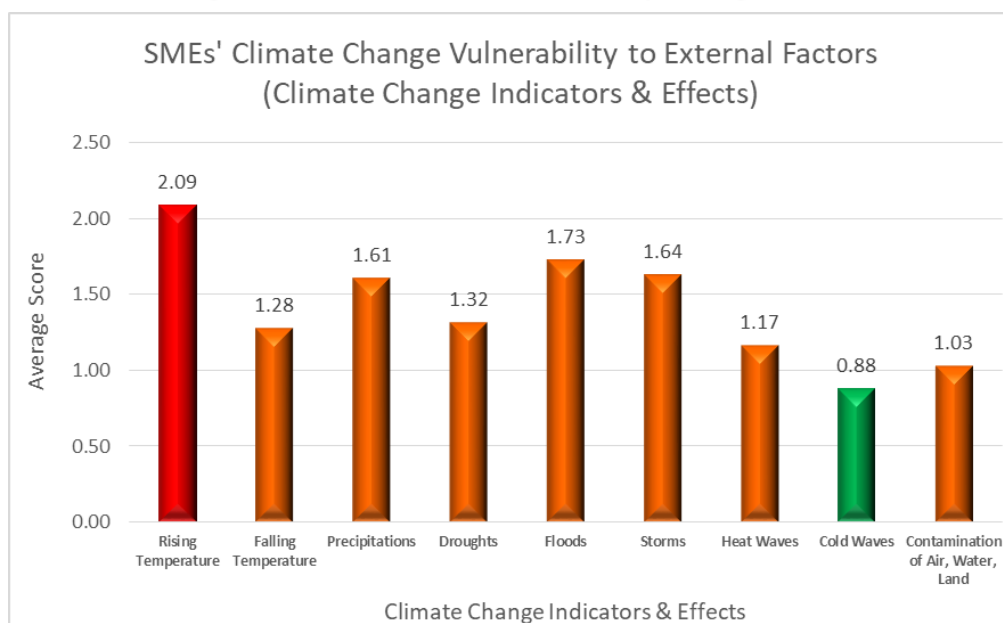
Average external vulnerability scores, calculated from the survey results, have been presented in the form of charts. For improving the visual presentation and better understanding of the readers, a color coding has been used in these charts. Vulnerability has been presented by using three colors, explained in Table 8.

Table 8 – External Factors Impact Score Ranges and Color Codes

Total Score Range	Bar Color
Up to 1.0	Green
Greater than 1.0 and Up to 2.0	Orange
Greater than 2.0 and Up to 3.0	Red

5.1 External Factors Vulnerability Average Scores

For comparing the overall climate external factors vulnerability perceptions of 206 surveyed enterprises in the four districts of Punjab, average scores were calculated for all the nine external factors. The results are presented in Figure 6.

Figure 6 – External Factors Vulnerability Average Scores

With an average score of 2.09, Rising Temperature was seen as the most significant factor likely to affect the business operations of SMEs. This showed that the SMEs perceived this factor as a climate change factor to have severe effect. The second largest threat was perceived to be Floods (heavy rains and snow storms) which had an average score of 1.73, signifying moderate effect. Storms (1.64), Precipitations (1.61) and Heat Waves (1.17) were respectively perceived as the third, fourth and fifth external climate factors likely to affect the business operations. Their scores also indicated moderate effect on business operations. Falling temperatures and Droughts were not perceived as major factors likely to disturb the routine business operations of SMEs, with their average scores lying in moderate range. Contamination of Air, Water and Land was seen as a threat of lower degree with an average score of 1.03, falling close to minor effect. Cold waves was seen as the factor least likely to affect the business operations. With a score of 0.88, it translated into a minor effect.

The average of all these average scores came out to be 1.42 which showed that the average external factor vulnerability for all the enterprises, surveyed from four districts, had a moderate climate change impact on the operations of SMEs. This showed that on an overall basis, the surveyed SMEs did not perceive the Climate Change external factors to be a major threat to their business operations. Eight of the nine factors received average scores lying between 1.0 and 2.0, the range representing moderate effect.

5.2 Vulnerability to Different External Factors

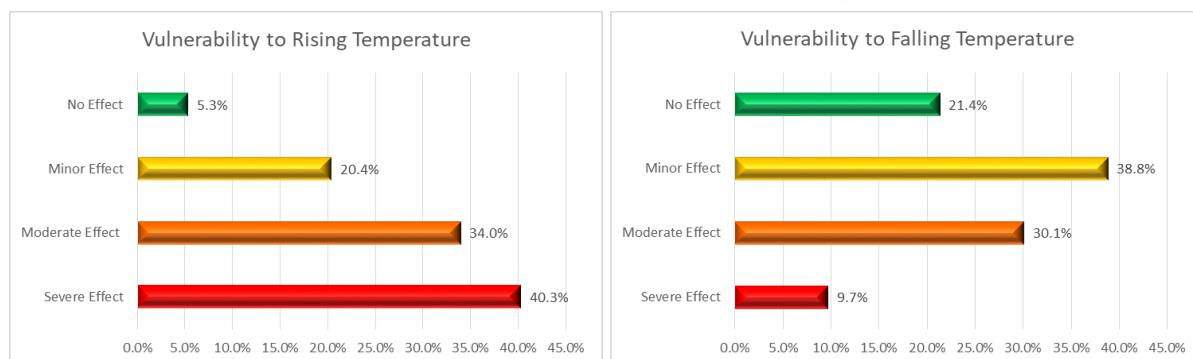
The following section maps the perceptions of the surveyed SMEs with respect to all the nine external climate change factors affecting the business operations of SMEs.

5.2.1 Vulnerability to Rising and Falling Temperatures

With an average score of 2.09, Rising Temperature was perceived to be the most significant factor, among all the nine factors, having a severe effect on business operations of SMEs.

Breakup of the four types of responses received for Rising Temperature and Falling Temperature is shown in Figure 7.

Figure 7 – Vulnerability to Rising and Falling Temperatures

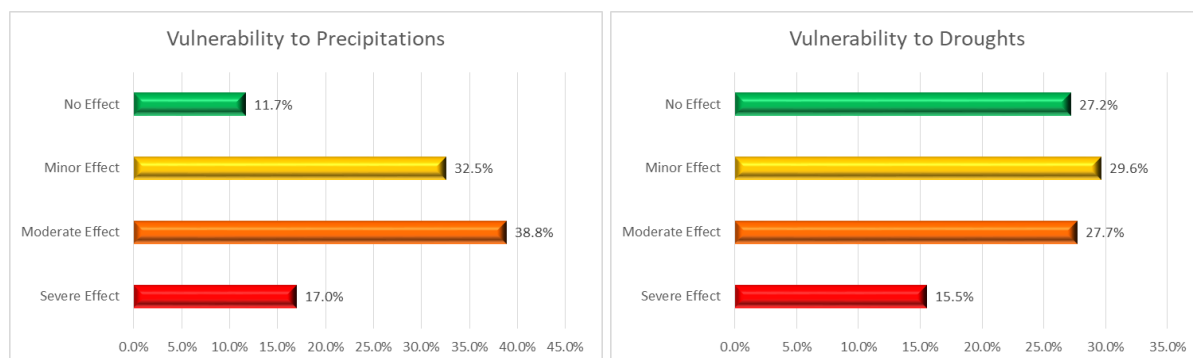


Only 5.3% respondents said that Rising Temperature does not have any effect on their business operations which meant that 94.7% surveyed SMEs perceived it to be having an impact. This indicates the high level of realization among the local SMEs about the threat associated with Rising Temperature. The highest number of responses (40.3%) were obtained for severe effect, while 34% perceived this effect to be moderate. Compared to this, the average score of the Falling Temperature was only 1.28, much lower than that for Rising Temperature, with only 9.7% SMEs perceiving it to have a severe effect. Of the balance responses, 38.8% respondents perceived that Falling Temperature has minor effect, and 21.4% perceived it to have no effect on their business operations.

5.2.2 Vulnerability to Precipitations and Droughts

Precipitations was perceived as the third most significant factor affecting the business operations. Average score on this factor was 1.61. Only 11.7% respondents quoted Precipitations to have no effect which meant that 88.3% considered it to be a factor affecting their businesses, with 38.8% respondents considering it to have moderate effect and 17% considering it to have severe effect. Breakup of 206 responses regarding the effect of Precipitations and Droughts is shown in Figure 8.

Figure 8 – Vulnerability to Precipitations and Droughts



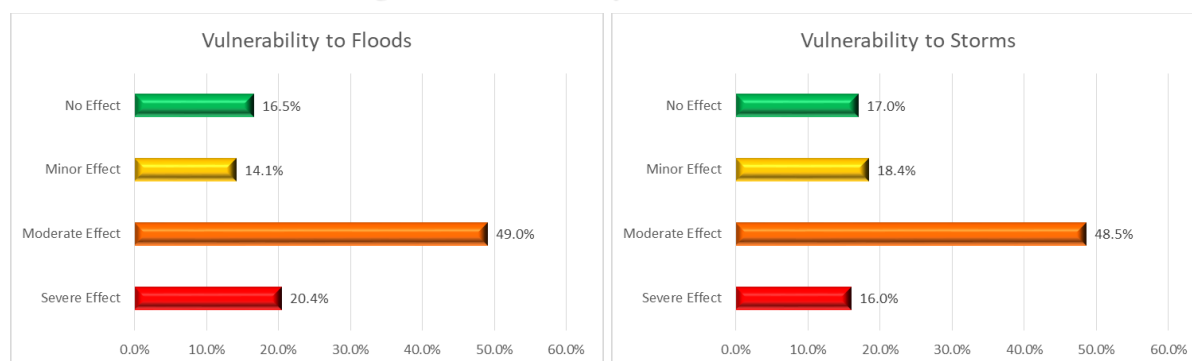
Average score regarding the effect of Droughts was 1.32 which was rated moderate effect on the business operations. 27.2% of the surveyed enterprises perceived Droughts to have no effect

on their businesses, whereas 29.6% perceived it to have minor effect. 27.7% SMEs thought that Droughts have a severe effect on their businesses.

5.2.3 Vulnerability to Floods and Storms

The responses of the surveyed SMEs regarding the effects of Floods and Storms on their business operations followed similar trends, with their average scores being 1.73 and 1.64 respectively. Floods was considered to be a slightly bigger threat compared to Storms. For both the factors, the largest number of responses were obtained for moderate effect. 49% SMEs perceived Floods to have moderate effect whereas, 48.5% SMEs perceived Storms to have moderate effect on the business operations. There was a slight difference in the perceptions when 20.4% responses rated the effect of Floods to be severe, compared to 16% responses for Storms. For both the factors, around 17% SMEs perceived them to have no effect on their businesses. The survey results of the responses about the effects of Floods and Storms is shown in Figure 9.

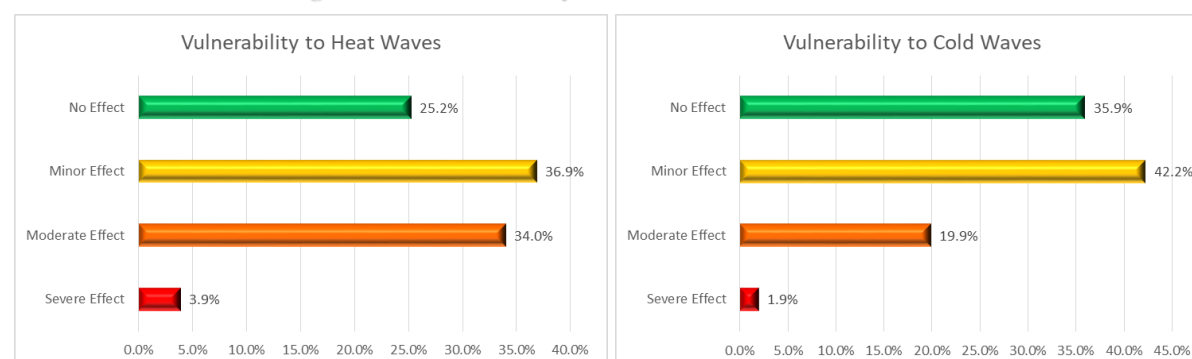
Figure 9 – Vulnerability to Floods and Storms



5.2.4 Vulnerability to Heat Waves and Cold Waves

Average vulnerability perception of Heat Waves as rated as moderate, with a score of 1.17, whereas the average vulnerability perception of Cold Waves was rated as minor, with a score of 0.88. 25.2% surveyed SMEs perceived Heat Waves to have no effect on business operations, whereas for Cold Waves, that share was 35.9%. Only 3.9% respondents perceived that Heat Waves have a severe effect on business operations whereas for Cold Waves, the SMEs perceiving it to have severe effect was only 1.9%. For both Heat Waves and Cold Waves, the highest shares of responses (36.9%) were obtained for minor effect (36.9% for Heat Waves and 42.2% for Cold Waves). The results are shown in Figure 10.

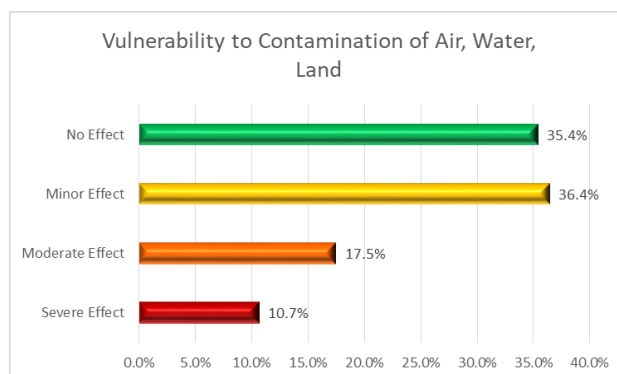
Figure 10 – Vulnerability to Heat Waves and Cold Waves



5.2.5 Vulnerability to Air, Water & Land Contaminations

Distribution of 206 responses between the four types of responses to map the effect of Air, Water and Land Contaminations is presented in Figure 11.

Figure 11 – Vulnerability to Air, Water and Land Contaminations

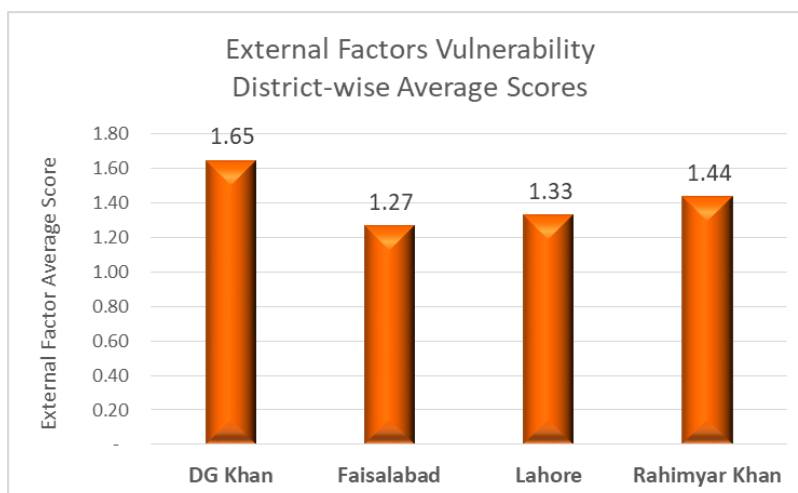


Average score for this factor was found to be 1.03 which placed it at the eighth rank among all the nine external factors being compared. 35.4% SMEs perceived that Contaminations of Air, Water and Land do not have any effect in their business operations whereas 10.7% respondents thought that this factor has a severe effect on their businesses.

5.3 External Factors Vulnerability-District-Wise Comparison

The survey covered four districts, including Lahore and Faisalabad, categorized as less vulnerable and DG Khan and Rahimyar Khan, categorized as more vulnerable districts. The data was sliced with respect to districts to understand the differences of the SMEs perceptions about vulnerability to climate change. Figure 12 shows the average external factors vulnerability scores of the four surveyed districts.

Figure 12 – District-wise Average External Factors Vulnerability Scores



These average scores are the averages of the scores for all the nine factors for the four districts. All the four districts had scores in the range from 1.0 to 2.0 which indicated that the external climate change factors have a moderate effect on the business operations of the SMEs in these districts. The survey results showed that the average scores of DG Khan and Rahimyar Khan

were higher than those of Lahore and Faisalabad. This result validated the hypothesis regarding the categorization of these four districts between less and more vulnerable districts.

As per the results, DG Khan was found to be the most vulnerable district, with an average score of 1.65. It was followed by the other more vulnerable district Rahimyar Khan which had an average score of 1.44. Lahore's average score was 1.33 which was only slightly higher than 1.27, the average score of Faisalabad. Both these scores translated into a moderate effect on the business operations of the SMEs in the two districts. Lahore and Faisalabad are located in central Punjab, not very far from each other. Both are industrial cities, and have quite similar industrial profiles, comprising of key sectors like Textile, Light Engineering, Food Processing, etc. Similarly, DG Khan and Rahimyar Khan are located in similar terrain in southern Punjab. As a result, the perceptions of the SMEs in those two districts about the threat of external climate change factors are not very different from each other.

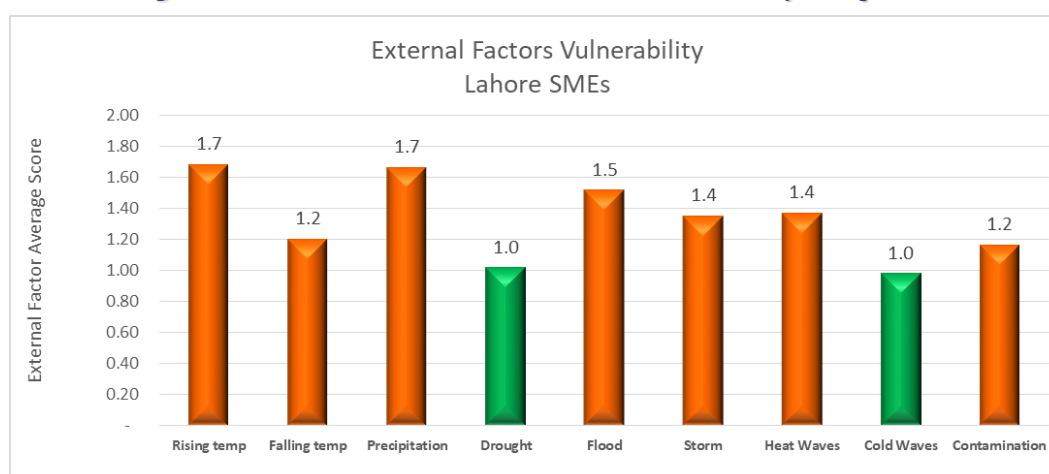
The average external factors vulnerability scores of the two more vulnerable districts was calculated to be 1.54, compared to 1.30 for less vulnerable districts. The SMEs in both these district categories were found to be moderately affected by the external climate change factors.

District-wise comparisons of the climate change vulnerability perceptions of the SMEs surveyed in Lahore, Faisalabad, DG Khan and Rahimyar Khan for nine external climate change factors, are presented in Figure 13, Figure 14, Figure 15 and Figure 16 respectively.

5.3.1 Lahore SMEs – External Factors Vulnerability

The SMEs surveyed from Lahore perceived Rising Temperature and Precipitations as the two most threatening climate change factors. The average score for both these factors was found to be 1.7. Floods, with an average score of 1.5, was perceived as the next most damaging factor for the business operations. It was followed by the two factors of Storms and Heat Waves. The factors perceived to have lower effect on business operations were Air, Water and Land Contamination, Droughts and Cold Waves.

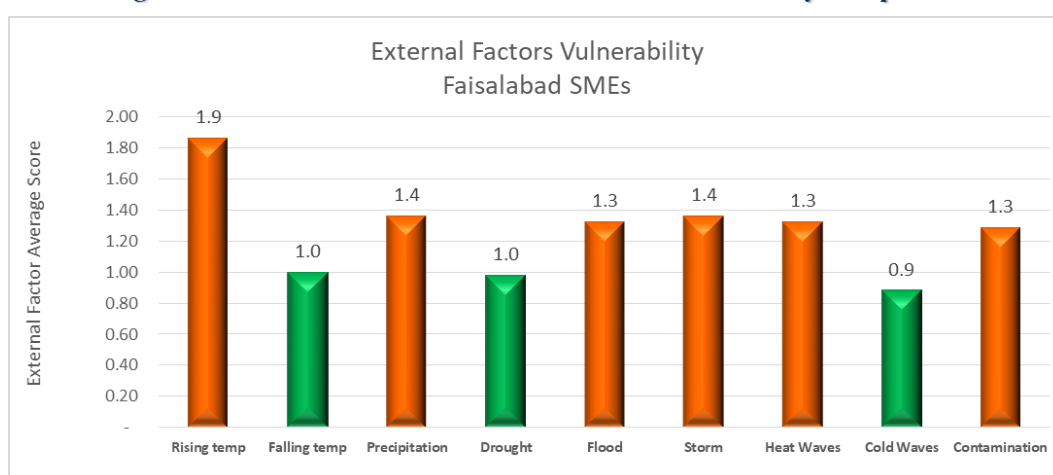
Figure 13 – Lahore SMEs - External Factors Vulnerability Comparison



5.3.2 Faisalabad SMEs – External Factors Vulnerability

The SMEs surveyed in Faisalabad also perceived Rising Temperature to be the biggest factor affecting their business operations. The vulnerability score for this factor was 1.9, higher than that for Lahore. This perception is aligned with the climate data of the two districts. In 2021, the mean daily average temperature in Faisalabad was 31.6 C, compared to 30.5 C in Lahore.⁴ The second most threatening factor, as perceived by Faisalabad SMEs, was Precipitations where the average score was 1.4. However, the perceived intensity of the effect of Perceptions was 22% higher in Lahore where the score was 1.67. This perception is also aligned with the climate data of the two districts. In 2021, the average recorded precipitation in Lahore was 747 mm compared to 668 mm in Faisalabad.⁵

Figure 14 – Faisalabad SMEs - External Factors Vulnerability Comparison



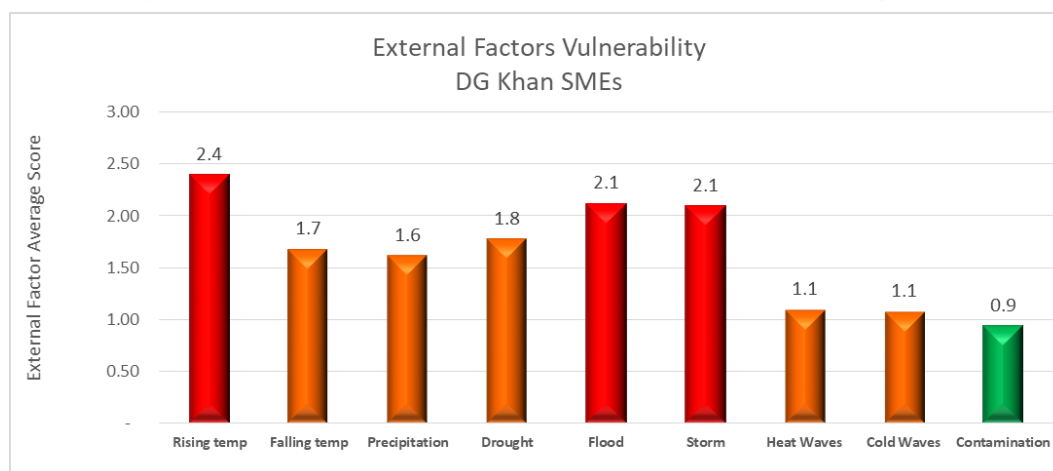
The third most important climate change vulnerability factor, perceived by the SMEs surveyed in Faisalabad, was Storms, which had an average score of 1.4. This result was different from the result of Lahore where Floods was identified as the third most affecting factor. After Storms, Floods, Heat waves and Air, Water & Land Contamination were considered to be next most damaging climate change factors for small and medium businesses in Faisalabad. These three factors had an average score of 1.3. The factors of Droughts, Cold Waves and Falling Temperature were perceived to be least affecting the SME businesses in Faisalabad.

5.3.3 DG Khan SMEs – External Factors Vulnerability

Average external factors vulnerability score of the SMEs surveyed from DG Khan was 1.65 which was the highest among all the four districts. Looking into the individual factors, Rising Temperature, Floods and Storms, with respective average scores of 2.4, 2.1 and 2.1, were found to have severe effect on business operations of surveyed SMEs. This was in contrast to the similar scores of the two less vulnerable districts which were found to have moderate effect.

⁴ https://en.wikipedia.org/wiki/Climate_of_Lahore
https://en.wikipedia.org/wiki/Climate_of_Faisalabad

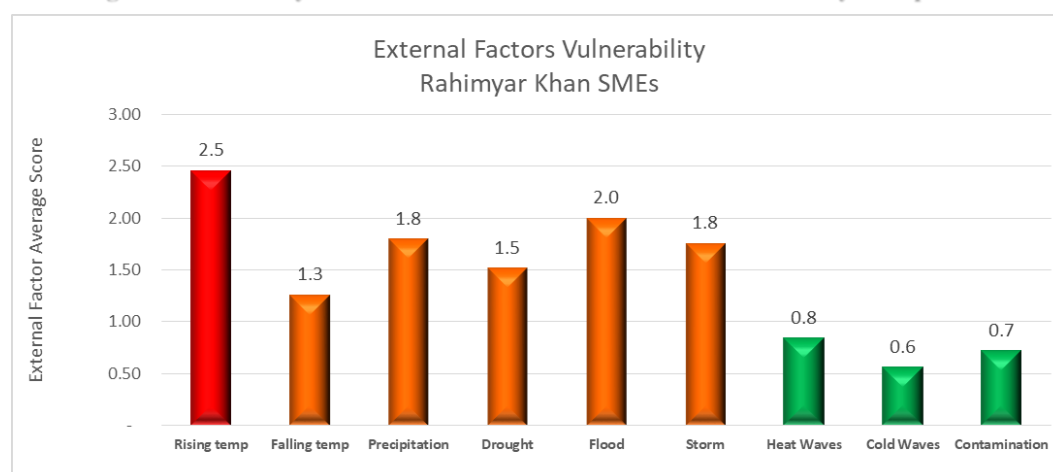
⁵ Ibid

Figure 15 – DG Khan SMEs - External Factors Vulnerability Comparison

Drought was the next more threatening factor identified by the SMEs of DG Khan. It had a score of 1.8 which was the highest among all the four districts. Falling temperatures and Precipitations were the two next factors perceived to be affecting the business operations of the surveyed SMEs. Precipitations was rated at 1.6, placing it in the moderate effect range. It is interesting to note that this score was lower than the similar score for Lahore SMEs (1.7), aligned with the fact that there is lesser rainfall in DG Khan compared to that in Lahore. The effect of heat waves and cold waves was also rated as moderate, but towards the lower end. There was only the factor of Air, Water & Land Contamination which was perceived to have minor effect on the business operations of DG Khan SMEs.

5.3.4 Rahimyar Khan SMEs – External Factors Vulnerability

The average score of external climate change factors vulnerability for the SMEs of Rahimyar Khan was 1.44, ranking it as the second most vulnerable district among the four surveyed districts. The highest score of 2.5 was obtained for Rising Temperature showing it as the most threatening climate change factor for the surveyed SMEs. The effect of this factor was rated as severe. The second biggest factor affecting the operations of the SMEs in this district was Floods which was also placed at the starting boundary of the severe effect range.

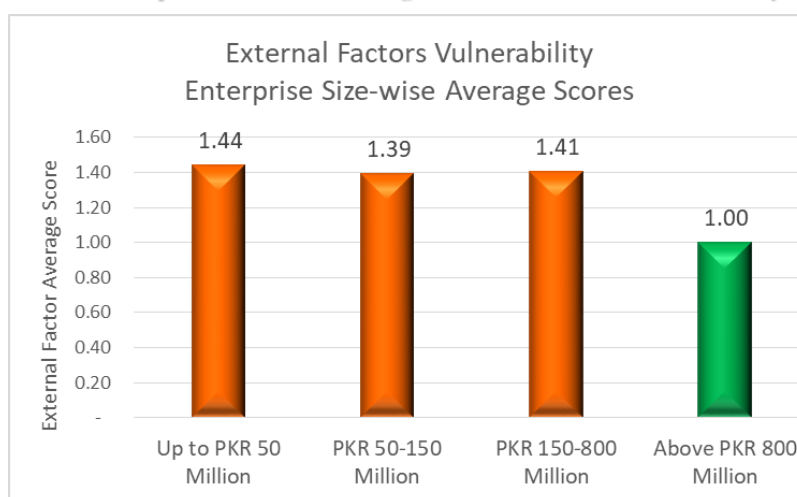
Figure 16 – Rahimyar Khan SMEs - External Factors Vulnerability Comparison

Storms and Precipitations were rated at a score of 1.8 indicating that the effect of these two factors was perceived as moderate. Falling Temperature also fell in the moderate range. There were three factors of Heat Waves, Cold Waves and Air, Water & Land Contamination for which the scores were less than 1.0, thereby placing them in the minor effect range.

5.4 External Factors Vulnerability-Enterprise Size-Wise Comparison

Climate change vulnerability for the surveyed SMEs was also analyzed with respect to the enterprise size (defined by the annual revenues). Average vulnerability scores for external factors were calculated for the enterprises falling under the four sizes, as defined in the questionnaire. Figure 17 shows the average scores of the SMEs categorized under the four sizes.

Figure 17 – Enterprise Size-wise Average External Factors Vulnerability Scores

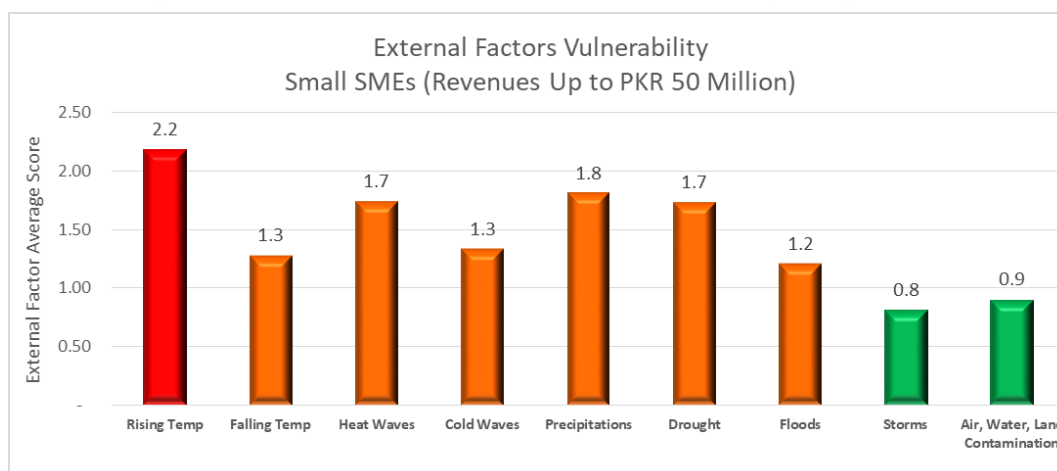


Climate change external factors vulnerability of the medium and small SMEs fell in the moderate range whereas the vulnerability of large enterprises fell in the minor range. The highest vulnerability score of 1.44 was observed for the small enterprises (Up to PKR 50 million) compared to the score of 1.41 for medium enterprises. There was only one large enterprise in the sample of 206 which had a score of 1.0, rating the effect as minor.

Enterprise size-wise comparisons of the climate change vulnerability perceptions of the SMEs, for nine external climate change factors, are presented in Figure 18, Figure 19, Figure 20 and Figure 21.

5.4.1 Small Enterprises (Up to PKR 50 Million) – External Factors Vulnerability

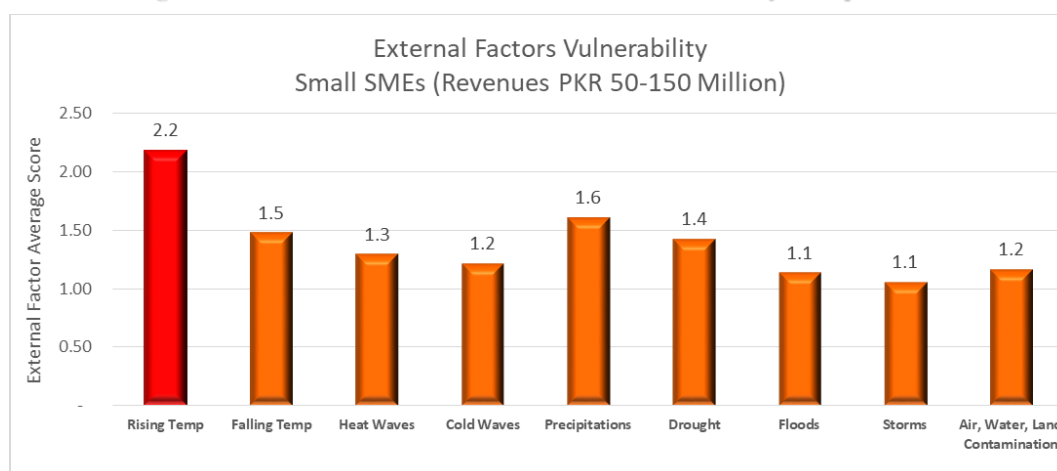
For small enterprises, with an average score of 2.2, Rising Temperature was perceived to be biggest factor affecting their routine business. The effect of this factor was rated to be severe. Rising temperature factor is likely to affect the availability and efficiency of the labor and other similar reasons. The second most threatening factor was perceived to be Precipitations which received a score of 1.8. That was the case since the location or the infrastructure of these enterprises are usually more exposed to irregular or excessive rainfall due to monsoons or unpredictable weather patterns. There were two factors, Heat Waves and Droughts, each with a score of 1.7, which were ranked as the third most damaging factors for the small SMEs. All those factors were rated as having moderate effect on the business operations of small SMEs.

Figure 18 – Small SMEs - External Factors Vulnerability Comparison-1

Floods, Cold Waves and Falling Temperature were also perceived to have moderate effect on business operations. The small SMEs usually have inadequate building and infrastructure, which increases their exposure to damages, compared to the bigger enterprises. Storms and Air, water & Land Contamination, had low vulnerability scores, lying in the minor range, and thus were not considered as major threats affecting the business operations.

5.4.2 Small Enterprises (PKR 50-150 Million) – External Factors Vulnerability

The SMEs having revenues in the range PKR 50-150 million are also classified as small enterprises. Perceptions of these enterprises about the climate change vulnerability were somewhat different from the small SMEs with revenues up to PKR 50 million. Rising Temperature was ranked as the factor with the highest average vulnerability scores of 2.2, placing it in the severe effect range. The extremely high temperatures affect the routine operations by possible disrupting supply chains, workforce productivity, etc. The next most threatening climate change factor for these small SMEs was Precipitations, getting a score of 1.6. Heavy rainfall or erratic weather was thus perceived as an important factor, affecting the routine business operations moderately.

Figure 19 – Small SMEs - External Factors Vulnerability Comparison-2

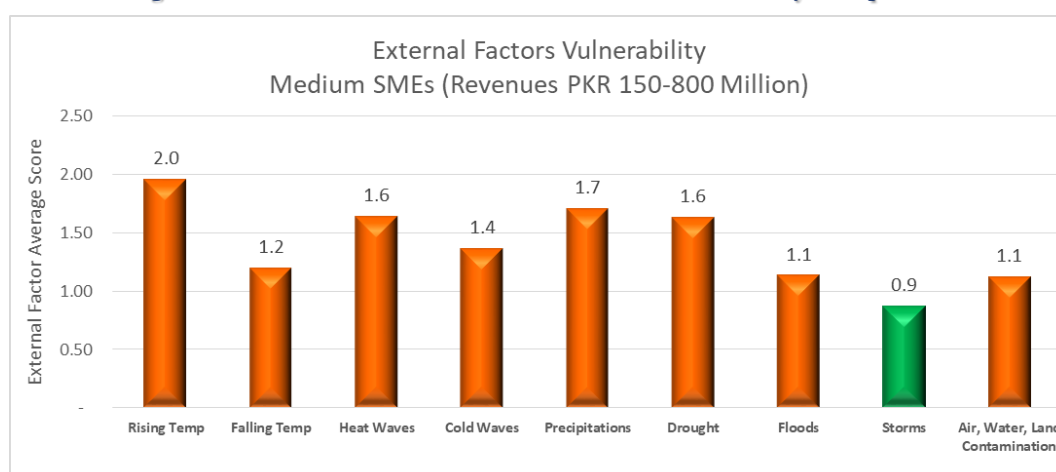
Falling Temperature was rated as the next most threatening factor, affecting the business operations moderately. Air, Water & Land Contamination had a score of 1.2 which showed

that the SMEs perceive these factors affecting their operations to have moderate effect in the forms of infrastructure damage, logistical disruptions, and needs for environmental compliance. Storms factor was rated at 1.1 which was lower than the rating on this factor by the SMEs having revenues up to PKR 50 million. None of the nine external climate change factors had scores lower than 1.0, thereby indicating that no factor was perceived to have minor effect on the business operations.

5.4.3 Medium Enterprises – External Factors Vulnerability

Climate External Factors Vulnerability average scores for medium enterprises, with revenues falling in the range PKR 150-800 million, are presented in Figure 20. Rising Temperature was considered to be the biggest factor affecting the business operations of these SMEs. The average score for this factor was 2.0 which represents the start of the severe effect range. This score was lower than the scores on this factor of the two categories of small enterprises. This means that medium enterprises are less exposed to the effects of Rising Temperature, compared to small and large enterprises.

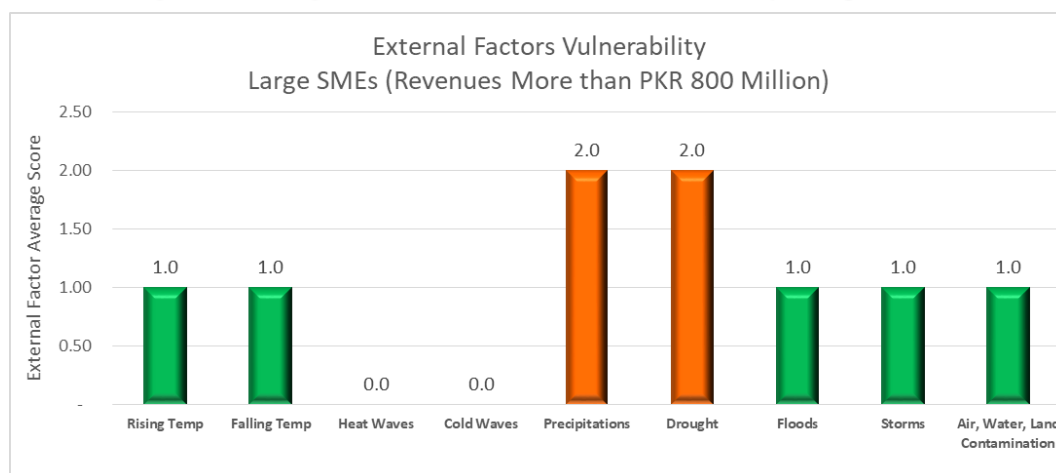
Figure 20 – Medium SMEs - External Factors Vulnerability Comparison



With an average score of 1.7, Precipitations was perceived as the next important factor affecting the businesses of medium enterprises. The other two factors, each with a score of 1.6, were Heat Waves and Droughts, placing them in the moderate effect range. With a score of 1.4, Cold Waves was considered as the next factor affecting the operations. It was followed by Air, Water & Land Contamination and Floods. It was only the factor of Storms for which the effect was rated as minor, with a score of 0.9.

5.4.4 Large Enterprises – External Factors Vulnerability

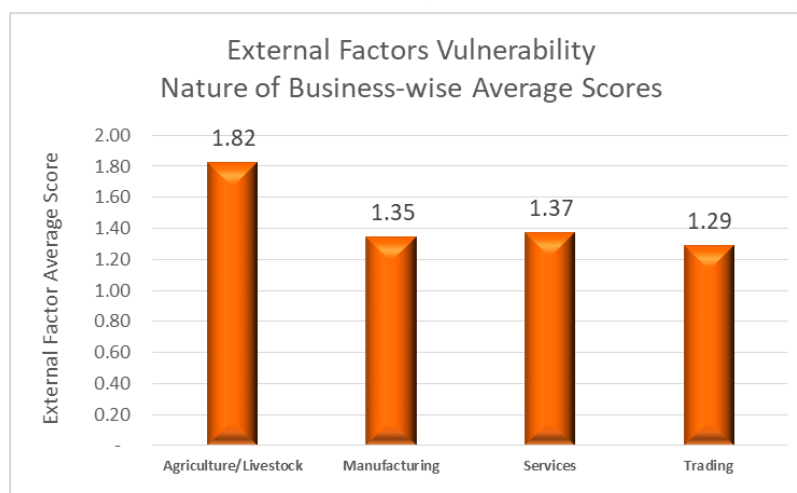
There was only one large enterprise in the survey, the results of which are presented in Figure 21.

Figure 21 – Large SMEs - External Factors Vulnerability Comparison-1

Precipitations and Droughts were the two climate change vulnerability factors which were perceived to have effect close to the severe range. No effect was perceived for Heat Waves and Cold Waves, whereas for all other factors, the effect on business operations was perceived to be minor. The results need to be interpreted in the context that it is the data of only one enterprise.

5.5 External Factors Vulnerability-Business Nature-Wise Comparison

Climate change vulnerability for the surveyed SMEs was also analyzed with respect to the nature of business. Average vulnerability scores for external factors were calculated for the enterprises falling under the four types of businesses, as defined in the questionnaire. Figure 22 shows the average scores of the SMEs categorized under the four types of businesses.

Figure 22 – Nature of Business-wise Average External Factors Vulnerability Scores

Agriculture/Livestock/Dairy sector was perceived to be most vulnerable to external climate change factors. The average score of all the nine factors, for the enterprises engaged in this type of business was found to be 1.82 which meant a moderate effect on the business operations. This is because the performance of Agriculture/Livestock SMEs is directly linked with the climate factors like temperature, availability of water, contamination in soil, air or

water, storms, etc. Most of the agricultural activities are carried out in open spaces which are more prone to natural disasters like floods and storms. It can be inferred that all these factors led to developing a perception of having a higher score, compared to other sectors. However, in spite of that, the perception did not fall in the severe effect range (2.0-3.0).

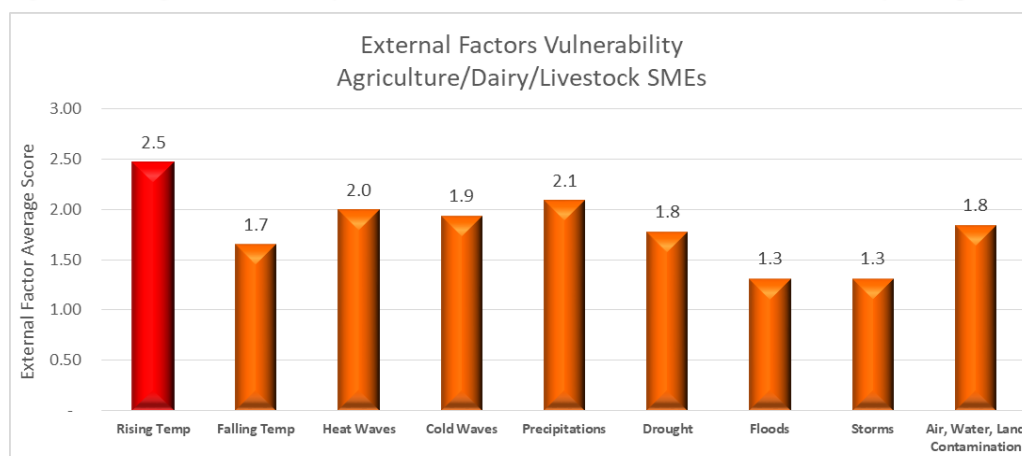
The second and third type of businesses, respectively perceived to be affected by climate change, were Services and Manufacturing. The two types of businesses were not very different in term of their perceptual scores, with Services receiving 1.37 and Manufacturing 1.35, being rated as having moderate effect on business operations. Disruptions in the operations of the Trading SMEs may relate to issues in logistics, delays in getting supplies, etc. Manufacturing sector was rated as the third most vulnerable in terms of the perceptions of the SMEs. Multiple reasons may be attributed to this perception. Manufacturing operations are carried out mostly in enclosed buildings and structures which are more protected against the climatic factors like floods, storms, etc. The effect of high or low temperatures or heat and cold waves can also be better controlled in enclosed spaces. The climate change vulnerability of manufacturing SMEs may stem from issues in logistics, supply chains, availability and productivity of workforce, etc. Trading was rated as the least vulnerable sector to external climate change factors, with an average score of 1.29.

Summing up, all the four types of businesses perceived the climate change vulnerability to have moderate effect on their business operations. The Agriculture/Livestock/Dairy SMEs were found to be most vulnerable, trading SMEs to be least vulnerable, with Manufacturing and Services SMEs lying in between, with Manufacturing being slightly more vulnerable than services.

Business nature-wise comparisons of the climate change vulnerability perceptions of the SMEs, for nine external climate change factors, for all the four types of businesses, are presented in Figure 23, Figure 24, Figure 25 and Figure 26.

5.5.1 Agriculture/Livestock/Dairy Enterprises – External Factors Vulnerability

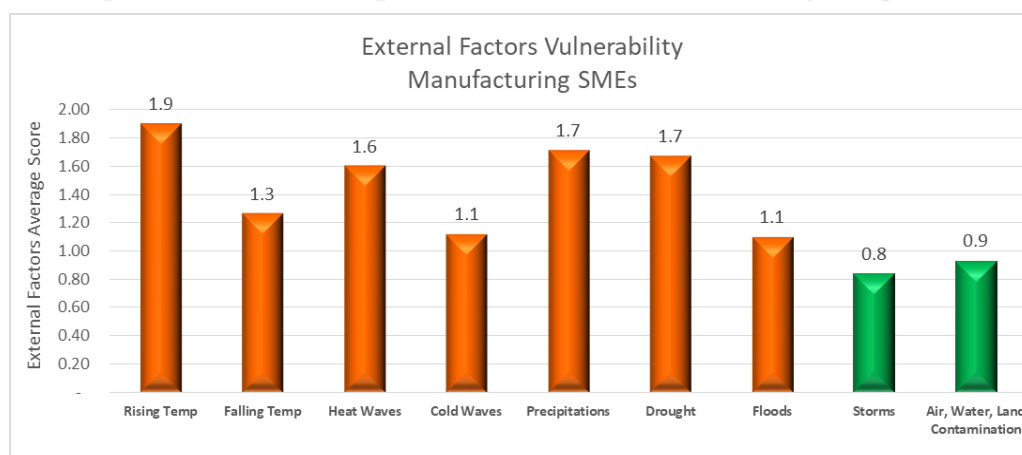
Looking at the survey results of Agriculture/Livestock/Dairy SMEs in Figure 23, it can be seen that there are three climate factors for which the average perception scores lied between 2.0 and 3.0. This means that the damaging effect of these three factors on the routine business operations was perceived to be severe. Rising Temperature was perceived as the biggest issue with an average score of 2.5. It is because for all the Agriculture related activities, land, water and air act as the basic production factors. Precipitations and Heat Waves were the next two most threatening factors, with respective scores of 2.1 and 2.0, perceived to be affecting these businesses in the severe range. Having efficient Agriculture/Livestock/Dairy production requires these production factors to remain in optimal ranges. Heat waves or excessive rainfall directly affects the agricultural production and are thus perceived as major threats.

Figure 23 – Agriculture/Dairy/Livestock SMEs External Factors Vulnerability Comparison

Cold Waves, Droughts and Falling Temperature were perceived as the next most damaging climate change factors by Agriculture/Livestock/Dairy SMEs. The respective scores were 1.9, 1.8 and 1.7, indicating that these factors affected their businesses in moderate range. Floods and Storms directly affect the agricultural production and also create disruptions in logistics, thereby affecting the profitability of the enterprises. Floods and Storms were perceived as the factors causing lower climate change vulnerability, compared to other factors. However, as per the scale being followed, the effects of these two factors were also rated as moderate. There was no external climate vulnerability factor the effect of which was rated as minor.

5.5.2 Manufacturing Enterprises – External Factors Vulnerability

The survey results for the manufacturing SMEs are presented in Figure 24. The graph shows that Rising Temperature, with an average score of 1.9 was perceived to be the biggest factor affecting the SMEs' business operations moderately. The two second most important factors were Precipitations and Droughts, each with a score of 1.7. These factors affect the logistics and supply chain of the manufacturing concerns, increase labor absenteeism, thereby decreasing the business's overall productivity. Heat Waves, Falling Temperature and Cold Waves, with respective scores of 1.6, 1.3 and 1.1 were the next important factors perceived to be affecting the business operations of manufacturing SMEs. These factors have a direct effect as possible destruction of capital assets, damage to means of transportation disrupting the supply chains, reduced workforce attendance, etc.

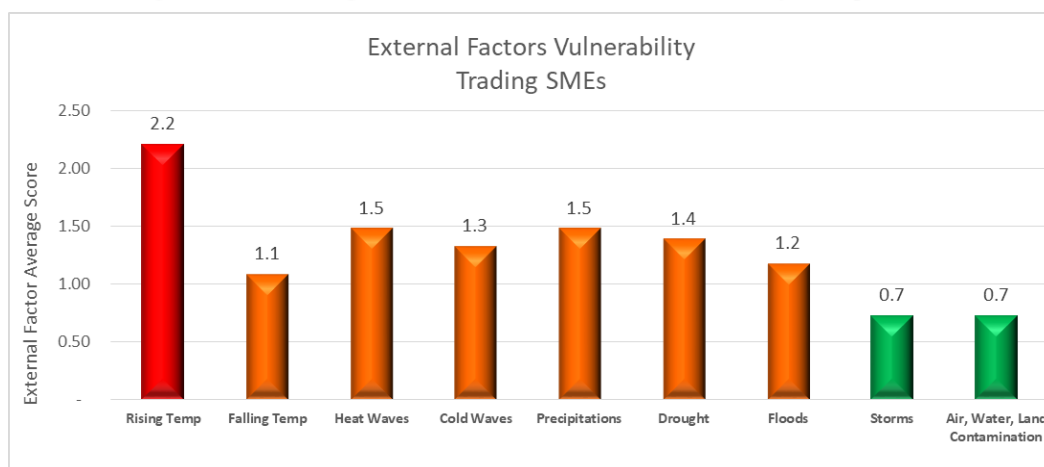
Figure 24 – Manufacturing SMEs External Factors Vulnerability Comparison

The manufacturing SMEs perceived Floods, Storms and Air, Water & Land Contamination as threats of lower degree. This aligns with the general approach of the local manufacturing enterprises where environmental factors are usually not considered important in running of the routine business operations. This result is in contrast to the result for Agriculture/Livestock sector SMEs where this factor was rated as a bigger threat for business operations. Unlike Agriculture/Livestock, Trading and Services SMEs, there was no external climate change factor which had a severe effect on the operations of manufacturing SMEs.

5.5.3 Trading Enterprises – External Factors Vulnerability

The survey results of the nine external climate change vulnerability factors for Trading SMEs are shown in Figure 25.

Figure 25 – Trading SMEs External Factors Vulnerability Comparison



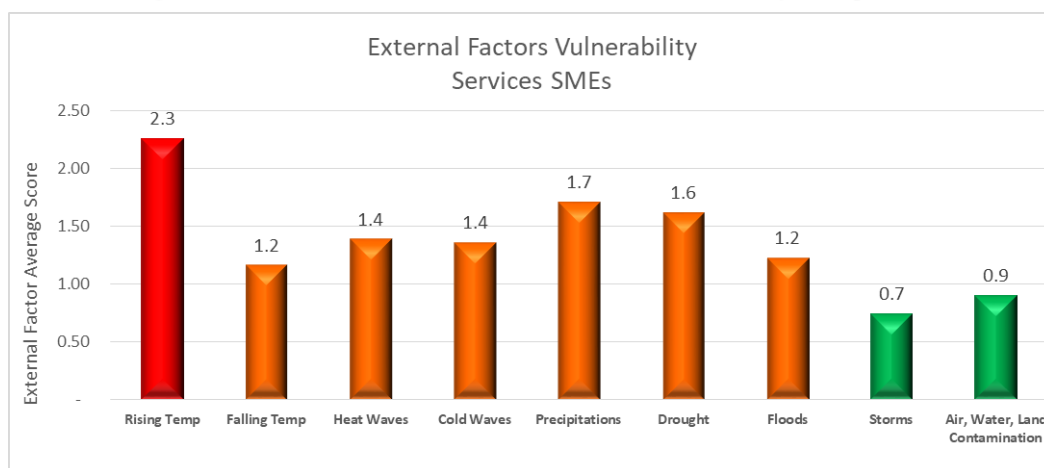
Just like Agriculture/Livestock and manufacturing SMEs, the Trading SMEs also perceived Rising Temperature as the most damaging climate change factor. With a score of 2.2, the effect of this factor on the business operations was rated as severe. Precipitations and Heat Waves, each with a score of 1.5, were ranked as the next most damaging factors to the business operations. The effect of both these factors was rated as being moderate. These two factors disrupt the routine trading activities by disturbing the logistics, supply chains and communication channels. Other factors rated in the moderate range were Cold Waves, Droughts, Floods and Falling Temperature, with respective scores of 1.3, 1.4, 1.2 and 1.1. These factors were perceived as less damaging than the Rising Temperature and Precipitations. The Trading SMEs showed little concern about the Storms and Contamination of Air, Water & Land, giving each of them average score of 0.7, thereby rating their effect as minor.

5.5.4 Services Enterprises – External Factors Vulnerability

The survey results of the nine external climate change vulnerability factors for Services SMEs are shown in Figure 26. The Services SMEs also perceived Rising Temperature as the biggest factor affecting the business operations. With a high score of 2.3, the factor was rated as affecting the operations in the severe range. It was followed by the factor of Precipitations with a score of 1.7. The result need to be seen in the context of the type of service enterprises selected during the survey, which included cargo service providers, hotels and restaurants, marriage halls and IT companies. The businesses of these enterprises are directly affected by increasing

temperatures and rainfall. These factors damage the roads and communication channels, and may completely halt the operations of transporters and cargo companies. Rising Temperature and Precipitations also contribute towards increased absenteeism of workers due to difficulty in reaching their work places. The productivity of the workforce may also get affected by these factors.

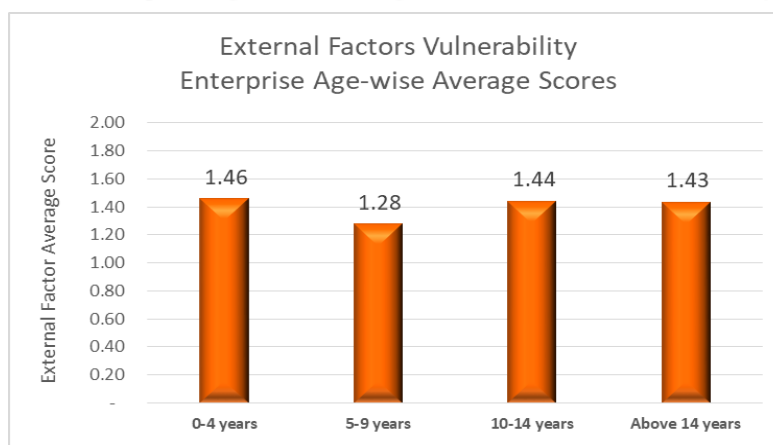
Figure 26 – Services SMEs External Factors Vulnerability Comparison



Droughts, Heat Waves and Cold Waves were rated as the next most damaging factors for the business operations of Services SMEs. With respective scores of 1.6, 1.4 and 1.4, the effect of these factors was rated as moderate. The effect of Floods and Falling Temperature was lower but still fell in the moderate range. Storms, and Air, Water & Land Contamination factors were rated as having minor effect on the business operations of Services SMEs. Since there is no production in services enterprises, the environmental factors do not have any major impact in this case and were thus not perceived as a major issue by the responding SMEs. All other factors lied in the range from 1.0 to 2.0 which meant that all of them were perceived to affect the business operations moderately. Just like Agriculture/Livestock and Trading SMEs, for Services SMEs also, there was only one factor for which the effect was rated as severe.

5.6 External Factors Vulnerability - Business Age-Wise Comparison

Climate change vulnerability for the surveyed SMEs was also analyzed with respect to the enterprise age. Average vulnerability scores for external factors were calculated for the enterprises falling under the four age ranges, as defined in the questionnaire. Figure 27 shows the average scores of the SMEs categorized under the four sizes.

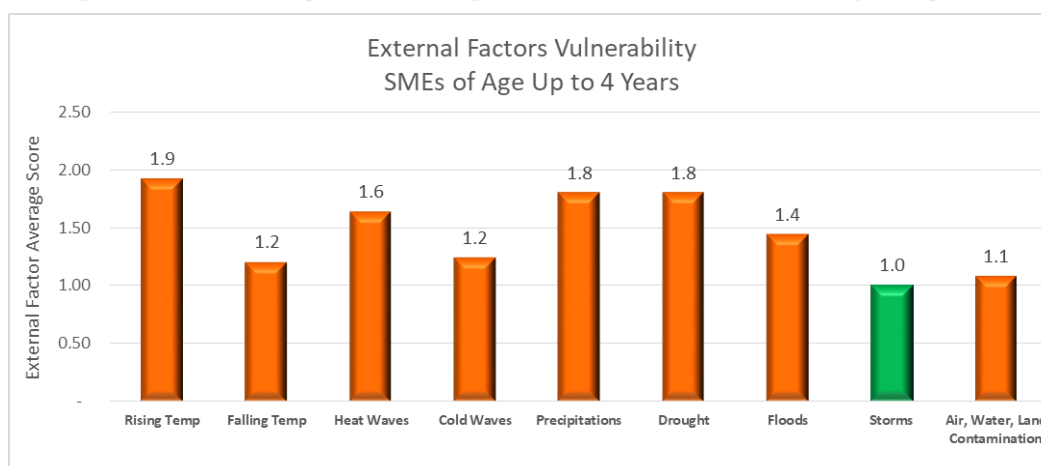
Figure 27 – Enterprise Age -wise Average External Factors Vulnerability Scores

Looking at the results, no particular trend was seen with respect to enterprise age. The effect of climate change on the business operations of SMEs in all these four categories was rated as moderate. The enterprises classified under 4 years of age (startups) depicted the highest average score among all the four categories, showing that these enterprises are most sensitive to climate change vulnerability. A similar score was observed for enterprises falling in the age bracket of 10-14 and above 14 years. The enterprises of 5-9 years had the lowest score.

Enterprise age-wise comparisons of the climate change vulnerability perceptions of the SMEs, for nine external climate change factors, are presented in Figure 28, Figure 29, Figure 30 and Figure 31.

5.6.1 Enterprises with Age Up to 4 Years – External Factors Vulnerability

The startups (up to 4 years age) perceived Rising Temperature as the biggest climate change factor affecting their business operations. With a score of 1.9, that factor was perceived to have moderate effect on the business operations.

Figure 28 –SMEs of Up to 4 Years Age - External Factors Vulnerability Comparison

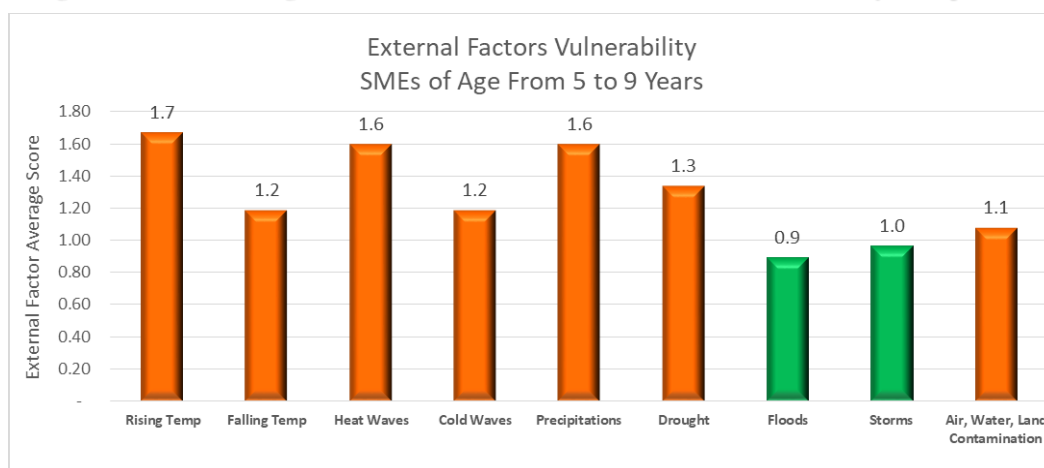
Two factors which were ranked second, each with a score of 1.8, included Precipitations and Droughts. They also fell in the moderate effect range. Heat Waves and Floods were the next most threatening factors, with respective scores of 1.6 and 1.4. The effects of Falling

Temperature, Air, Water & Land Contamination and Storms were the three factors for which the effect of external climate change factors was lower, with the score of Storms classifying this sector in the minor range. There was no factor for which the effect was rated as severe for these SMEs.

5.6.2 Enterprises with Age from 5 to 9 Years – External Factors Vulnerability

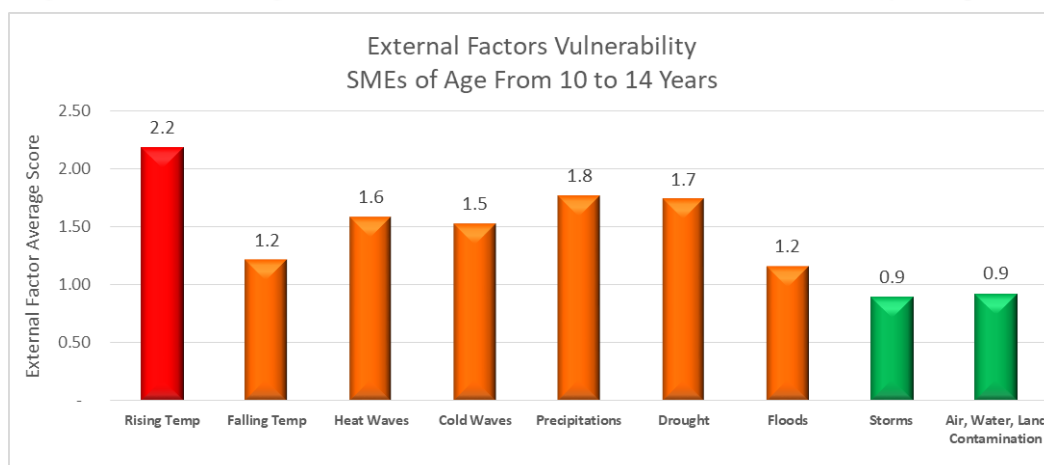
For the enterprises with age in the range of 5 to 9 years, the average climate change vulnerability score was calculated to be 1.28. Those enterprises also perceived Rising Temperature as the biggest climate change factor, assigning it a score of 1.7, getting placed in the range of moderate effect. Heat Waves and Precipitations were rated as the next more damaging factors, each ending up with a score of 1.6. For this age group of SMEs, seven of the nine external climate change factors were perceived to have effect in the moderate range. There was two factors of Floods and Storms for which the effect was rated as minor. The results are shown in Figure 29.

Figure 29 –SMEs of Age from 5 to 9 Years - External Factors Vulnerability Comparison



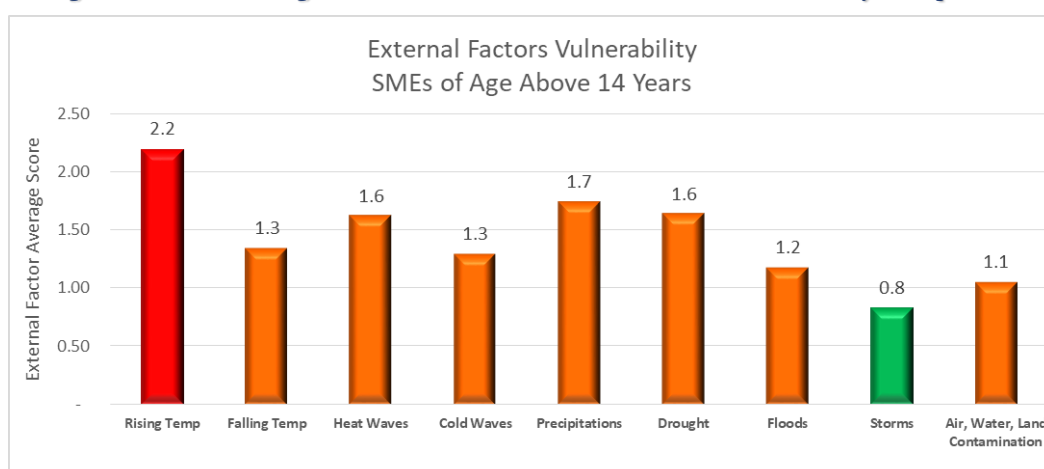
5.6.3 Enterprises with Age from 10 to 14 Years – External Factors Vulnerability

The average score of the enterprises in the age group of 10 to 14 years was found to be 1.44 which was the lowest among the four age groups. Rising Temperature was once again rated as the most threatening factor, with a score of 2.2, rating the effect as severe. It was followed by Precipitations and Droughts, with respective scores of 1.8 and 1.7, showing that their effect on the business operations of those SMEs was moderate. The factors of Heat Waves, Cold Waves, Floods and Falling Temperature were also placed in the moderate effect range. There were two factors of Storms and Air, Water & Land Contamination which had a score of less than 1.0 signifying that these enterprises perceived the climate change effect of these factors on their businesses to be minor. Figure 30 shows the results.

Figure 30 –SMEs of Age from 10 to 14 Years - External Factors Vulnerability Comparison

5.6.4 Enterprises with Age above 14 Years – External Factors Vulnerability

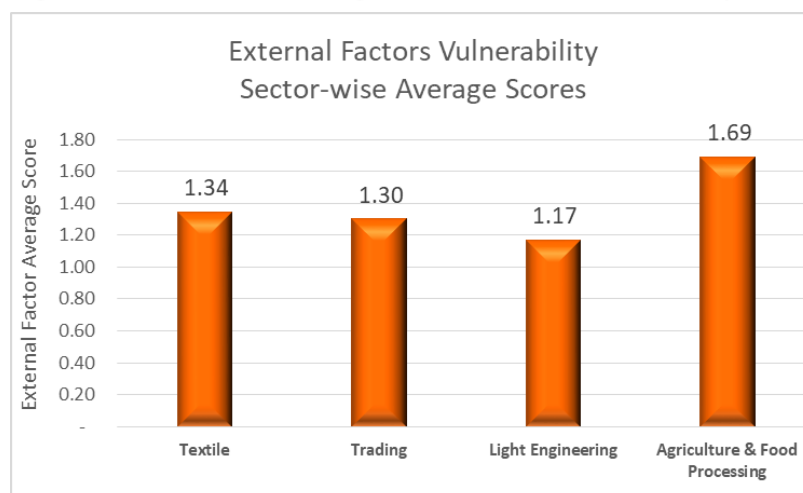
The average external climate change vulnerability factors for the enterprises with an age of above 14 years was 1.43. The results of the all the nine factors making up this average score are presented in Figure 31.

Figure 31 –SMEs of Age above 14 Years - External Factors Vulnerability Comparison

Just like the results of the other three age brackets, the results of SMEs in the age bracket of above 14 years also showed the Rising Temperature to be the most damaging climate change factor. With a score of 2.2, the effect of this factor was rated as severe. Precipitations, Droughts and Heat Waves were the next most threatening factors, with their scores placing them in the moderate range. Cold Waves and Falling Temperatures, each had score of 1.3, putting them in moderate range. There was only the Storms factor for which the score was less than 1.0, rating it to have minor effect on the business operations of the SMEs in this age group.

5.7 External Factors Vulnerability-Sector-Wise Comparison

The average scores showing the climate change vulnerability of the surveyed SMEs with respect to the sector are shown in Figure 32. The analysis was conducted for four sectors of Textile, Trading, Light Engineering and Agriculture & Food Processing.

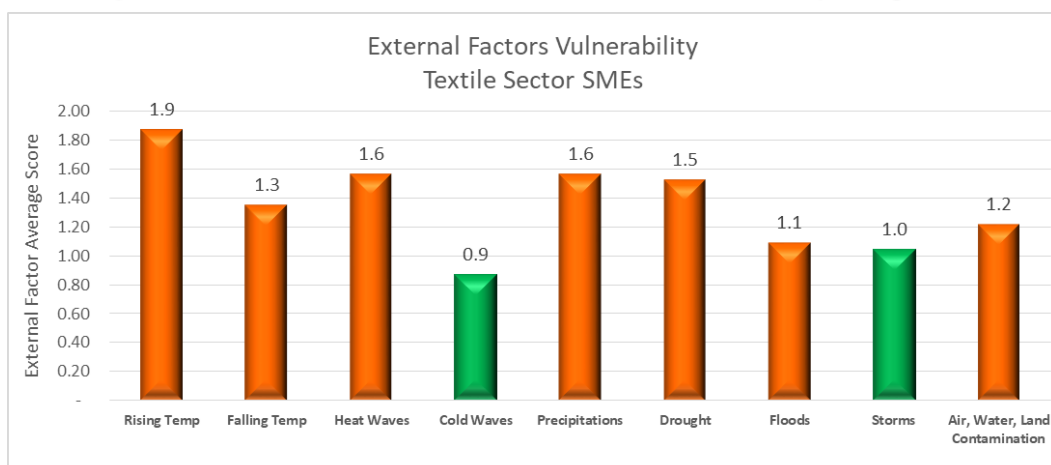
Figure 32 – Sector-wise Average External Factors Vulnerability Scores

All the four sectors were perceived to have climate change effect on business operations in the moderate range. No severe effect was perceived for any of the four sectors. Agriculture & Food Processing was found to be most vulnerable sector, with a score of 1.69. Most of the activities of the sector are usually carried out in open spaces which are more exposed to the climate change factors. The two industrial sectors of Textile and Light Engineering were rated lower for climate change vulnerability, with scores of 1.34 and 1.17 respectively. The industrial activity is usually carried out in enclosed buildings which reduces the effects of factors like rainfall, floods, storms and extreme temperatures, in contrast to Agriculture sector. Trading sector had an average climate change vulnerability score of 1.17, lowest of all the four sectors. The sector has high dependence on activities related to transportation, warehousing, etc. which causes its exposure to climate change factors.

Sector-wise comparisons of the climate change vulnerability perceptions of the SMEs, for nine external climate change factors, are presented in Figure 33, Figure 34, Figure 35 and Figure 36.

5.7.1 Textile Sector Enterprises – External Factors Vulnerability

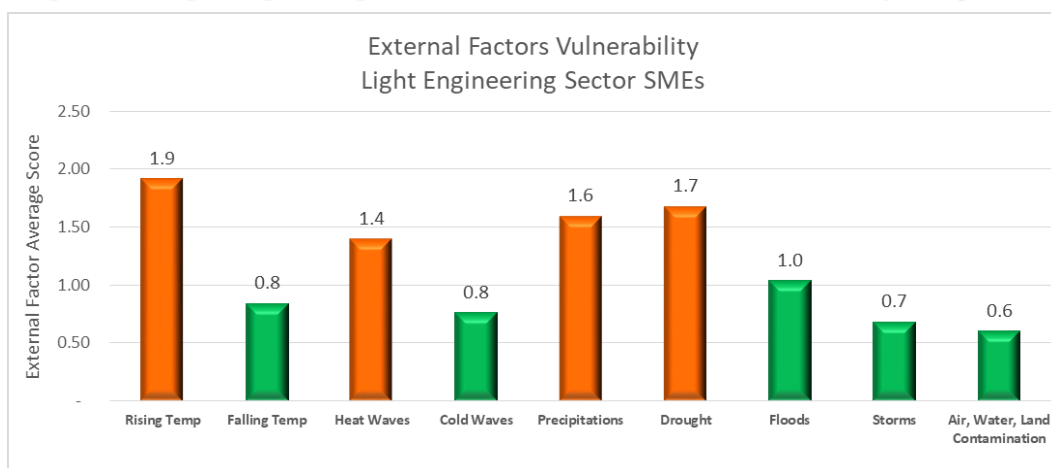
Textile SMEs perceived seven of the nine factors to have effect on their business operations to be in the moderate range, while the remaining two factors of Cold Waves and Storms were perceived to lie in the minor effect range. Rising Temperature was perceived as the most threatening climate change factor, with an average score of 1.9, falling in the moderate range. It was followed by Precipitations and Heat Waves, each with a score of 1.6. Droughts and Falling Temperature were rated at 1.5 and 1.3, placing them in the moderate range. The results are shown in Figure 33.

Figure 33 – Textile Sector SMEs - External Factors Vulnerability Comparison

Air, Water & Land Contamination was rated to have moderate effect on the business operations of Textile sector SMEs. This finding is in line with the general perception of industrial enterprises where environmental factors are usually assigned lower importance.

5.7.2 Light Engineering Sector Enterprises – External Factors Vulnerability

Light Engineering was the other industrial sector, with an average external factors climate vulnerability score of 1.17, lower than the average score of 1.34 for Textile sector. The sector was thus less perceived less vulnerable to climate change effect than Textile sector. The results of the nine external climate change factors for Light Engineering sector are presented in Figure 34.

Figure 34 – Light Engineering Sector SMEs - External Factors Vulnerability Comparison

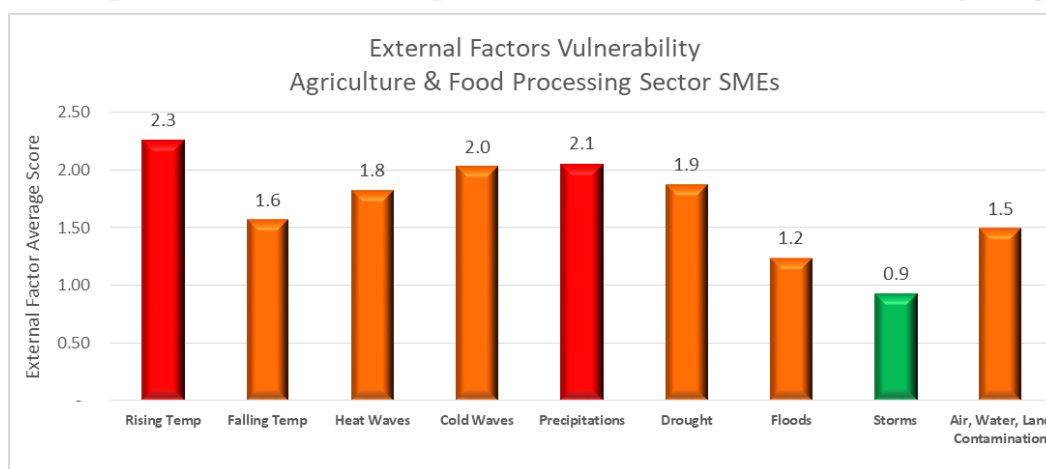
The scores of four of nine factors were found to lie from 1.0 to 2.0 which meant that the damaging effect of these four factors were perceived to be moderate. Five factors of Falling Temperature, Cold Waves, Floods, Storms and Air, Water & Land Contamination had scores of less than 1.0 which meant that the effect of these three factors on the business of Light Engineering sector enterprises was rated as minor. The factor of Rising Temperature was perceived as having maximum effect on the business operations. Droughts and Precipitations were ranked as the next most threatening climate change factors with respective scores of 1.7 and 1.6. Heat Waves had a score of 1.4, placing it in the moderate effect range. None of the

nine factors was perceived to have severe effect on the business operations of Light Engineering SMEs.

5.7.3 Agriculture & Food Processing Sector Enterprises – External Factors Vulnerability

Agriculture & Food Processing sector had the highest average score of 1.69 among the four sectors included in this analysis, ranking it as the most vulnerable sector to climate change. The results of the perception ratings of the nine individual external climate change factors for the enterprises surveyed from this sector are shown in Figure 35.

Figure 35 – Agriculture & Food Processing Sector SMEs - External Factors Vulnerability Comparison

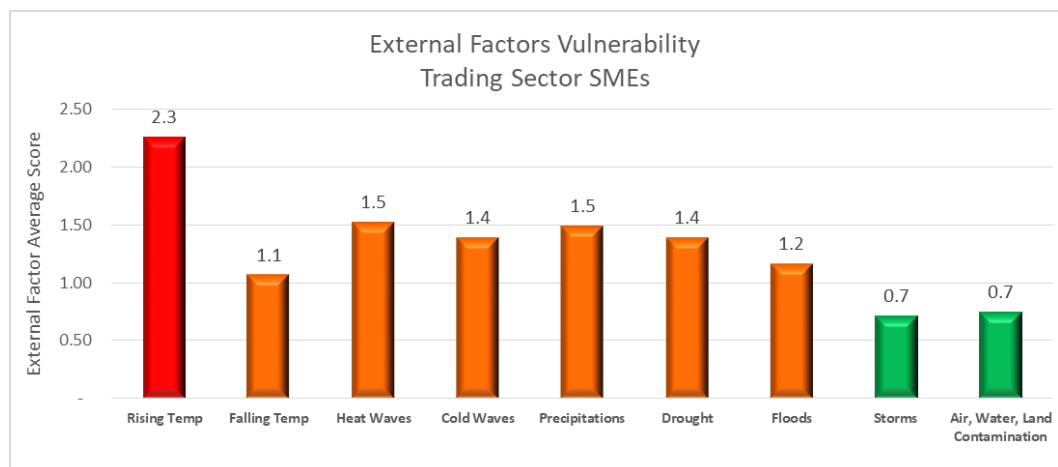


Rising Temperature was perceived as the most damaging climate change factor. The average score of this factor was 2.3 which meant that the enterprises perceived it to have severe effect on their routine business operations. The other factor rated as having severe effect was Precipitations which ended up having a score of 2.1. With a score of 2.0, the effect of Cold Waves was also rated close to severe range. The factors of Droughts, Heat Waves and Falling Temperature had respective scores of 1.9, 1.8 and 1.6 which classified these as having moderate effect on the business operations of Agriculture & Food Processing SMEs. Air, water and land are the basic requirements of the Agricultural production. Moreover, the production activities of Agriculture sector enterprises are carried out mostly in open areas which are directly exposed to climate change factors. It was surprising to note that the effects of floods and storms were rated lower than other factors. In fact, the effect of storms was rated to fall in the minor effect range.

5.7.4 Trading Sector Enterprises – External Factors Vulnerability

The results of the nine individual climate change factors, presented in Figure 36, show that the Trading sector enterprises perceived the effect of Rising Temperature to be severe. This factor was followed by Precipitations, Heat Waves, Droughts and Cold Waves with respective scores of 1.5, 1.5, 1.4 and 1.4. The effects of all these factors were perceived to be in moderate range. The activities of Trading SMEs have high dependence on transportation and logistics, road travel, etc. which are directly affected by the climate change factors. Floods had a score of 1.2 and Falling Temperature 1.1, which placed these two factors also in the moderate range. There were two factors of Air, Water & Land Contamination and Storms which had scores of less than 1.0 and were thus perceived to have minor effect on the business operations.

Figure 36 – Trading Sector SMEs - External Factors Vulnerability Comparison



6.0 INTERNAL CLIMATE CHANGE FACTORS VULNERABILITY ANALYSIS

The survey questionnaire mapped the perception of the responding SMEs regarding their climate change vulnerability with respect to internal business operational factors. There were twelve internal factors in the questionnaire about which the surveyed SMEs shared their perceptions by choosing one response from the ten available responses. The factors related to the enterprise's productivity, logistics, profitability, land, capital, and labor. By examining these dimensions and the twelve factors, the survey results led to developing a comprehensive understanding of how climate change affects SMEs. All the factors were rated on a scale from 0 to 10, where 0 indicated no impact and 10 indicated a high impact on the business's internal operations due to climate change. The final Climate Change Vulnerability scores due to internal operational factors were calculated using weighted average of all the responses.

The potential impact of climate change due to internal operational factors was analyzed by defining ranges of the final vulnerability score. The four types of potential impacts are listed in Table 9.

Table 9 –Internal Factors Impact Score Ranges and Impacts

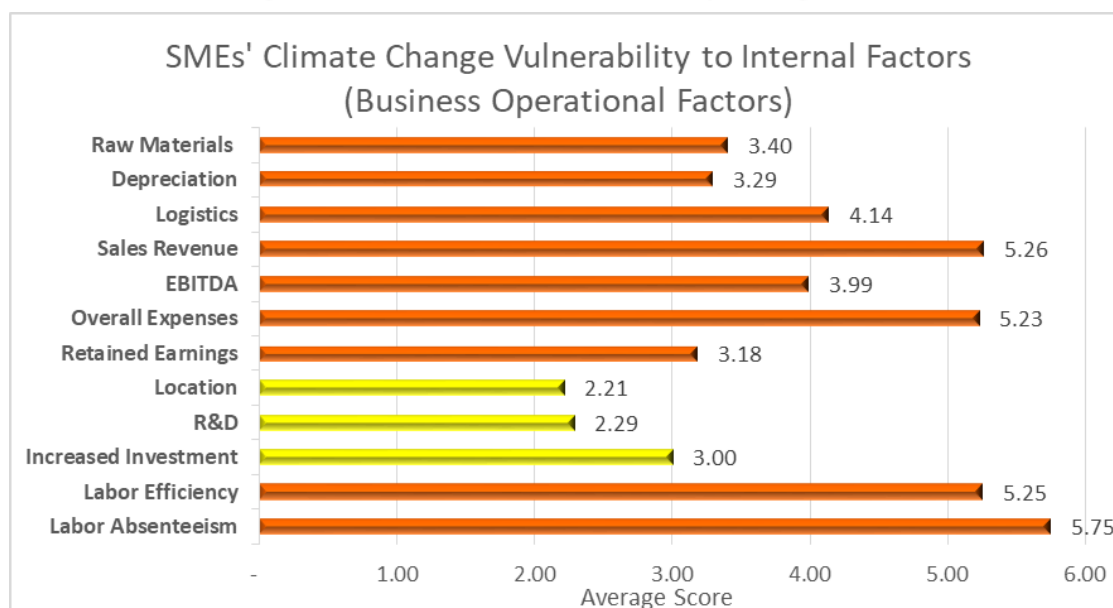
Total Score Range	Impact
0	No Impact
Up to 3.0	Minor Impact
Greater than 3.0 and Up to 7.0	Moderate Impact
Greater than 7.0 and Up to 10.0	Severe Impact

Average vulnerability scores, calculated from the survey results, have been presented in the form of charts. For improving the visual presentation and better understanding of the readers, a color coding has been used in these charts. Vulnerability has been presented by using three colors, explained in Table 10.

Table 10 –Internal Factors Impact Score Ranges and Color Codes

Total Score Range	Bar Color
0	Yellow
Up to 3.0	Yellow
Greater than 3.0 and Up to 7.0	Orange
Greater than 7.0 and Up to 10.0	Red

Average values of the ratings obtained during the survey for all the twelve internal factors are presented in Figure 37.

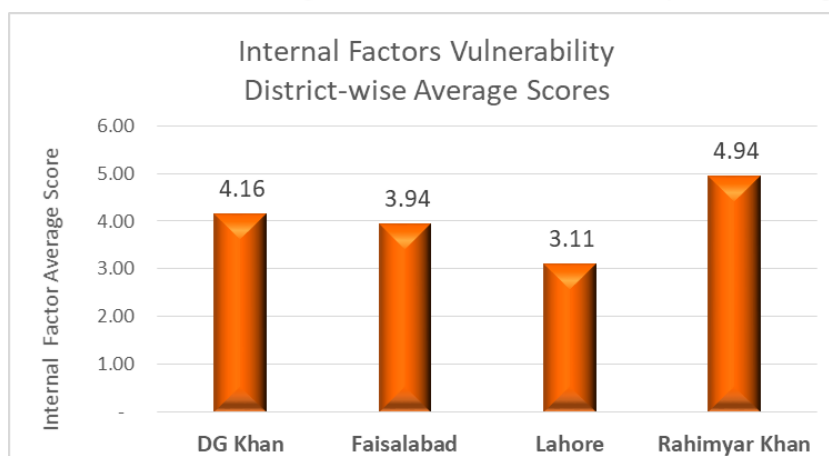
Figure 37 – Internal Factors Vulnerability Average Scores

The overall average score for all the twelve internal factors was calculated to be 3.92 which meant that the overall effect of all of those factors on the business operations of the surveyed SMEs was perceived to be moderate. Nine of the twelve factors were perceived to be moderately affected whereas the other three were perceived to be minorly affected. The biggest effect was perceived to be for labor-related indicators. Labor absenteeism was the most affected indicator, with a score of 5.75, with the labor efficiency being the second most affected, with a score of 5.25. An equally affected indicator was Sales Revenue, shown by a score of 5.26. Other factors, with scores more than 4.0, included Overall Expenses (5.23) and Logistics (4.14). All of these factors were placed in the moderate effect range. Increased investment, location and R&D were the three indicators for which the climate change effect was rated to be minor. The least effect was perceived to be on location with a score of 2.21.

Overall, it can be inferred that the effect of climate change was perceived to be the highest on labor-related factors. Profitability was also perceived to be affected in the higher range. Sales Revenues, Overall Expenses and EBITDA were affected more than other factors. However, within this, the effect on Retained Earnings was perceived to be lower, but still in the moderate effect range.

6.1 Internal Factors Vulnerability-District-Wise Comparison

The data of the four districts, Lahore, Faisalabad, DG Khan and Rahimyar Khan was sliced to understand the differences of the SMEs perceptions regarding their vulnerability to climate change in terms of internal operational factors. Figure 38 shows the average scores of the effect on the internal indicators of the SMEs of the four target districts.

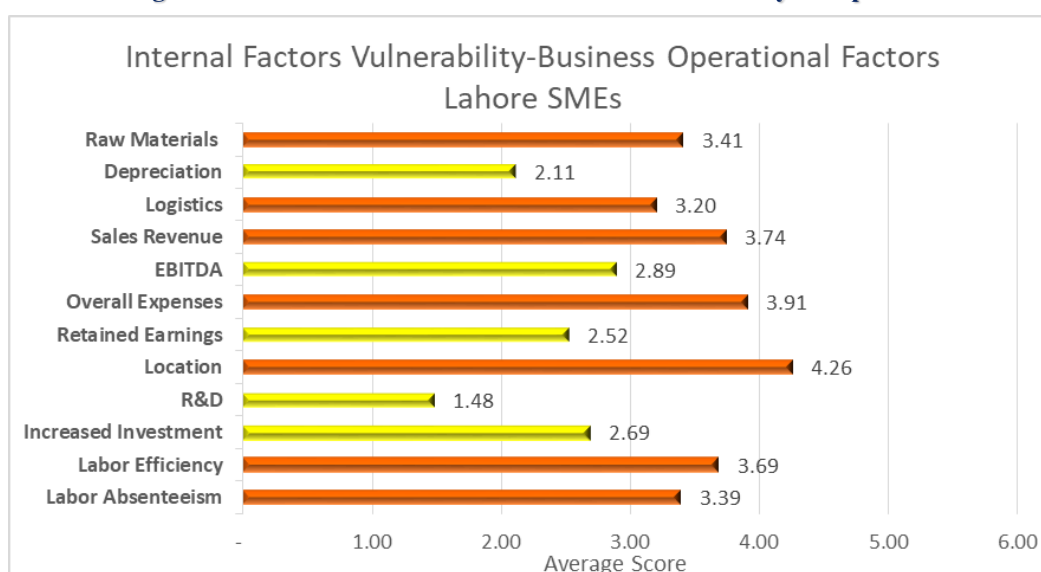
Figure 38 – District-wise Average Internal Factors Vulnerability Scores Comparison

These average scores are the averages of the scores for all the twelve factors for the four districts. All the four scores lied in the range 3.0-7.0 which showed that the effect of climate change in terms of internal indicators of the business was perceived to be moderate. The results showed that the SMEs of Rahimyar Khan perceived the climate change effect on the internal factors of the business to be highest among the four districts, shown by a score of 4.94. DG Khan was identified as the second most affected district with an average score of 4.16. These two scores were higher than those of 3.94 for Faisalabad and 3.11 for Lahore. The results validated the hypothesis that DG Khan and Rahimyar Khan are more vulnerable to climate change than Faisalabad and Lahore.

District-wise comparisons of the climate change vulnerability perceptions of the SMEs surveyed in Lahore, Faisalabad, DG Khan and Rahimyar Khan, in terms of twelve internal operational indicators, are presented in Figure 39, Figure 40, Figure 41 and Figure 42.

6.1.1 Lahore SMEs – Internal Indicators Vulnerability

Figure 39 shows that seven of the twelve internal indicators were found to be affected moderately for the SMEs surveyed in Lahore.

Figure 39 – Lahore SMEs - Internal Factors Vulnerability Comparison

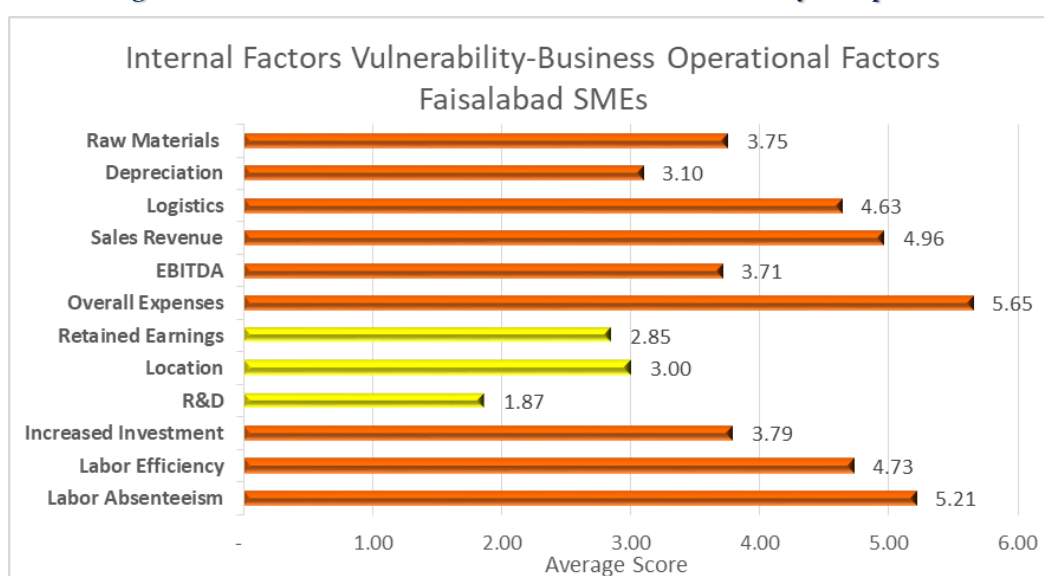
The biggest effect was perceived to be on Location, with a vulnerability score of 4.26. This meant that the SMEs perceived their place of business to be vulnerable to climate change effects in the moderate range. The next two bigger scores were observed for the profitability indicators of Overall Expenses and Sales Revenues. Both of these were perceived to be affected moderately with respective scores of 3.91 and 3.74. Both the labor-related indicators of efficiency and absenteeism were also rated higher, but in the moderate range.

Five of the twelve indicators obtained average scores of less than 3.0 which showed that the climate change effect on these was perceived to be minor. Two of those related to the capital (Increased Investment and R&D), two related to profitability (EBITDA and Retained Earnings) and one to productivity (Depreciation). R&D was perceived to be affected to the lowest degree with a score of 1.48.

6.1.2 Faisalabad SMEs – Internal Indicators Vulnerability

Overall, the SMEs of Faisalabad perceived their internal business indicators to be more vulnerable compared to those perceived by the SMEs of Lahore. For Faisalabad, there were nine indicators which were affected moderately whereas three were affected minorly. The highest impact was perceived to be on the profitability indicators. Overall Expenses received the highest score of 5.65 among all the indicators, Sales Revenues and EBITDA were also perceived to be affected to a higher degree with respective scores of 4.96 and 3.71. Labor productivity was also perceived to be affected higher than other areas. Labor efficiency was perceived to decrease and labor absenteeism to increase due to climate change factors. The effect on both these factors was perceived to be moderate.

Figure 40 – Faisalabad SMEs - Internal Factors Vulnerability Comparison

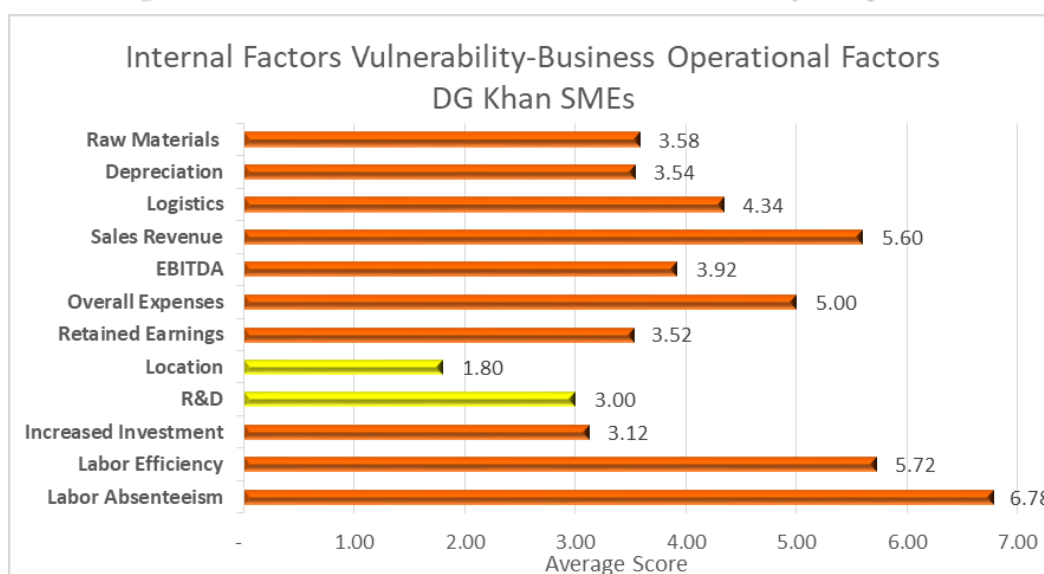


Unlike the SMEs of Lahore, the SMEs of Faisalabad perceived the climate change effect on their locations to be minor, assigning it a score of 3.0. Retained Earnings and R&D were perceived to be the two least affected internal indicators.

6.1.3 DG Khan SMEs – Internal Indicators Vulnerability

With an average score of 4.16, the SMEs of DG Khan were found to be more vulnerable compared to those of Lahore and Faisalabad. Ten out of twelve internal indicators were found to lie above the score of 3.0, thereby placing them in the moderate effect range. Only two indicators of Location and R&D were rated to be minorly affected by climate change.

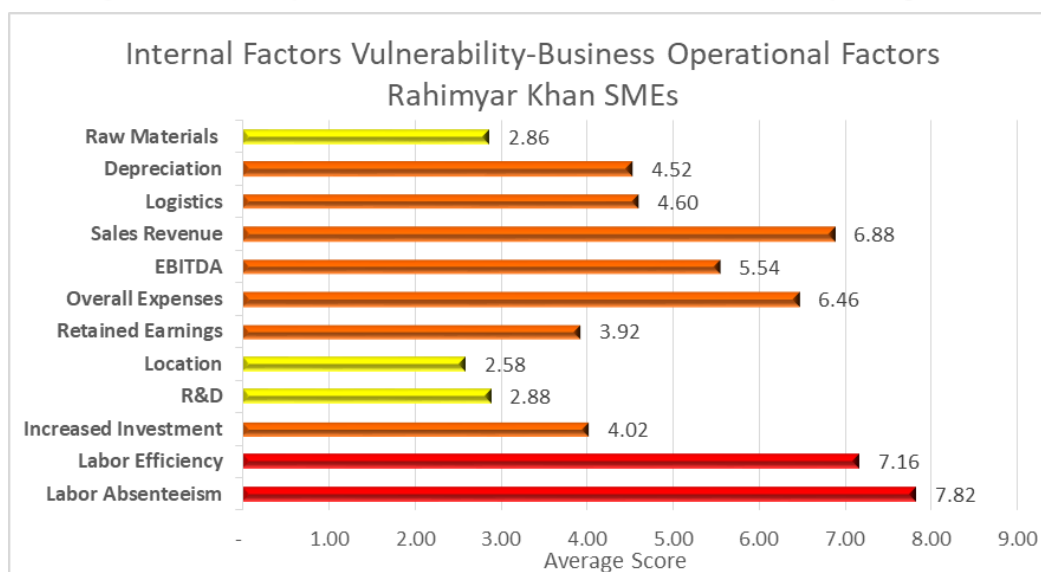
Figure 41 – DG Khan SMEs - Internal Factors Vulnerability Comparison



The two labor-related indicators were the most affected indicators, with Labor Absenteeism getting the highest score of 6.78 and Labor Efficiency the second highest score of 5.72. Profitability-related indicators were also found to be affected higher relative to other indicators. Sales Revenue was the third most affected indicator with a score of 5.6. Another profitability indicator was Overall Expenses which had a score of 5.0. The climate change effect for these two indicators fell in the moderate range. Logistics was also rated as a factor moderately affected by climate change, with score of 4.34. The indicators of Raw Materials, Depreciation, EBITDA and Retained Earnings had respective scores of 3.58, 3.54, 3.92 and 3.52, placing all these in the moderate effect range. There was no indicator which was severely affected by climate change for the SMEs surveyed in DG Khan.

6.1.4 Rahimyar Khan SMEs – Internal Indicators Vulnerability

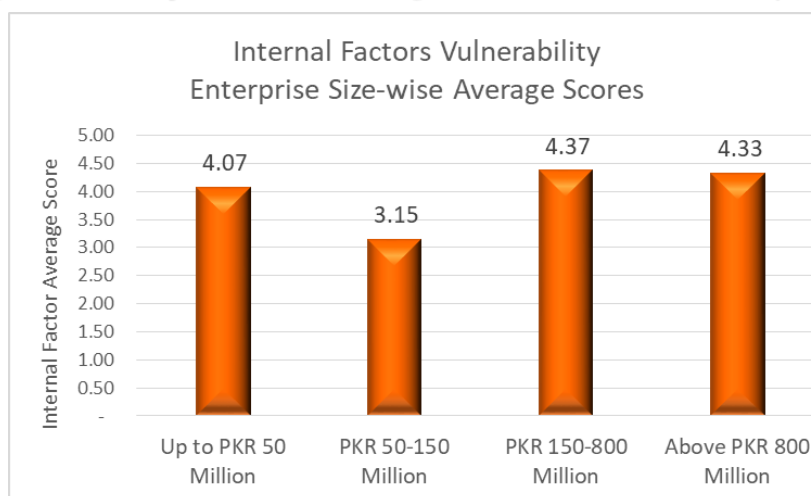
With an average score of 4.94, Rahimyar Khan was found to be the most affected among the four target districts in terms of effect on internal indicators. Just like the results of DG Khan, for Rahimyar Khan also, the two labor-related indicators were rated as the most affected internal indicators. However, the intensity of effect was higher for Rahimyar Khan SMEs. The respective scores of Labor Absenteeism and Labor Efficiency were 7.82 and 7.16, placing them in the severe effect range. In fact, these were the only two cases among all the four districts where the score was found to be more than 7.0.

Figure 42 – Rahimyar Khan SMEs - Internal Factors Vulnerability Comparison

Profitability indicators were also higher compared to other indicators. Sales Revenue, Overall Expenses and EBITDA had respective scores of 6.88, 6.46 and 5.54, placing them in moderate effect range, but close to severe range. There were three indicators for which the climate change effect was rated as minor. Those included Raw Materials, Location and R&D, with respective scores of 2.86, 2.58 and 2.88. R&D was the only indicator which was rated to be minorly affected for the SMEs of all the four districts.

6.2 Internal Factors Vulnerability-Enterprise Size-Wise Comparison

Climate change vulnerability of the internal business operational indicators for the surveyed SMEs was also analyzed with respect to the enterprise size (defined by the annual revenues). Average vulnerability scores for the internal indicators were calculated for the enterprises falling under the four sizes. Figure 43 shows the average scores of the SMEs categorized under the four sizes.

Figure 43 – Enterprise Size-wise Average Internal Factors Vulnerability Scores

The graph shows that the highest vulnerability score of 4.37 was found for medium enterprises (PKR 150-800 million) which shows that these enterprises perceive the climate change effect on their businesses to be higher than those perceived by small and large enterprises. The effect for medium enterprises was rated as moderate. The score of large enterprises was only slightly lower than that of medium enterprises (4.33) which placed them in the moderate range. It is important to consider the fact that it was the result of only one large enterprise included in the survey.

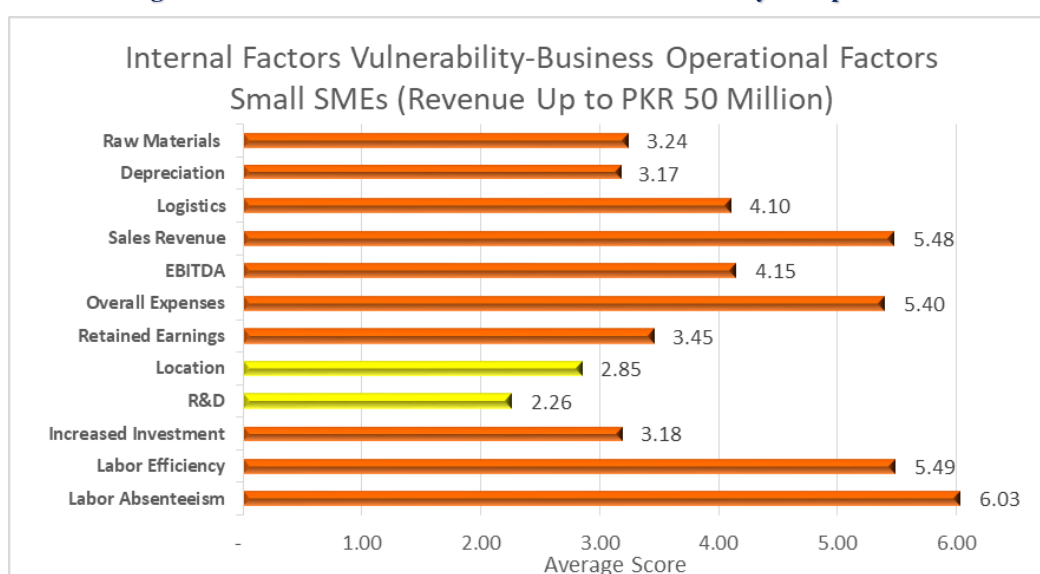
Looking at the small enterprises, the results of the two segments of this category were somewhat different. The average score for small enterprises, having revenues of up to PKR 50 million, was 4.07 whereas the average score of the other segment of the small enterprises, with revenues in the range PKR 50-150 million, 3.15 (closer to minor effect range). It is important noting that SMEs in all the four size categories rated the climate change effect on the internal factors to be moderate. None of them rated the effect to be severe.

Enterprise size-wise comparisons of the climate change effect on twelve internal indicators, are presented in Figure 44, Figure 45, Figure 46 and Figure 47.

6.2.1 Small Enterprises (Up to PKR 50 Million) – Internal Indicators Vulnerability

Average score of climate change effect on the internal business operational indicators for small enterprises (Up to PKR 50 million) was 4.07, rating the effect as moderate. Looking into the individual indicators, maximum effect was perceived on the labor-related indicators. With scores of 6.03 and 5.49, Labor Absenteeism and Labor Efficiency were rated as the two most affected indicators. The next most affected indicators were the profitability indicators. Sales Revenue received a score of 5.48, followed by Overall Expenses and EBITDA, with respective scores of 5.40 and 4.15. All these indicators were rated to be moderately affected. Looking at the productivity indicators, raw material and depreciation were moderately affected. Logistics was also an indicator which was moderately affected with a score of 4.1.

Figure 44 – Small SMEs - Internal Factors Vulnerability Comparison-1

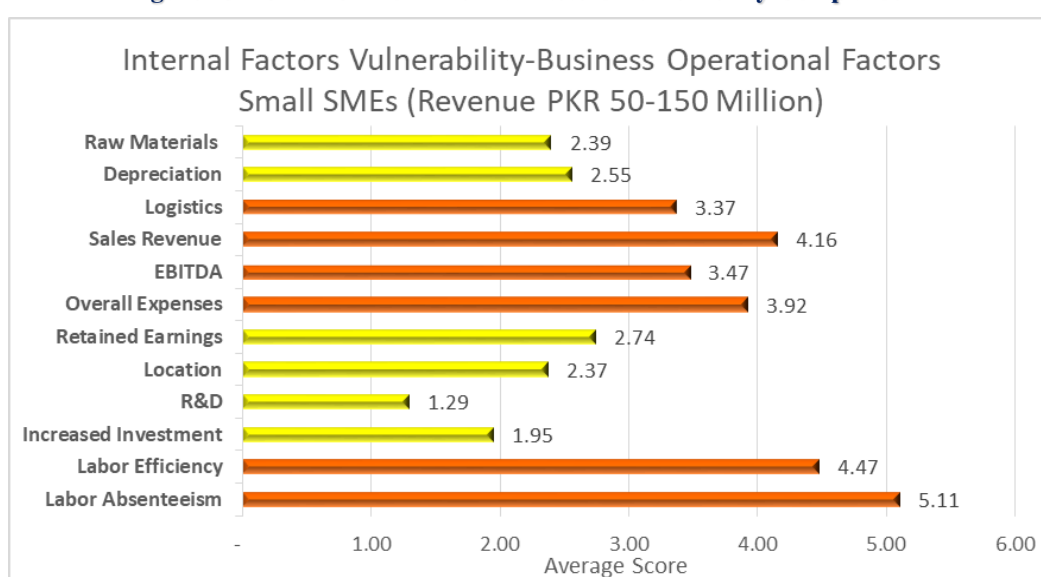


Of the total twelve indicators, there were only two indicators which were minorly affected. Those included location and R&D, with respective scores of 2.85 and 2.26. None of the indicators fell in the severe effect range.

6.2.2 Small Enterprises (PKR 50-150 Million) – Internal Indicators Vulnerability

Figure 45 illustrates the vulnerability of various internal business operational indicators for small SMEs (with revenue between PKR 50–150 million) based on their average impact scores. According to the data, none of the factors fall into the severe impact category. However, six of the twelve indicators showed moderate impact. Labor Absenteeism, with the highest score of 5.11, and labor efficiency with a score of 4.47, represented the most significant vulnerabilities, highlighting workforce-related issues as the key operational concerns.

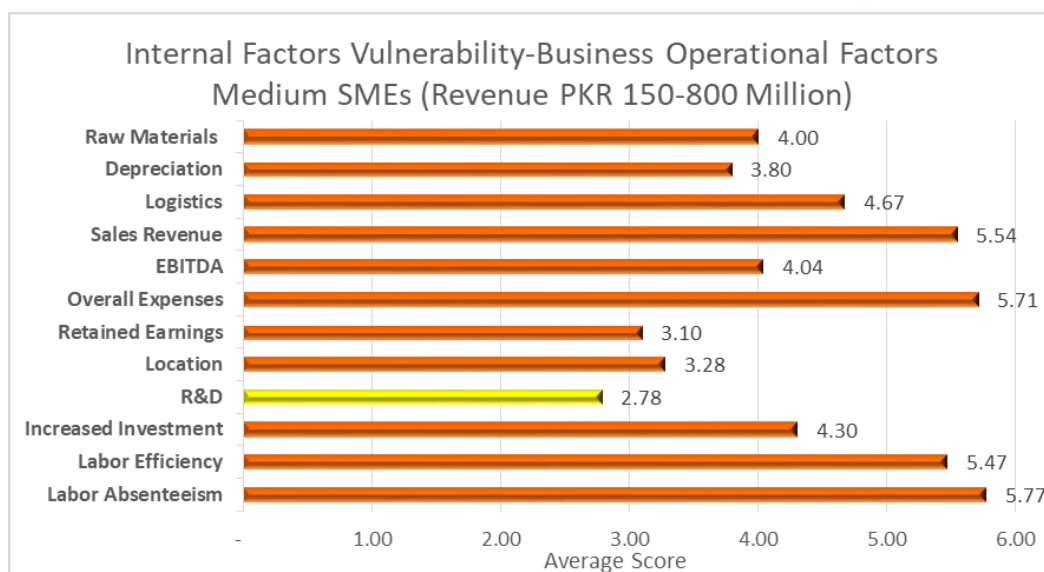
Figure 45 – Small SMEs - Internal Factors Vulnerability Comparison-2



Sales revenue (4.16), Overall Expenses (3.92), and Logistics (3.37) also fell within the moderate impact range, suggesting profitability challenges and supply chain issues. The indicators of EBITDA (3.47), lied towards the upper end of the minor impact category, indicating some operational sensitivity but not at alarming level. Increased investment (1.95), raw materials (2.39), and retained earnings (2.74) showed lower vulnerability. The lowest impact was seen for R&D (1.29). Overall, the graph highlighted that small SMEs (Up to PKR 50-150 million revenues) are more vulnerable to human resource inefficiency and profitability.

6.2.3 Medium Enterprises (PKR 150-800 Million) – Internal Indicators Vulnerability

The graph shown in Figure 46 highlights the internal operational vulnerabilities of medium SMEs, categorized by impact on productivity, profitability, logistics, capital and labor efficiency. Unlike small SMEs with lower revenues, several indicators appear to have moved deeper into the moderate impact zone, indicating increased vulnerability.

Figure 46 – Medium SMEs - Internal Factors Vulnerability Comparison

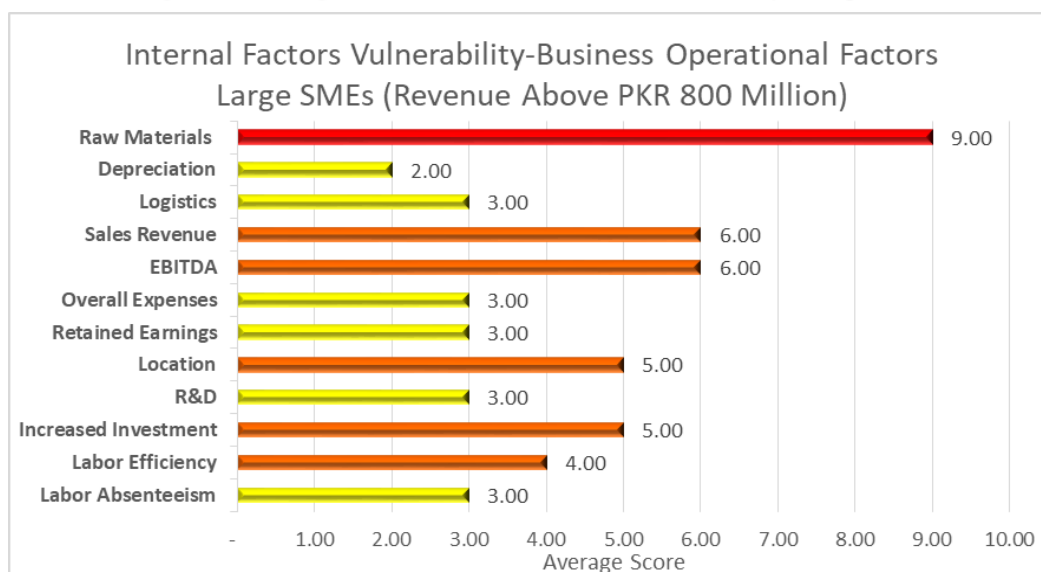
Eleven of the twelve indicators fell in the moderate effect range, whereas one only indicator R&D, with a score of 2.78, lied in the minor effect range. Among the productivity-related indicators, raw materials scored 4.0, reflecting a clear increased vulnerability compared to that of the small SMEs. Depreciation, was also within the moderate impact range at 3.80. This vulnerability was also higher than those found for the previous two categories of small SMEs.

For labor-related indicators, the risks were found to be considerably higher. Labor Absenteeism showed the most significant concern with a score of 5.77, representing the highest vulnerability across all twelve factors. The vulnerability of labor efficiency was also higher, shown by a score of 5.47. Overall Expenses (5.71), Sales revenue (5.54) and EBITDA (4.04) also reflected high exposure, suggesting strained margins and productivity challenges. Location at 3.28, remained within the moderate range, indicating operational pressure but not yet critical. Retained earnings (3.1) also showed moderate effect hinting at emerging concerns in profit retention. It was however close to the boundary of minor effect. Capital-related indicators again showed moderate vulnerability, with increased investment getting a score of 3.80, indicating rising concern about capital deployment. The scores of none of the twelve indicators fell in the severe effect range.

In summary, as SMEs scale up, their climate change vulnerabilities shift noticeably toward profitability and workforce-related challenges, while productivity and capital factors, though still important, show comparatively lower impact. This pattern suggests that while operational scale brings revenue, it also amplifies cost pressures and labor management complexities.

6.2.4 Large Enterprises (Above PKR 800 Million) – Internal Indicators Vulnerability

Figure 47 presents the internal operational vulnerabilities to climate change of single large SME. Although limited to one firm, the data reveals important trends about operational pressures at a larger scale.

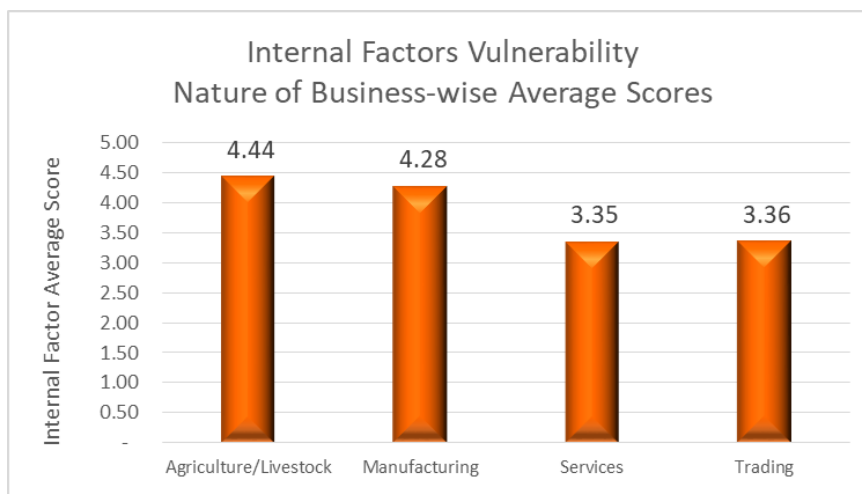
Figure 47 – Large SMEs - Internal Factors Vulnerability Comparison

The most critical concern is raw materials, which scored a 9.0, placing this indicator in the severe impact category. This suggests extreme vulnerability, likely due to dependence on supply chain disruptions or volatile input costs. Sales Revenue, EBITDA, and Location indicators, all scored 6.0 or 5.0, reflecting moderate vulnerability. These point to significant challenges in maintaining profitability and adapting to geographical or market-related constraints. Increased investment (5.0) also fell under moderate impact, indicating sensitivity around capital planning and future growth strategies. The other indicator R&D, related to capital was found to be minorly vulnerable with a score of 3.0. Labor efficiency, with a score of 4.00, implied ongoing challenges in optimizing workforce productivity.

Other factors like Depreciation, Logistics, Overall Expenses, Retained Earnings and Labor absenteeism, all scored 3.0 or below, indicating minor impact. While the graph reflected data from just one large SME, it highlighted that as firms grow, vulnerabilities tend to concentrate around profitability and supply chain pressures, particularly raw materials, while some operational and capital-related issues remain comparatively stable.

6.3 Internal Factors Vulnerability-Nature of Business-Wise Comparison

Climate change vulnerability of the internal indicators of the surveyed SMEs was also analyzed with respect to the nature of business. Average vulnerability scores for internal factors were calculated for the four types of enterprises, as defined in the questionnaire. Figure 48 shows the average scores.

Figure 48 – Nature of Business-wise Average Internal Factors Vulnerability Scores Comparison

Agriculture/Livestock/Dairy sector was perceived to be most exposed to climate change with respect to internal business indicators. The average score of all the twelve factors, for the enterprises engaged in this type of business was found to be 4.44 which meant that the perceived impact was moderate. This is because of the fact that the operational performance of these SMEs is directly linked with the climate factors like temperature, availability and quality of water, contamination in soil, air or water, etc. Most of the agricultural activities are carried out in open where these SMEs are more exposed to natural disasters like floods and storms.

The second highest vulnerability score was obtained for Manufacturing sector SMEs. With a score of 4.28, the vulnerability of these SMEs was also rated as moderate. Disruptions in the operations of the Manufacturing SMEs may relate to issues due to delays in getting raw materials, labor-related issues, transportation disruptions, potential damage to inventories, etc. A lower rating of compared that for Agriculture/Livestock/Dairy SMEs is due to the fact that the operations of manufacturing SMEs are carried out mostly in enclosed buildings and structures, usually more protected against the climatic factors like rainfall, floods, storms, etc. The effect of high or low temperatures or heat and cold waves can also be better controlled in enclosed spaces.

Trading sector was found to be the third most exposed sector due to climate change in terms of internal business operational factors. Lower vulnerability perception of these SMEs is derived from the nature of their business operations which are not dependent on complex processes involving machinery and equipment. Involvement of labor for carrying out the routine operations is also lower for such enterprises.

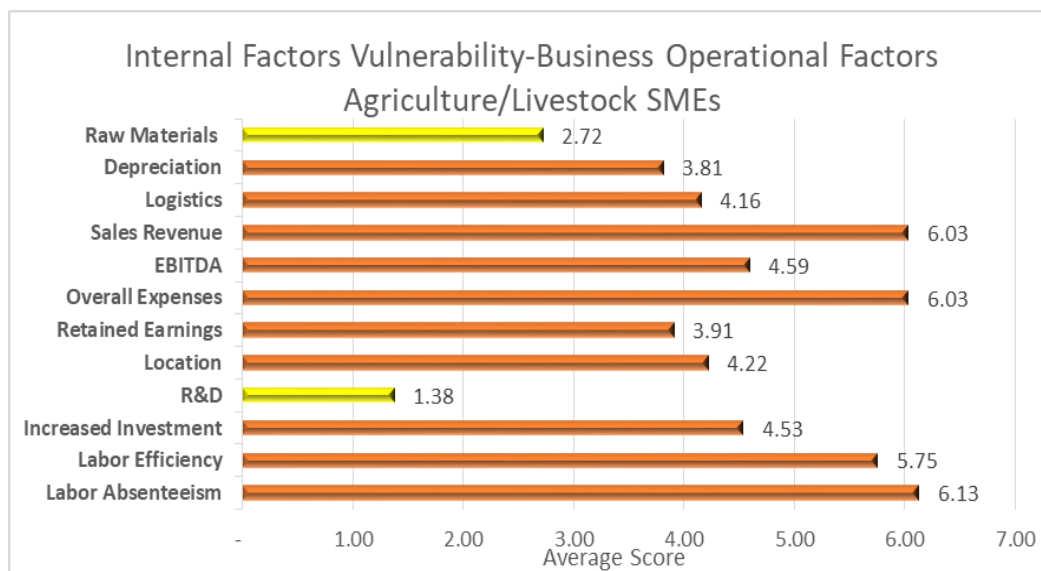
Services sector was rated as the least exposed to impact of climate change for internal business operational factors. Lesser use of physical goods, intangible assets, low logistics needs, etc. are some of the attributes of these enterprise which resulted in a lower climate change vulnerability score of these SMEs.

Business nature-wise comparisons of the climate change vulnerability of the internal operational indicators of the surveyed SMEs, for twelve external climate change factors, for all the four types of businesses, are presented in Figure 49, Figure 50, Figure 51 and Figure 52.

6.3.1 Agriculture/Livestock/Dairy Enterprises – Internal Indicators Vulnerability

The average score of the internal indicators vulnerability of Agriculture/Livestock SMEs was 4.44 which was the highest among all the four types of businesses. This figure is the average of the individual scores of the twelve business operational indicators, shown in Figure 49.

Figure 49 – Agriculture/Dairy/Livestock SMEs Internal Indicators Vulnerability



All the indicators except Raw Materials and R&D lied in the range from 3.0 to 7.0 and were thus rated as being moderately affected by the climate change factors. The raw materials for Agricultural production includes materials like seeds, fertilizers, etc. which are not in large volumes and can be protected against the climatic factors. Also, there is no routine role of R&D in the operations of Agriculture/Livestock SMEs which led to a lower perception of climate change impact for these two factors, placing them in the minor effect range. The indicators related to profitability were relatively more vulnerable compared to other functions of the business. A high score of 6.03 was obtained, each for Sales Revenue and for Overall Expenses making it the very vulnerable indicators of the Agriculture/Livestock businesses. Other profitability indicators of EBITDA and Retained Earnings were also in the higher range with respective scores of 4.59 and 3.91.

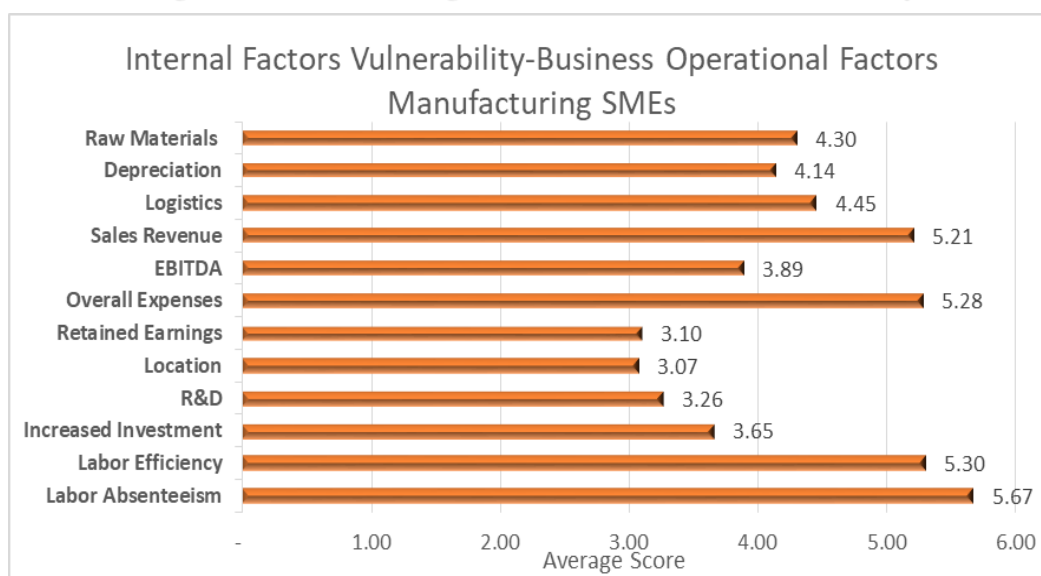
Labor Absenteeism was found to be the most vulnerable indicator with score of 6.13, followed by another high score of 5.75 for Labor Efficiency, placing them in the moderate range. Potential reasons for this include difficulty in routine commuting of labor to reach their work places or the work environment getting more difficult to work, due to the impact of climate change. The effect on the two labor-related indicators was perceived to be moderate. The effect on Logistics was also rated as moderate with a score of 4.16. Climate change effect for none of the twelve indicators was rated as severe for Agriculture/Livestock SMEs.

6.3.2 Manufacturing Enterprises – Internal Indicators Vulnerability

Individual scores showing the perceived impact on the business operational indicators of the manufacturing SMEs are presented in Figure 50. Overall vulnerability of manufacturing SMEs was lower than that of Agriculture SMEs, shown by an average score of 4.28. The results of the manufacturing SMEs was found to be unique in the sense that the climate change impact

for all the twelve indicators was rated as moderate and none was rated as minor. Just like Agriculture SMEs, for manufacturing SMEs also, the labor-related factors had higher scores, with Labor Absenteeism receiving the highest impact with a score of 5.67. It was followed by Labor Efficiency with a score of 5.3, making it the second most affected indicator. The impact scores of profitability indicators of Sales Revenue and Overall Expenses were also high; 5.21 and 5.28 respectively.

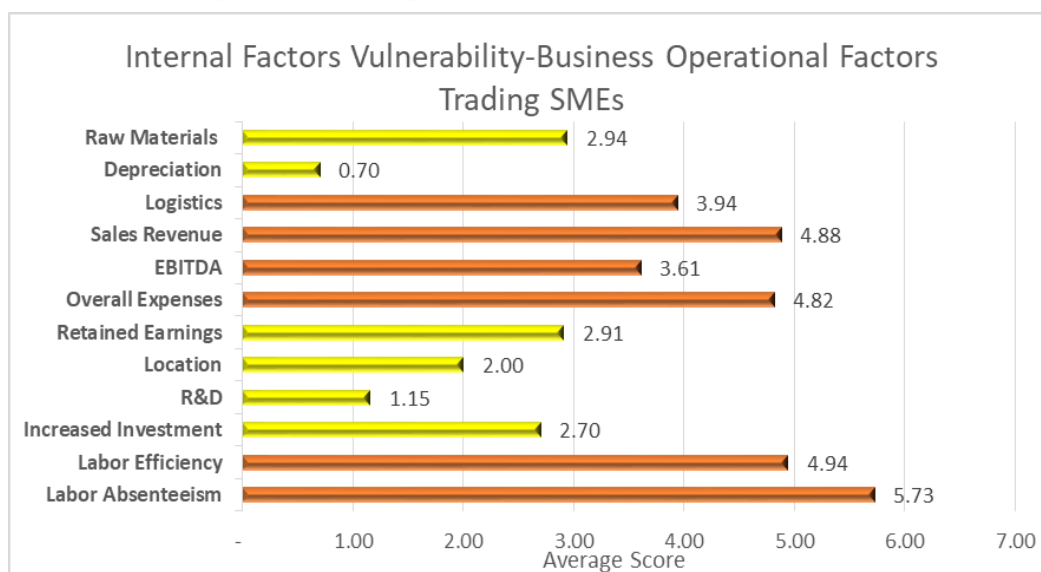
Figure 50 – Manufacturing SMEs Internal Indicators Vulnerability



Raw Materials factor for the manufacturing SMEs was rated as being moderately affected with a score of 4.3. Climate change impact on the other productivity-related indicator of Depreciation was perceived to be 4.14. Other indicators where the effect was relatively lower included Retained Earnings, R&D and Location.

6.3.3 Trading Enterprises – Internal Indicators Vulnerability

Individual scores showing the perceived impact on the business operational indicators of the trading SMEs are shown in Figure 51.

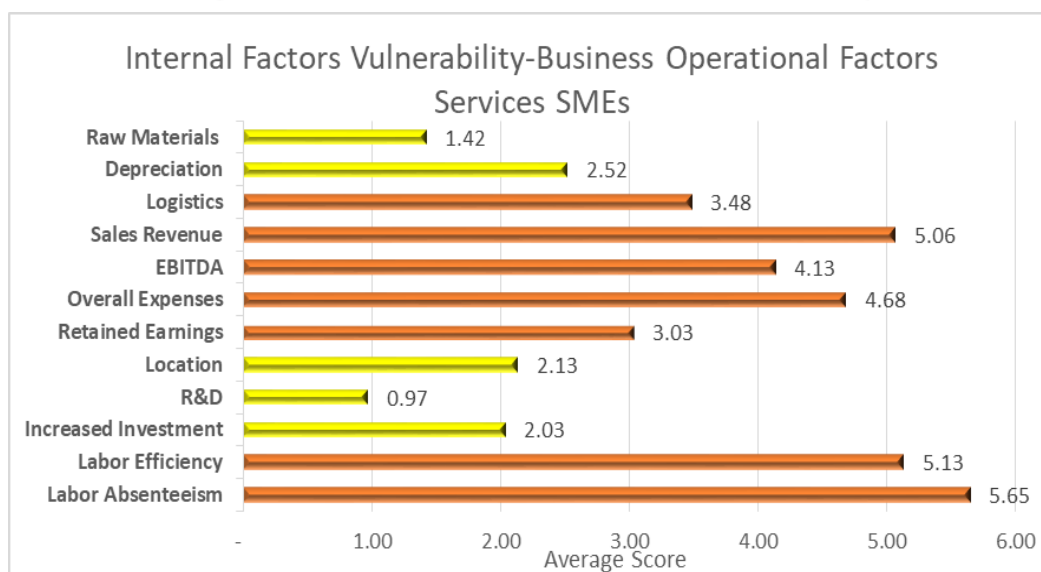
Figure 51 – Trading SMEs Internal Indicators Vulnerability

The SMEs of Trading sector was found to be less affected by climate change compared to SMEs of Agriculture and Manufacturing sectors. Maximum exposure was perceived on the labor-related indicators. The labor indicators of Efficiency and Absenteeism, with respective scores of 5.73 and 4.94 were the two highest rated indicators with the effect rated as moderate. The profitability indicators of Sales Revenues and Overall Expenses were the next most affected indicators with respective scores of 4.88 and 4.82, while EBITDA had a score of 3.61. All of these three indicators were perceived to have moderate climate change effect.

Raw Materials were also perceived to be affected minorly, with a score of 2.94. The raw materials of Trading businesses generally include stocks which are affected in terms of their availability and potential damages from different climatic factors like rainfall, floods, storms, extreme temperatures, etc. Retained Earnings, Location, Depreciation and R&D, with respective scores of 2.91, 2.0, 0.70 and 1.15, were the three indicators for which the climate change effect was rated as minor. Trading businesses usually do not have expensive machinery and equipment due to which the effect on Depreciation was affected the lowest among all the twelve indicators.

6.3.4 Services Enterprises – Internal Indicators Vulnerability

The overall average score of the services sector SMEs was 3.35 which was the lowest among all the four types of businesses. This average score rated the services sector as being moderately affected by the climate change factors. Figure 52 shows the individual scores of the twelve indicators, showing the perceived impact on the business operations of the services SMEs. Climate change impact on seven indicators was moderate and for the remaining five, it was minor.

Figure 52 – Services SMEs Internal Indicators Vulnerability

The maximum climate change impact was perceived to be for workforce related factors. The scores for Labor Absenteeism and Labor Efficiency had the first and second highest scores of 5.65 and 5.13. On the scale being used, the impact on these two factors was rated as moderate. Services sector SMEs usually have lesser machinery and equipment and other physical assets and their main dependence is on manpower input. Two profitability indicators of Sales Revenue and Overall Expenses were perceived to be moderately affected with respective scores of 5.06 and 4.68 lying in the moderate effect range. The other two indicators of EBITDA and Retained Earnings also fell in the moderate impact range. With a score of 1.42, the climate change effect on Raw Materials was rated as minor since unlike the other three sectors, Services sector have lower dependence on raw materials. With a score of 0.97, the climate change effect on R&D was also rated as minor. Location was also one of the factors which was rated as being minorly affected, with a score of 2.13.

7.0 INTERNAL READINESS ANALYSIS

The survey questionnaire mapped the perception of the responding SMEs regarding their readiness to climate change vulnerability. There were seventeen internal measures to cope with climate change effects, about which questions were asked during the survey. The responding SMEs shared their perceptions by choosing one response from the eleven available responses through which the survey results led to developing a comprehensive understanding of climate change readiness of SMEs. All the factors were rated on a scale from 0 to 10, where 0 indicated no readiness and 10 indicated a high readiness of the business towards climate change impact. The final Climate Change Readiness scores were calculated using weighted average of all the responses.

The potential readiness of the SMEs towards climate change impact was analyzed by defining ranges of the final Readiness score. The four types of Readiness are listed in Table 11.

Table 11 –Internal Factors Impact - Score Ranges and Impacts

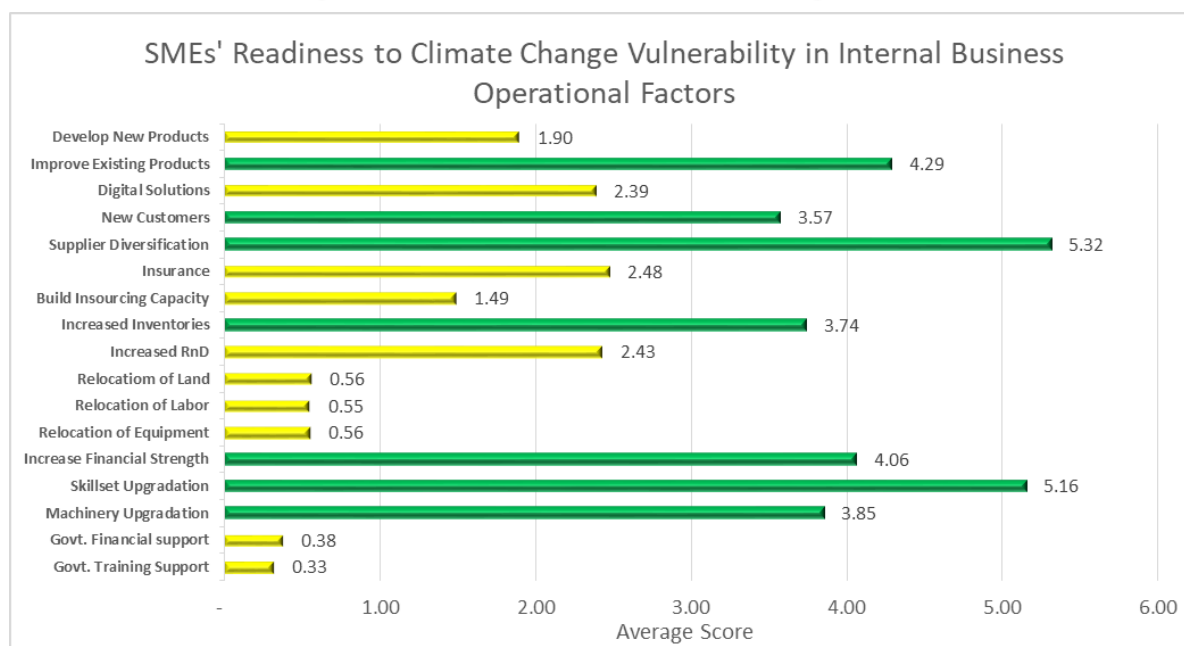
Total Score Range	Readiness
0	No Readiness
Up to 3.0	Low Readiness
Greater than 3.0 and Up to 7.0	Moderate Readiness
Greater than 7.0 and Up to 10.0	High Readiness

Average Readiness scores, calculated from the survey results, have been presented in the form of bar charts. For improving the visual presentation and better understanding of the readers, a color coding has been used in these charts. Readiness has been presented by using three colors, listed in Table 12.

Table 12 –Internal Factors Impact – Indicative Colors in Graphs

Total Score Range	Bar Color
0	Yellow
Up to 3.0	Yellow
Greater than 3.0 and Up to 7.0	Green
Greater than 7.0 and Up to 10.0	Dark Green

Average values of the ratings obtained during the survey for all the seventeen readiness factors are presented in Figure 53.

Figure 53 – Internal Factors Readiness Average Scores

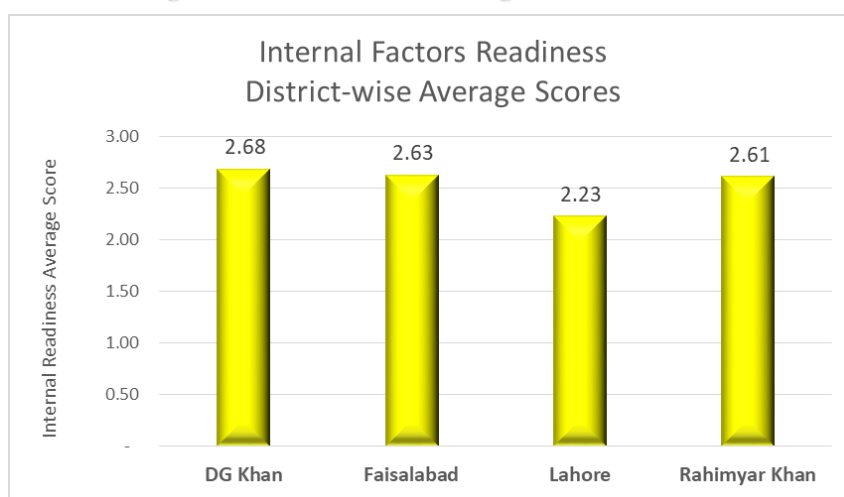
The average score of all the seventeen readiness indicators was calculated to be 2.53 which meant that the overall readiness of SMEs against climate change impact was rated as Low. Ten of the seventeen readiness indicators were perceived to be in the Low range. The adaptation measures related to relocation of land, labor and machinery were rated among the lowest ones, with their scores falling below 0.6. This meant that relocation was not considered as a feasible option by the SMEs to counter the potential effects of climate change. The lowest scores were obtained for the indicators related to getting support from the government. In that regard, Financial Support obtained a score of 0.38 and Training Support a score of 0.33. Thus the SMEs perceived that they have to cope with climate change impact through their own resources and efforts. They did not expect any support from the government. Three of the indicators, rated as Low Readiness, while still falling in the low readiness range, were better than others and closer to moderate range. The options of using Digital Solutions, Developing New Products and Insurance received scores of 2.39, 1.90 and 2.48 respectively.

Seven of the seventeen indicators had scores in the range from 3.0 to 7.0 and were thus perceived as having moderate readiness against climate change effects. Supplier Diversification received the highest readiness score of 5.32 which meant that the SMEs use this option most commonly to protect themselves from the climate change effects like natural disasters, resource scarcities, transportation issues, etc. Resource upgradation was also identified as an important Readiness measure. Skillset and machinery upgradation options respectively received scores of 5.36 and 3.85 putting them in the range of moderate readiness. Improving Existing Products received a score of 4.29 which meant that it was adopted more commonly than the option of Developing New Products to cope with climate change effects. Increased Inventories received a higher score of 3.74, indicating that investing more in inventories was adopted to avoid delayed shipments due to extreme weather events or scarcity of raw materials when supply chains are temporarily disrupted due to climate change effects.

7.1 Internal Readiness - District-Wise Comparison

The survey covered four districts, with Lahore, Faisalabad, categorized as less vulnerable and DG Khan and Rahimyar Khan, categorized as more vulnerable districts to climate change. The data was sliced to understand the differences of the SMEs readiness against climate change. Figure 54 shows the average readiness scores of the four target districts.

Figure 54 – District-wise Average Readiness Scores



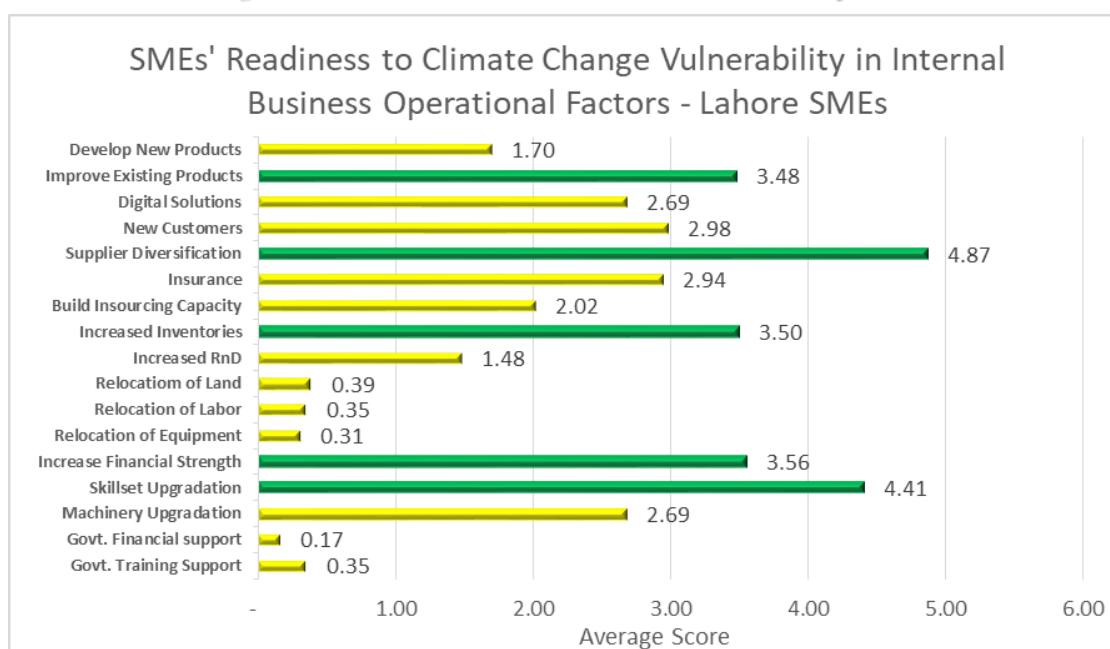
SMEs in all the four districts were found to have Low Readiness to climate change since their average scores fell below 3.0. DG Khan, with a score of 2.68, was slightly more ready than the other three districts. Surprisingly, the SMEs of Lahore, with an average score of 2.23, were found to be the least ready against climate change, compared to the SMEs from other three districts. Average readiness score of the two less vulnerable (Lahore and Faisalabad) districts was 2.43, which was surprisingly lower than the average score of 2.65 for the two more vulnerable districts (DG Khan and Rahimyar Khan).

District-wise comparisons of the climate change vulnerability perceptions of the SMEs surveyed in Lahore, Faisalabad, DG Khan and Rahimyar Khan for nine external climate change factors, are respectively presented in Figure 55, Figure 56, Figure 57 and Figure 58.

7.1.1 Lahore SMEs – Readiness to Climate Change

The average readiness score of Lahore SMEs was 2.23, placing the district in the Low Readiness range. Looking at the scores of seventeen individual readiness indicators, it was seen that twelve of those fell in the Low readiness range. Support from government was seen as the area of lowest readiness, with both the financial and technical support indicators getting scores below 0.4 (close to zero). Similarly, relocation of land, labor or machinery was not practiced as a measure to cope with the effects of climate change. All three indicators in this head received scores below 0.4. Looking for New Customers, Insurance, Digital Solutions and Developing New Products were the measures adopted by Lahore SMEs against climate change threats, but the Readiness on these indicators was still rated as Low. The results are shown in Figure 55.

Figure 55 – Lahore SMEs – Readiness Indicators Comparison



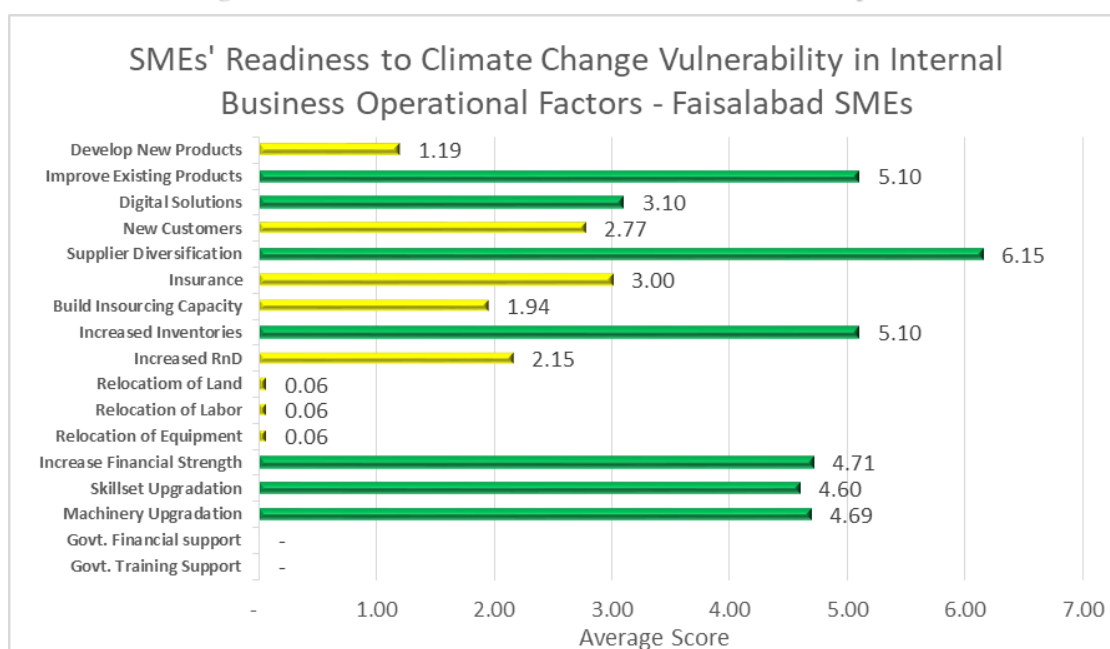
There were five indicators for which the readiness against climate change was rated as moderate. Supplier Diversification, with a Readiness score of 4.87, was the most common practice in this regard. Skill upgradation was the second most commonly adopted measure to deal with climate change effects. The activities carried out in that regard may include training the staff on new technologies, emergency procedures related to extreme weather events, or sustainability practices that reduce environmental impact. Readiness on Improving Existing Products was also rated as an important indicator, and with a score of 3.56, was rated as having moderate readiness. Lahore SMEs also practiced increasing their financial strength to better deal with climate change threats.

It is important noting that none of the seventeen readiness indicators received a score of more than 5.0 and none of them were rated as having a high readiness. The readiness of all the indicators was found to either in low or in the lower half of moderate range.

7.1.2 Faisalabad SMEs – Readiness to Climate Change

The readiness mapping results of Faisalabad SMEs were quite similar to those of Lahore SMEs. Average readiness rating was 2.63, which was higher than that of Lahore. With a score of less than 3.0, ten of the seventeen indicators were rated as having Low readiness. The results are shown in Figure 56.

Figure 56 – Faisalabad SMEs – Readiness Indicators Comparison



Just like for Lahore SMEs, for SMEs of Faisalabad as well, the readiness indicators related to government support and relocation received scores close to zero. Those indicators were thus not viewed as relevant for coping with the effects of climate change. The indicators of Insurance, New Customers and R&D were also rated at low readiness, but they fell towards the higher end of this band. Building insource capacity received a score of 1.94 and was thus also rated as having low readiness.

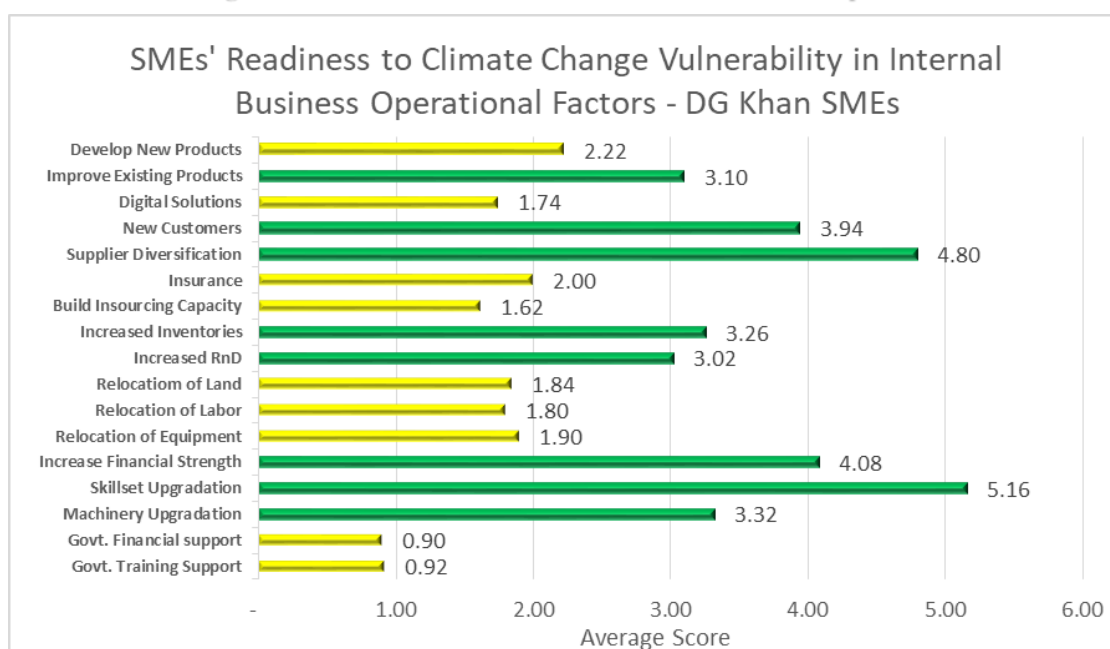
Among the indicators falling in the moderate readiness range, Supplier Diversification was rated as the one with the highest readiness score of 6.15. In fact this rating was higher than the one obtained for Lahore. This also lied towards the higher end of moderate range (closer to high readiness). Faisalabad SMEs were found to have higher readiness in Increased Inventories and Improving Existing Products, both getting a score of 5.1. The SMEs were thus covering themselves against the potential shortages in raw material supplies or delayed deliveries of their final products by having more stocks. This increases their financial cost but the SMEs were still adopting this measures against the potential climate change effects. This results was also supported by a high score of 4.71 for the readiness indicator of Increased Financial Strength. Improving Existing Products and Services was also seen as a well-practiced measure against climate change by Faisalabad SMEs. Adoption of skillset and machinery upgradation were the two other important indicators falling in the moderate readiness range.

None of the seventeen indicators showed a high readiness score since all of the scores were below 7.0.

7.1.3 DG Khan SMEs – Readiness to Climate Change

With an average readiness score of 2.68, the readiness mapping results of DG Khan SMEs was the best among the SMEs from all the four districts covered in the survey. With a score of less than 3.0, nine of the seventeen indicators were rated as having Low readiness. The survey results are shown in Figure 57.

Figure 57 – DG Khan SMEs – Readiness Indicators Comparison



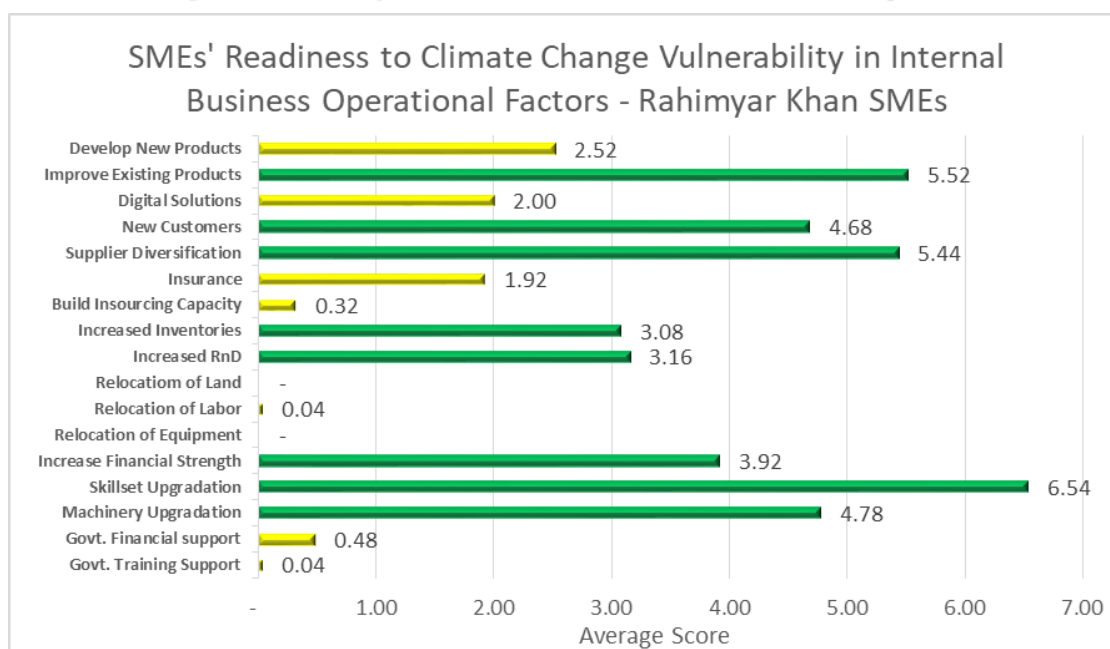
Skillset upgradation was the most commonly used measure to cope with climate change impact, shown by the highest readiness score of 5.16. Along with this, the readiness with respect to machinery upgradation was also rated high (3.32). The readiness of these two indicators was placed in the moderate range. Just like the SMEs of Lahore and Faisalabad, the SMEs of DG Khan also rated Supplier Diversification as an important factor to protect their businesses against climate change effects. With a score of 4.8, this was the second highest rated indicator for the readiness of SMEs. The readiness indicator of increasing financial strength also received a high score of 4.08. A related indicator was increasing inventories which also fell in the moderate readiness range with a score of 3.02. Within marketing indicators, looking for new customers was a commonly adopted measure by the DG Khan SMEs, shown by a score of 3.94. Regarding products, improving existing products was a more commonly adopted measure, compared to developing new products. Improving existing products had score of 3.1 which rated it at moderate readiness, compared to the score of 2.22, rating it at low readiness. Adopting digital solutions had a low readiness score of 1.74.

The readiness scores of getting government's technical or financial support were less than 1 (0.9) which shows the low expectations of the SMEs from the government. Similarly, the measures of relocating land, labor or equipment were also rated as less adopted measures, with their readiness scores of less than 2.0. The readiness in terms of building insourcing capacity to cope with climate change impact was also rated low (1.62). Insurance was also not seen as a commonly adopted measure in this regard by the SMEs of DG Khan.

7.1.4 Rahimyar Khan SMEs – Readiness to Climate Change

With an average readiness score of 2.61, the readiness mapping results of Rahimyar Khan SMEs placed the district in the low readiness range (just like the other three districts). The results were quite similar to those obtained for DG Khan SMEs. With a score of less than 3.0, nine of the seventeen indicators were rated as having Low readiness. The survey results are shown in Figure 58.

Figure 58 – Rahimyar Khan SMEs – Readiness Indicators Comparison



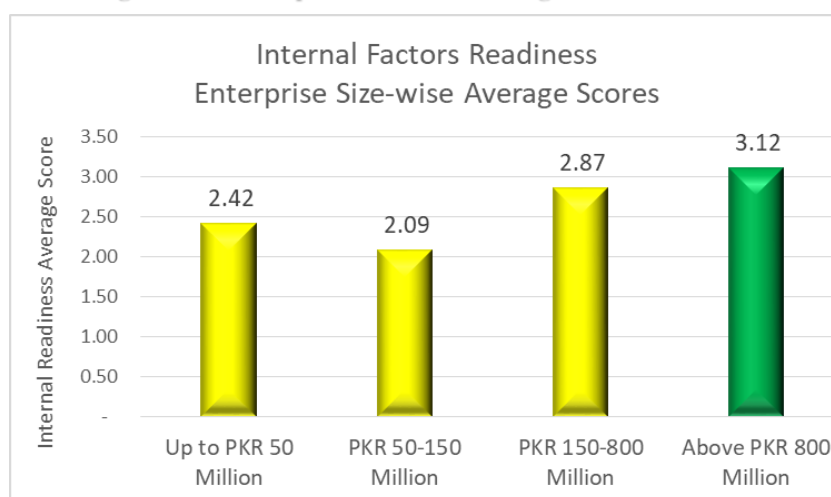
Just like DG Khan SMEs, the highest readiness score of 6.54 was obtained for Skillset upgradation. While it fell within the moderate readiness range, it was close to the high readiness range that starts from 7.0. That was the most commonly adopted measure to cope with the climate change impact. Machinery upgradation also had a moderate readiness score of 4.78. For this district, the indicator of Improving Existing Products received the highest score of 5.52, rating it at moderate readiness. Similarly, the other marketing-related indicator of New Customers also received a high score of 4.68, placing it in moderate readiness range. However, the scores of Developing New products was rated at 2.52, putting it in low readiness range. Other important measures adopted by the SMEs of Rahimyar Khan were Increased Financial Strength and Increased Inventories, shown by respective scores of 3.92 and 3.08, putting them in moderate readiness range.

The indicators related to relocation of land, equipment or labor were rated at zero readiness, thereby showing that these factors were not considered as effective measures by the SMEs to cope with the climate change impact. Similarly, the readiness scores of the two indicators of getting government's technical or financial support were also rated at close to zero values. The score of increasing insourcing capacity to reduce dependence on outside vendors was also rated in the low range, with a score of 0.32. Insurance was not adopted as an important measure to deal with the climate change impact, shown by a score of 1.92, putting it in low readiness range.

7.2 Internal Readiness – SME Size-Wise Comparison

Climate change readiness of the surveyed SMEs was also analyzed with respect to the enterprise size (defined by the annual revenues). Average readiness scores were calculated for the enterprises falling under the four sizes, as defined in the questionnaire. Figure 59 shows the average readiness scores of the SMEs categorized under the four sizes.

Figure 59 – Enterprise Size-wise Average Readiness Scores



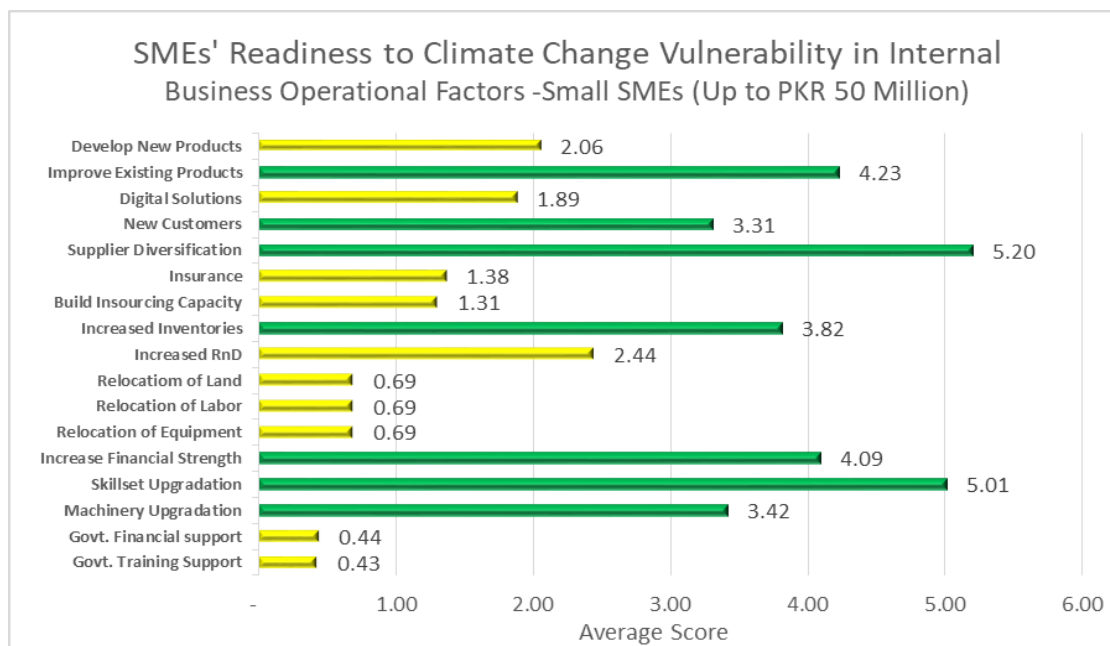
The graph shows that the readiness against climate change impact generally increased with the size of the business enterprise. The highest readiness score of 3.12 was that for the large enterprises (above PKR 800 million) which showed the readiness rated as moderate (result of only one large enterprise). The average readiness scores of small and medium enterprises were rated Low. The small enterprises, having revenues in the range PKR 50-150 million, had an average readiness score of 2.09 which was the lowest among all the four types of enterprises being compared. The average score of the other segment of the small enterprises, with revenues up to PKR 50 million, was 2.40, only slightly higher. The readiness score of medium enterprises was 2.87 which was higher than those of small enterprises and lower than that of large enterprise. Increasing readiness against climate change impact with the enterprise size indicates that the enterprises with larger sizes and better access to resources have a better capacity to protect themselves against the adverse effects of climate change.

Enterprise size-wise comparisons of the readiness of the SMEs against climate change, in terms of the seventeen readiness indicators, are presented in Figure 60, Figure 61, Figure 62 and Figure 63.

7.2.1 Small Enterprises (Up to PKR 50 Million) – Internal Readiness

The overall readiness score of small enterprises (up to PKR 50 million) were found to be low. The results of the seventeen indicators constituting the average score of 2.14 is shown in Figure 60.

Figure 60 – Small SMEs – Readiness Scores Comparison-1



None of the readiness indicators were rated in the High range. There were ten indicators which fell in the Low range. The indicators related to locations and government supports were rated at scores of less than 0.5, showing a very low readiness. The measures of Digital solutions and New Products were used by the SMEs but their readiness remained in the low range (respective scores of 1.89 and 2.06). The indicators of building insourcing capacity and Insurance were also rated as having low readiness. A low score for Insurance measure can be traced back to weak financial strength of small enterprises to bear the insurance cost. The readiness scores of three measures of relocating land, labor or equipment were less than 0.7, classifying these as low readiness indicators.

Highest readiness was seen for Supplier Diversification. With the highest score of 5.2, the readiness of this indicator was rated as moderate. The second highest score of 5.01 was for skillset upgradation which showed that SMEs considered this as an important measure to cope with the climate change impact. Machinery upgradation was also found to have higher score of 3.42. The readiness of both of these upgradation-related scores was found to fall in the moderate range.

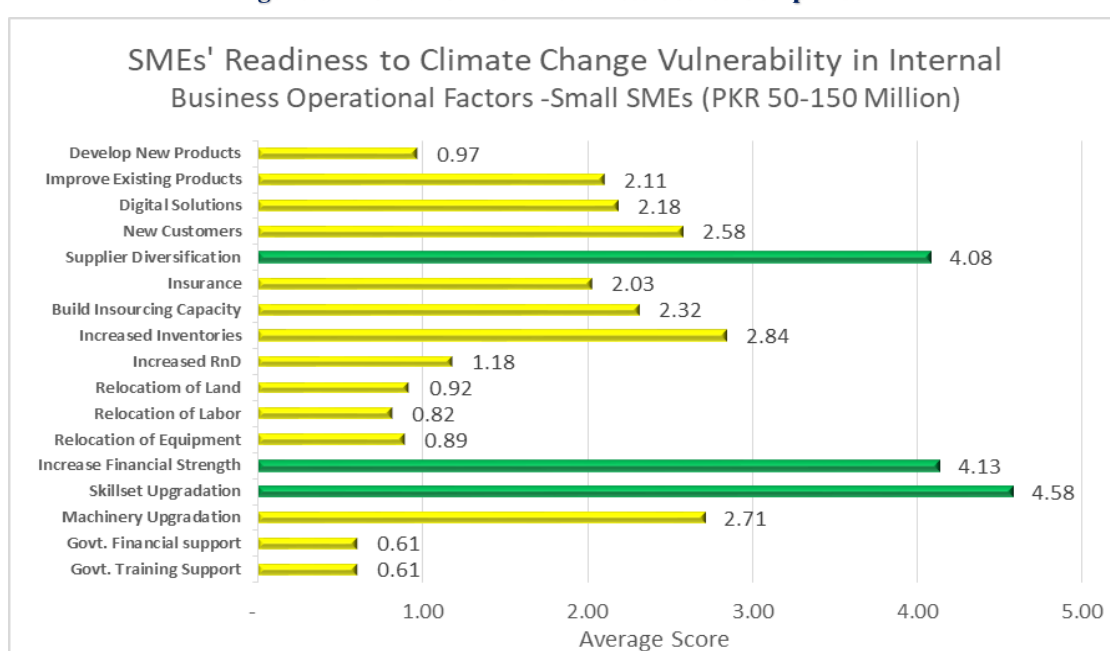
With a score of 3.82, increasing the size of inventories was also practiced by these small enterprises as an important measure to cope with the potential impact of climate change. While adopting this measure is challenging for small SMEs due to shortage of capital, they were still found to be practicing this to avoid the potential raw material shortages or sale losses due to climate change factors. They also increase their financial strength to meet this challenge. This is shown by a readiness score of 4.09 for Increased Financial Strength indicator, placing it in

moderate readiness range. Developing new products was not commonly practiced by these small SMEs but improving the existing products was practiced, as indicated by a moderate readiness score of 4.23.

7.2.2 Small Enterprises (PKR 50-150 Million) – Internal Readiness

The results of this survey for this segment of small enterprises (PKR 50-150 million) is quite similar to the results of the other segment of small SMEs (Up to PKR 50 million). SMEs in this segment were found to be the least ready to deal with climate change threats. Of the total seventeen indicators, fourteen indicators were found to fall in the low readiness range, with only the remaining three falling in the moderate readiness range. There was no indicator which had a high readiness score. The results are shown in Figure 61.

Figure 61 – Small SMEs – Readiness Scores Comparison-2



The highest readiness was rated for Skillset upgradation, with a score of 4.58, putting it in moderate range. This showed that the SMEs in this category undertook activities focused at improving the skills of their staff by training and development. However, the other related indicator of machinery upgradation was not commonly adopted, shown by a score of 2.71, placing this indicator in low readiness range. This can be related to the fact that machinery upgradation is more capital intensive activity compared to skillset upgradation. It is therefore more difficult for the SMEs to upgrade machinery. Increasing financial strength was also found to have a high score of 4.13, placing this in moderate readiness range. Supplier Diversification indicator also had a high score of 4.08 for these SMEs, rating it as moderate readiness. Supplier Diversification was found to be the most commonly adopted measure for SMEs of all sizes.

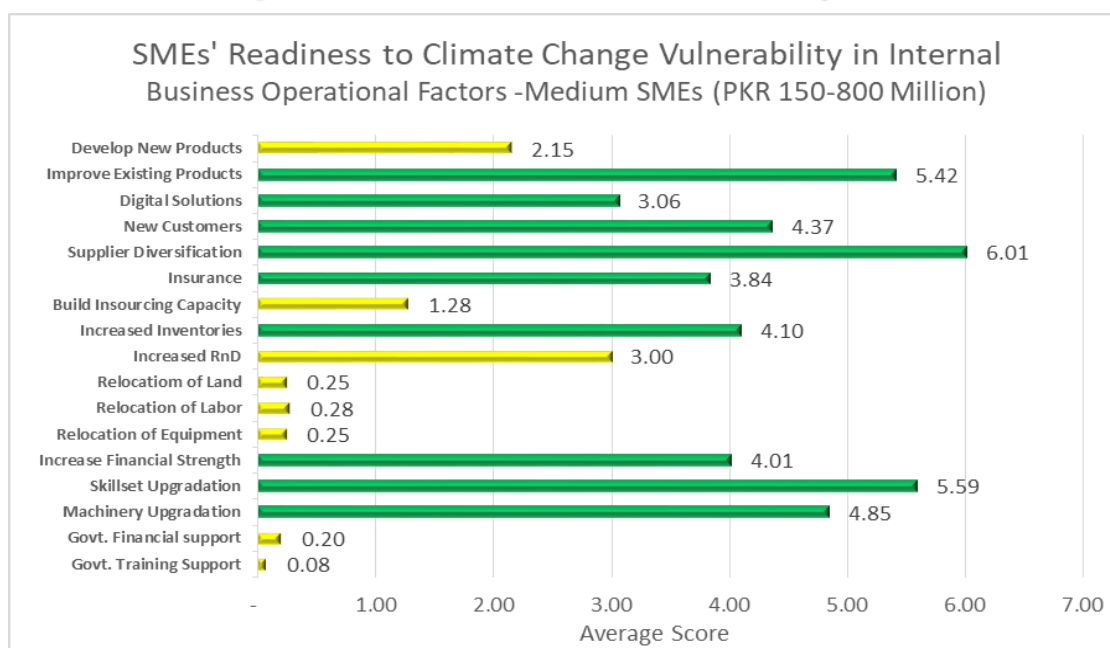
All the marketing-related indicators were found to have low readiness showing that these measures were not commonly used by SMEs to deal with climate change threats. The indicator of Finding New Customers had a relatively higher score of 2.58 among the four related indicators. All the three relocation indicators were also rated as having low readiness. Similarly, the readiness of getting government's financial or technical support were also rated

low, each with a score of 0.61. The indicators of insurance, building insourcing capacity and increasing R&D had respective scores of 2.03, 2.32 and 1.18, rating their readiness to be low.

7.2.3 Medium Enterprises (PKR 150-800 Million) – Internal Readiness

The overall readiness score of medium enterprises was 2.87 which was higher than those of small enterprises, but still getting placed in Low readiness range. The readiness scores of the seventeen indicators is shown in Figure 62.

Figure 62 – Medium SMEs – Readiness Scores Comparison



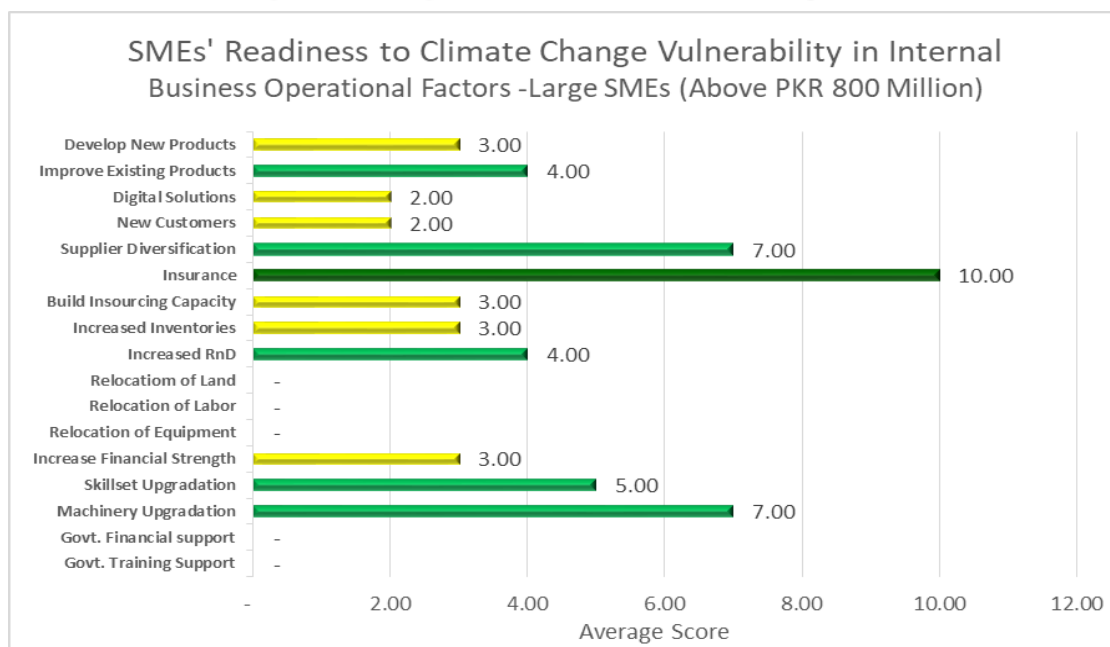
Readiness scores of five indicators were close to zero. Those included relocation of land, labor and equipment and government's financial or training support. Apart from these, there were two indicators for which the readiness scores were less than 3.0, placing them in low readiness range. These included Increased R&D and Build Insourcing Capacity, with respective scores of 3.0 and 1.28. Just like small enterprises, the indicator of Supplier Diversification had the highest readiness score of 6.01, placing it in moderate range. This was the most commonly used measure against the climate change impact by the mediums SMEs. The next most commonly used measure was skillset upgradation, with a score of 5.59, placing it in moderate readiness range. The other related indicator of machinery upgradation also had moderate readiness, shown by a score of 4.85.

Within marketing indicators, Improving Existing Products, Digital Solutions and Finding New Customers, with respective scores of 5.32, 3.06 and 4.37, were rated as having moderate readiness, whereas one indicator of Developing New Products was rated as having low readiness (2.15). One result that was different from that of small enterprises was that for Insurance. This indicator had a higher score of 3.84 which meant a moderate readiness. The measure was thus considered important to protect the business from climate change effects. A similar result is also shown by the indicators of Increased Inventories and Increase Financial Strength, for which the respective readiness scores were 4.10 and 4.01 and were rated at moderate readiness.

7.2.4 Large Enterprises (Above PKR 800 Million) – Internal Readiness

The results of one large surveyed enterprise are shown in Figure 63. The results are slightly different from those of medium and small enterprises.

Figure 63 – Large SMEs – Readiness Scores Comparison

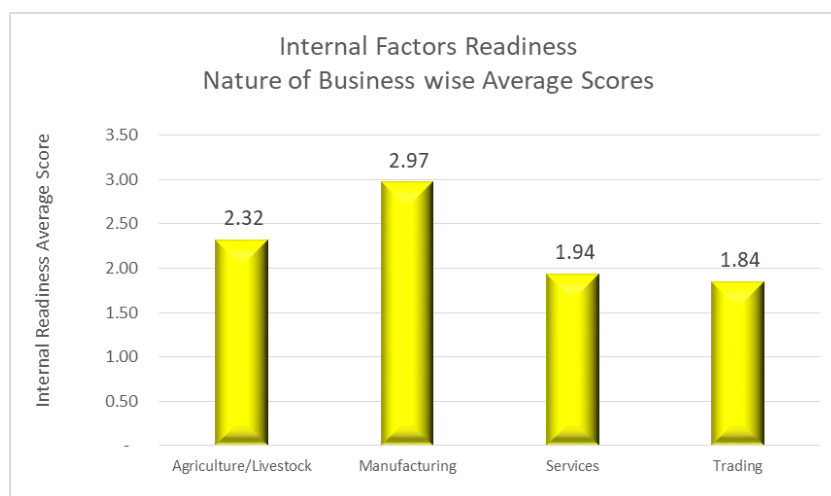


Insurance was seen as the most important measure to protect the business from climate change effects. The indicator was given the maximum score of 10, placing the readiness of this indicator at the highest. This shows that as the financial strength of business enterprises rise, they do start considering the use of insurance as a viable measure to deal with the adverse effects of climate change.

Supplier Diversification and Machinery Upgradation indicators were also rated close to High Readiness, each with a score of 7.0. In contrast to small and medium enterprises, the large enterprise also used R&D as a measure to deal with climate change effects. R&D had a score of 4.0, rating it as moderate. For marketing-related measures, Improving Existing Products had a moderate readiness of 4.0, whereas the other three indicators of Developing New Products, Digital Solutions and Finding New Customers were rated as having low readiness. The measures of relocation of land, labor or machinery or getting any financial or training support from the government were not practiced at all, shown by zero scores for all these indicators.

7.3 Internal Readiness – Nature of Business-Wise Comparison

The analysis of climate change readiness of the surveyed SMEs with respect to the nature of business was also carried out. Average readiness scores were calculated for the four types of businesses, as defined in the questionnaire. Figure 64 shows the average readiness scores of the four types of SMEs.

Figure 64 – Nature of Business-wise Average Readiness Scores

All the four types of SMEs had a score of less than 3.0 which placed them in the Low range of readiness against climate change impact. Manufacturing SMEs led with the highest average score of 2.97, suggesting presence of stronger internal systems and higher preparedness to cope with climate change impact. Agriculture/Livestock followed with a score of 2.32, while Trading and Services trailed slightly behind with scores of 1.94 and 1.84, respectively. The variation in scores, with a gap of 1.03 between the highest and the lowest, highlighted sector-specific differences in internal capabilities. These findings could inform policymakers and support organizations to focus on capacity-building efforts, especially for service-oriented and trading businesses. Overall, the graph emphasizes the importance of strengthening internal readiness across all sectors to enhance overall business performance and sustainability.

Business of Nature-wise comparisons of the readiness of the SMEs against climate change impact, in terms of the seventeen readiness indicators, are presented in Figure 65, Figure 66, Figure 67 and Figure 68.

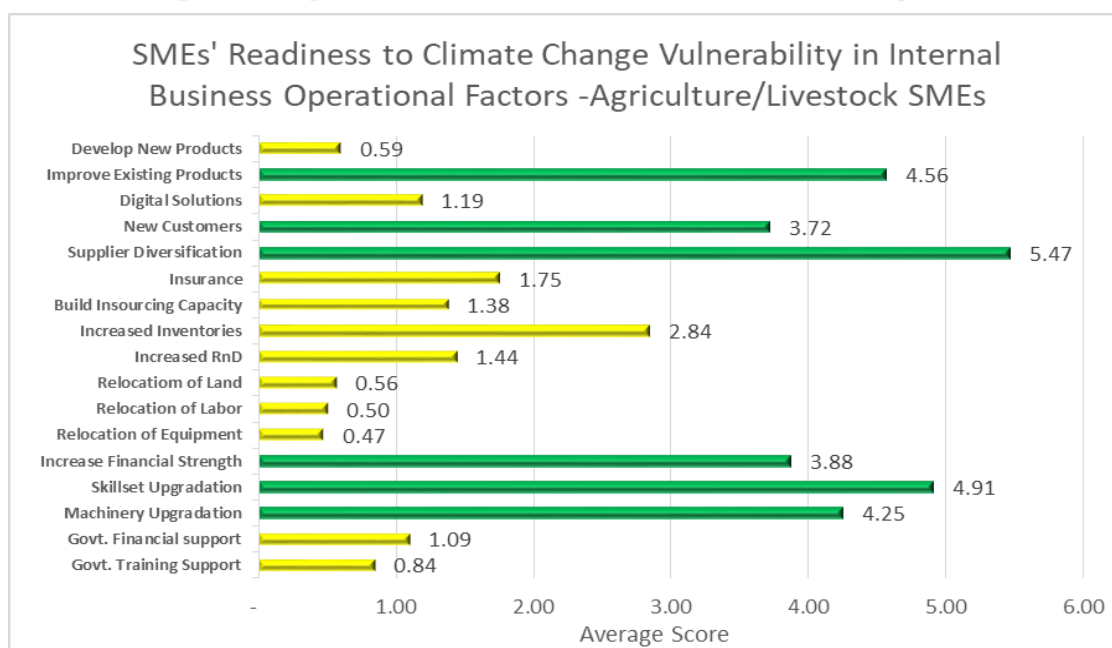
7.3.1 Agriculture/Livestock Enterprises – Internal Readiness

The average readiness scores, presented in Figure 65, reflect the preparedness of Agriculture/Livestock SMEs to address and adapt to climate-related vulnerabilities. The highest readiness was observed for supplier diversification, with a score of 5.47, placing it in the moderate readiness range. That suggested that many SMEs take steps to reduce reliance on a single supplier, enhancing their resilience to supply chain disruptions triggered by climate impacts. The second area of high readiness related to upgradation of skillset and machinery, with respective scores of 4.91 and 4.25, rating those at moderate readiness. Other areas with relatively higher readiness included Improving Existing Products (4.56), Finding New Customers (3.72) and Increasing Financial Strength (3.88). Readiness of these three variables also fell in the moderate range. These findings indicate a proactive approach among SMEs to strengthen internal capabilities, manage risk, and enhance operational efficiency in the face of climate change.

With respective scores of 0.59 and 1.19, the indicators of Developing New Products and Digital Solutions were rated as having low readiness. The indicators of Insurance, Building Insourcing Capacity, Increased R&D and Increased Inventories also had low readiness. These low scores

point to limited capacity, lack of resources, or a lack of awareness about the importance of innovation and risk transfer mechanisms. Three indicators related to location of land, labor or equipment were also rated at low readiness, reflecting the practical and financial constraints that SMEs face in physically shifting operations. The Agriculture/Livestock/Dairy SMEs did not assign high weightage to financial or training support from the government, shown by low readiness scores of 1.09 and 0.84 respectively. These results highlight the limited role of institutional support and the need to improve outreach, accessibility, and relevance of government programs for climate resilience in the SME sector.

Figure 65 – Agriculture/Livestock SMEs – Readiness Scores Comparison

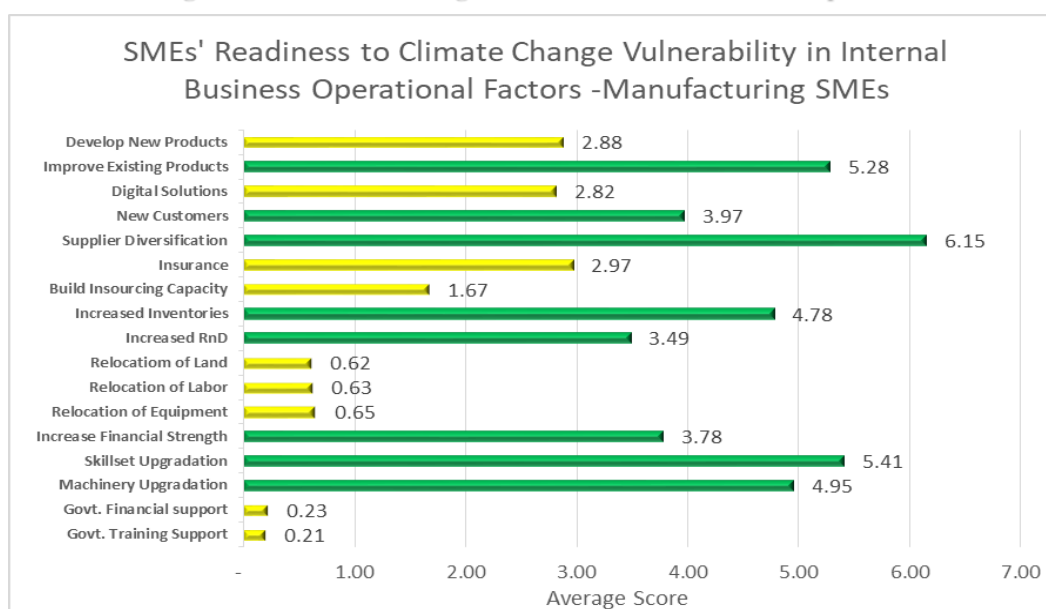


Overall, the graph reflected that while agriculture/livestock SMEs showed reasonable preparedness in improving internal operations and supply strategies, they lag behind in areas that require innovation, digital adoption, and external support.

7.3.2 Manufacturing Enterprises – Internal Readiness

Readiness scores of manufacturing SMEs are shown in Figure 66. Eight of the total seventeen indicators were rated in the moderate range and the remaining in the low range. None fell in the high readiness range. Supplier Diversification had the highest score of 6.15 (close to high readiness range) which showed that the manufacturing SMEs use the option of expanding their supplier base to cope with the potential impact of climate change. The readiness of Improving Products was also rated as high, with a score of 5.28, falling in the moderate range. Similarly, skillset and machinery upgradation indicators were also rated high with scores of 5.41 and 4.95 respectively. Increasing stocks was also found to be a more commonly adopted practice, with score of 4.78. Having more raw materials or finished goods stocks increase the preparedness of manufacturing SMEs against climate change impact.

Figure 66 – Manufacturing SMEs – Readiness Scores Comparison

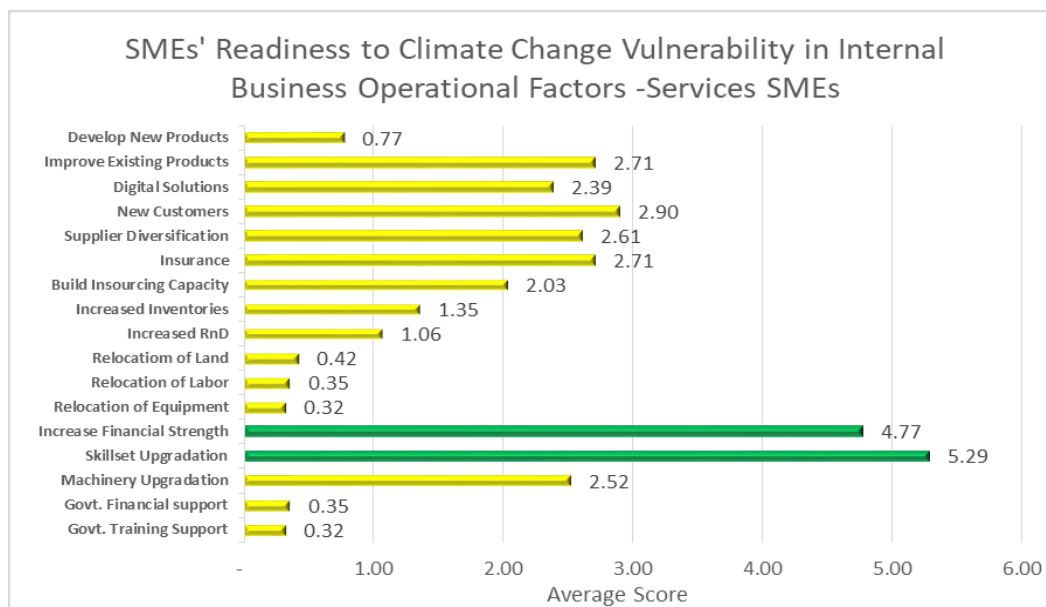


Relocation of land, labor or equipment was not viewed as viable options to cope with potential climate change threats. The scores of three variables for this obtained a score of less than 0.7. Similarly, government support, either in the form of money or training, was rated as close to zero. This perception may relate to lack of awareness or low access to avail any such options. Use of Digital Solutions, Building Insourcing Capacity, Developing New Products or Increased R&D were also rated as low readiness options but were higher than the options of relocation and government support.

7.3.3 Services Enterprises – Internal Readiness

Readiness mapping of Services SMEs in Figure 67 showed that only two factors were rated as moderate and the remaining fifteen were rated as low. This is also shown by the second lowest average score of 1.94 among all the four types of businesses being compared in this analysis.

Figure 67 – Services SMEs – Readiness Scores Comparison



With score of 5.29, the Upgradation of Skillset was rated as the factor most commonly adopted by Services SMEs to deal with climate change threats. The readiness of this indicator was rated as moderate. Increased Financial Strength was the other commonly adopted practice to cope with climate change impact. It had a score of 4.77 which placed this indicator also in the moderate readiness range. Apart from these two, all other indicators had score of less than 3.0 which rated their readiness as low. Within those, Finding New Customers was found to have the higher score of 2.9, placing it close to moderate readiness boundary.

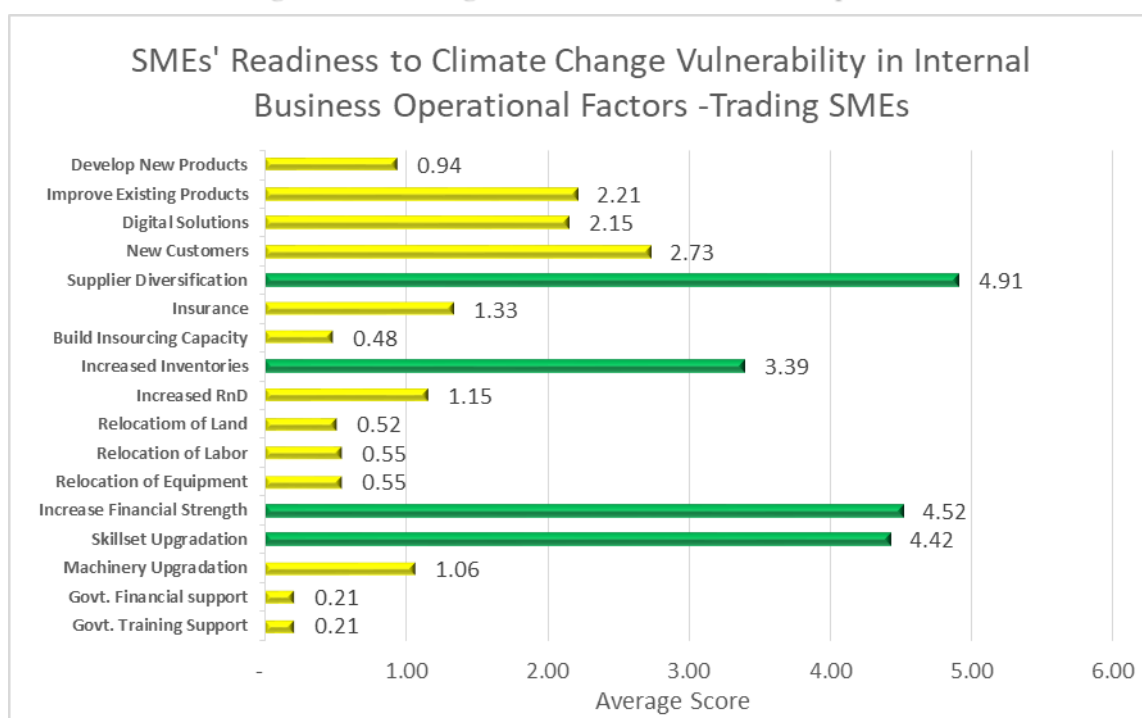
Use of Digital Solutions was also rated as an important indicator, with a score of 2.39. That showed a higher reliance of Services SMEs on Digital Solutions, compared to those for Agriculture/Livestock and manufacturing SMEs where this indicator had lower readiness scores. Insurance was also adopted as a protection measure against climate change and was rated in moderate range with as score of 2.71, but still falling in the low readiness range. Unlike Agriculture/Livestock/Dairy and Manufacturing SMEs, the reliance of Services SMEs on supplier diversification was much lower. The readiness score was also rated as low. This is due to the reason that the services SMEs are much less dependent on raw material supplies. They may be using vendors to get certain type of services/supplies but their dependence is much lower than those of the other three types of businesses.

Services SMEs also rated the three location indicators and the two government support indicators at scores very low (less than 0.5).

7.3.4 Trading Enterprises – Internal Readiness

Average readiness scores of Trading SMEs was 1.84 which was the lowest among all the four types of businesses. Looking at the results of individual readiness indicators in Figure 68, it can be seen that there are only four indicators for which the readiness score lied in the moderate range. For all others, it was rated as low.

Figure 68 – Trading SMEs – Readiness Scores Comparison



Supplier Diversification was used as the most common measure to cope with climate change threats. An average score of 4.91 for this indicator puts it in moderate readiness range. The second important measure adopted by trading SMEs was Increased Financial Strength which had a score of 4.52. This result is also supported by a higher score of 4.82 for Increased Inventories, also placed in the moderate range. Stocks constitute the major share of working capital of a trading enterprise. The enterprises were seen to shield themselves from the effects of supply chain uncertainties by having more stocks. Improving skillsets of the workforce was also adopted as a measure against climate change impact, indicated by the score of 4.42, placing it in moderate range.

Unlike manufacturing SMEs, the trading SMEs did not rate machinery upgradation as a commonly adopted measure, since there is lesser involvement of machinery and equipment in the operations of a trading business. This was shown by a low readiness score of 1.06. The indicators of Developing New Products, Digital Solutions, New Customers and Improve Existing Products also had readiness scores less than 3.0, thereby rating their readiness as low.

Relocation of land, labor and equipment were not practiced as common measures to deal with climate change threats. Similarly, government's financial or training support were rated as low readiness indicators, shown by scores close to zero.

8.0 CLIMATE CHANGE VULNERABILITY INDEX

Climate Change Vulnerability Index (CCVI) determines the final status of SMEs regarding their vulnerability. It is calculated by subtracting the readiness score from the potential impact, defined by internal factors.

$$\text{CCVI} = \text{Potential Impacts (Internal Factors)} - \text{Readiness/Adaptation capacity}$$

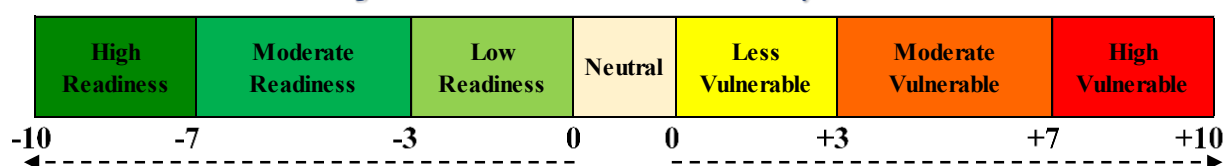
The scale of CCVI ranges from -10 to +10, indicating the vulnerability level of SMEs. A score of +10 implies highest vulnerability, while -10 indicates highest readiness. A score of zero represents neutrality, suggesting SMEs are not vulnerable. These scores can be categorized into highly vulnerable, moderately vulnerable, or least vulnerable for vulnerability, and low readiness, moderate readiness, or high readiness for preparedness/readiness. The seven categories, as defined by different ranges of CCVI and the Readiness/Vulnerability status is shown in Table 13, where x represents the value/score of overall CCVI.

Table 13 - CCVI Score Ranges and Readiness/Vulnerability

Total Score Range	Readiness / Vulnerability
$-10 \leq x \leq -7$	High Readiness
$-7 < x \leq -3$	Moderate Readiness
$-3 < x \leq -0.01$	Low Readiness
0	Neutral
$0 < x \leq 3$	Less Vulnerable
$3 < x \leq 7$	Moderate Vulnerable
$7 < x \leq 10$	High Vulnerable

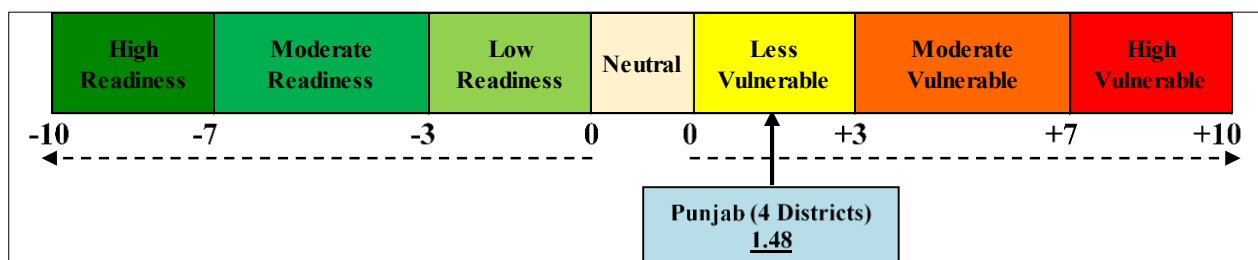
The CCVI ranges can also be represented in the form of a band, showing the boundaries of different readiness/vulnerability categories. The band is shown in Figure 69.

Figure 69 – CCVI Readiness/Vulnerability Band



8.1 Overall CCVI of the Surveyed SMEs

Overall CCVI, as calculated from the data of 206 SMEs, surveyed from four target districts of Punjab (Lahore, Faisalabad, DG Khan, and Rahimyar Khan) was found to be **1.48**. This meant that the SMEs of those four districts were rated as ‘Less Vulnerable’ to climate change impact. This is also shown on the Readiness/Vulnerability band in Figure 70.

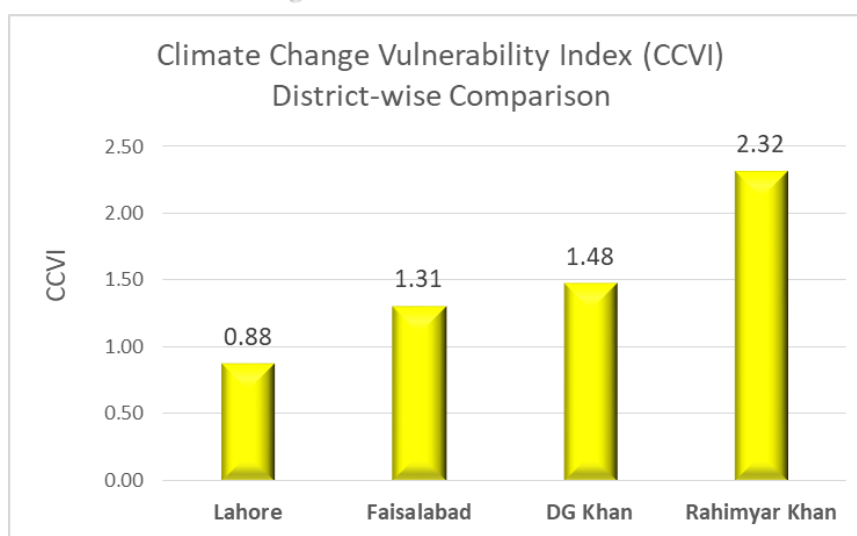
Figure 70 – Punjab CCVI on Readiness/Vulnerability Band (4 Districts)

The score signifies that the surveyed SMEs are placed towards the lower end of vulnerability — fairly resilient to climate change impacts, but still with some emerging risks which could push them into the moderate vulnerability range.

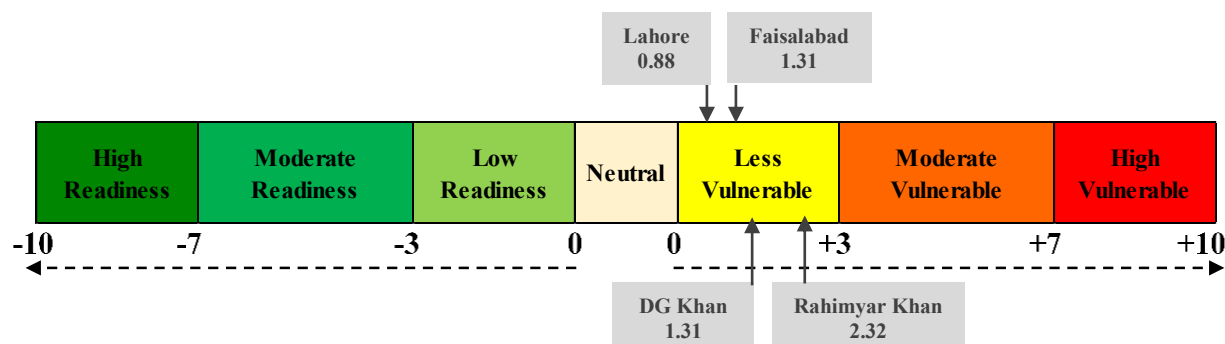
8.2 CCVI Analysis w.r.t. Different Factors

8.2.1 District-wise CCVI

CCVI comparison of the four districts, surveyed during the project is shown in Figure 71.

Figure 71 – District-wise CCVI

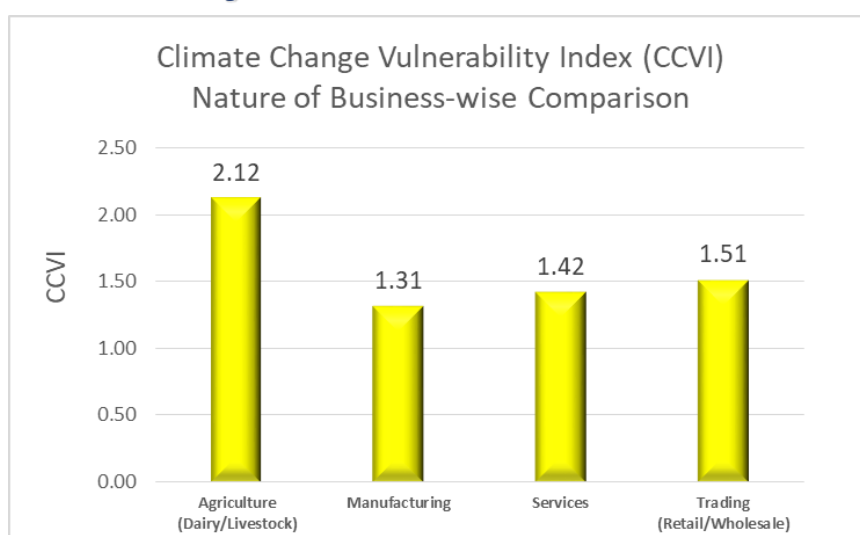
Rahimyar Khan was found to be the most vulnerable district among all the four surveyed districts. With a CCVI of 2.32, the vulnerability score was 57% higher than the survey's average score of 1.48. Rahimyar Khan was followed by DG Khan which had a CCVI of 1.48. Faisalabad was the third most vulnerable district with a CCVI of 1.31 and Lahore was the least vulnerable district. With a CCVI of 0.88, Lahore was 41% less vulnerable than the sample average. These results are in line with the initial hypothesis that Lahore and Faisalabad are less vulnerable and DG Khan and Rahimyar Khan are more vulnerable districts to climate change. Placement of the four districts on CCVI Readiness/Vulnerability band is shown in Figure 72.

Figure 72 – District Placement on CCVI Readiness/Vulnerability Band

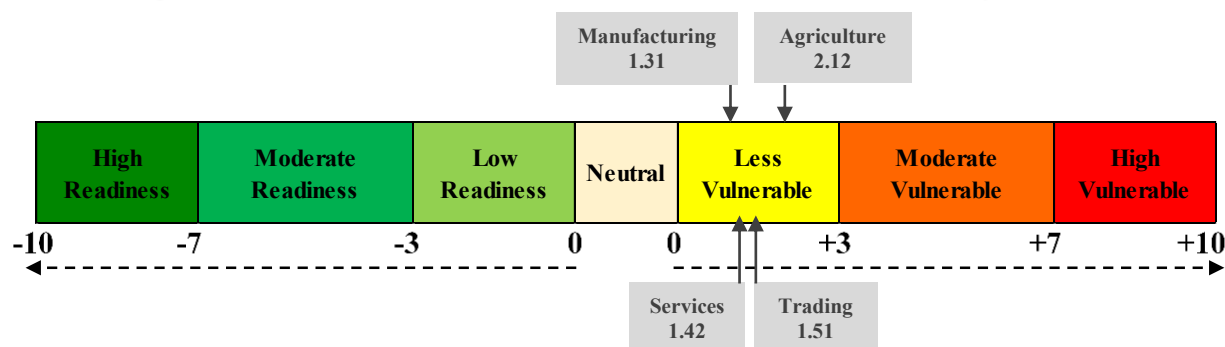
All the four districts are placed in the 'Less Vulnerable' category. The positions of the four districts on the band show their relative vulnerabilities. None of the four districts was classified as 'ready' since the CCVIs of all districts lied on the right side of the neutral range (which represents vulnerability).

8.2.2 Nature of Business-wise CCVI

Figure 73 shows the CCVI of the four types of SMEs covered during the survey. It can be seen that Agriculture/Dairy Livestock SMEs had the highest CCVI of 2.12 among all the four types of businesses. This was 43% higher than the sample average. The CCVIs of the other three types of businesses were not very different from each other. Trading had the second highest CCVI of 1.51 making it the next most vulnerable type of business to climate change. Manufacturing SMEs were the least vulnerable enterprises with a CCVI of 1.31.

Figure 73 – Nature of Business-wise CCVI

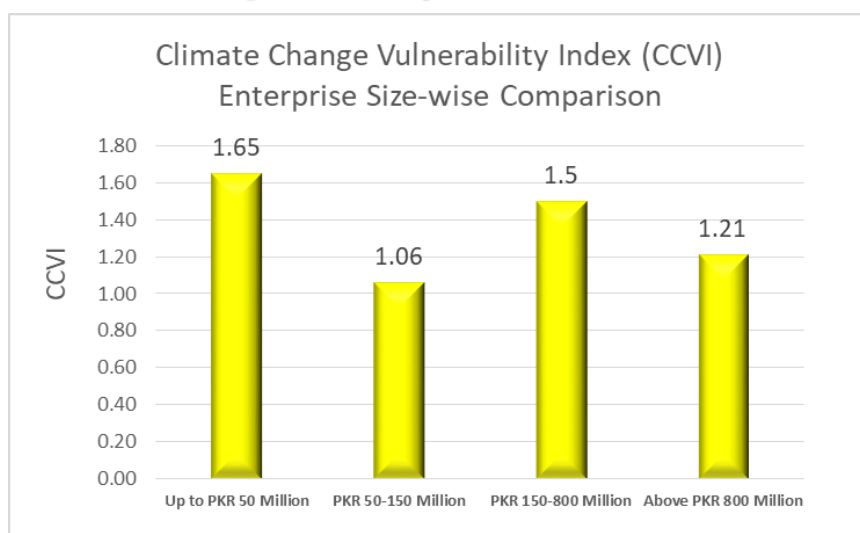
The placement of SMEs of different types of businesses on CCVI Readiness/Vulnerability band is shown in Figure 74.

Figure 74 – Nature of Business Placement on CCVI Readiness/Vulnerability Band

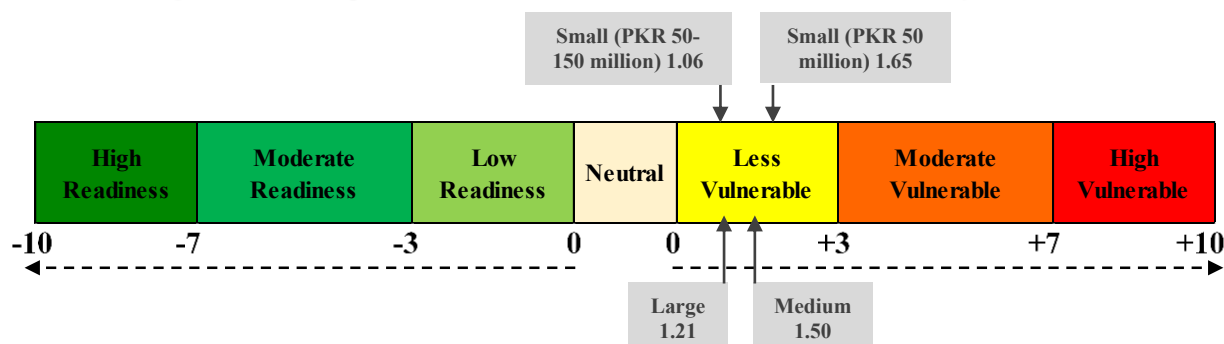
All the four types of businesses were classified as ‘Less Vulnerable’ to climate change. The positions of the four types of businesses on the band show their relative vulnerabilities. Just like in the case of district-wise analysis, none of the four types of businesses was classified as ‘ready’ since the CCVIs of all types of businesses lied on the right side of the neutral range.

8.2.3 Enterprise Size-wise CCVI

CCVI trend was also analyzed with respect to the enterprise size. The results are shown in Figure 75. Small enterprises, with revenues up to PKR 50 million, were the most exposed to climate change effect, with the highest CCVI of 1.65. The second highest CCVI of 1.50 was obtained for medium enterprises. The least vulnerable enterprises were the small enterprises with revenues in the range PKR 50-150 million. They had a CCVI of 1.06.

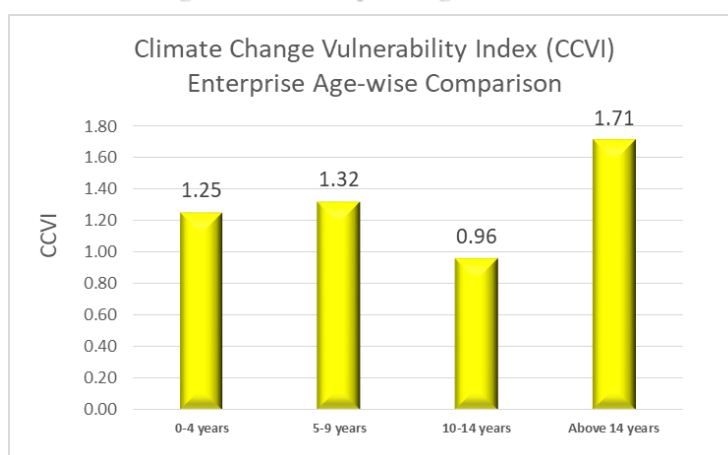
Figure 75 – Enterprise Size-wise CCVI

Looking at the placement of the enterprises of four sizes on the CCVI Readiness/Vulnerability band, all of those were classified as ‘Less Vulnerable’. The positions of SMEs of four sizes on the band show their relative vulnerabilities. None of the four categories of SMEs was categorized as ‘ready’ since the CCVIs of all types of SMEs lied on the right side of the neutral range. The results are shown in Figure 76.

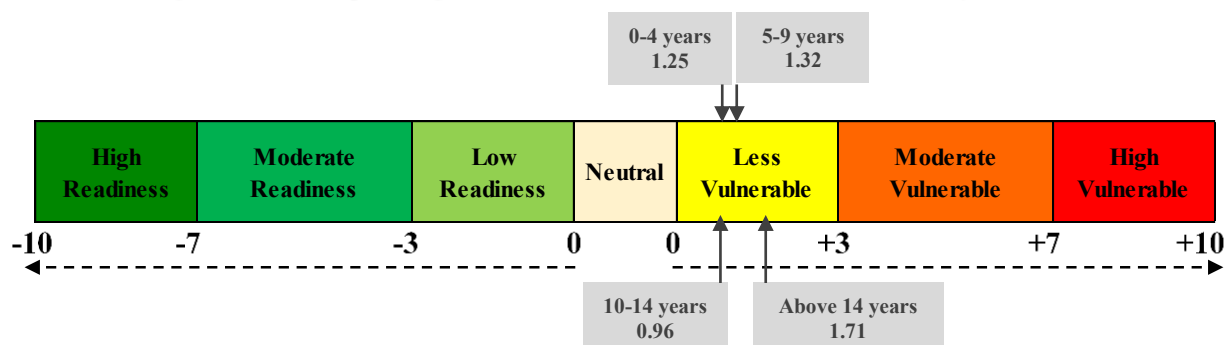
Figure 76 – Enterprise Size Placement on CCVI Readiness/Vulnerability Band

8.2.4 Enterprise Age-wise CCVI

CCVI analysis with respect to the age of the surveyed enterprises is shown in Figure 77. The older enterprises were found to be more vulnerable to climate change effects. The highest average CCVI of 1.71 was obtained for the SMEs more than 14 years old. It was followed by SMEs having age from 5 to 9 years which had a CCVI of 1.32. The enterprises of age 10-14 years were found to be least vulnerable with average CCVI of 0.96.

Figure 77 – Enterprise Age-wise CCVI

Placement of the enterprises, classified in the four age brackets, on the Readiness/Vulnerability band showed that all of them were 'Less Vulnerable' to climate change. The placement is shown in Figure 78. The positions of four types of SMEs on the band show their relative vulnerabilities. None of the four types of SMEs was categorized as 'ready' since all the four average CCVIs lied on the right side of the neutral range.

Figure 78 – Enterprise Age Placement on CCVI Readiness/Vulnerability Band

8.2.5 Sector-wise CCVI

A CCVI comparison of six sectors was made for the purpose of this analysis. The results are shown in Figure 79. Textile and Light Engineering sectors were found to be the two less vulnerable sectors with CCVI values of 1.15 and 1.02 respectively. Agriculture & Food sector was found to be more vulnerable with CCVI of 2.36. However, the most vulnerable sector was identified as Furniture which had a CCVI of 2.57.

Figure 79 – Sector-wise CCVI

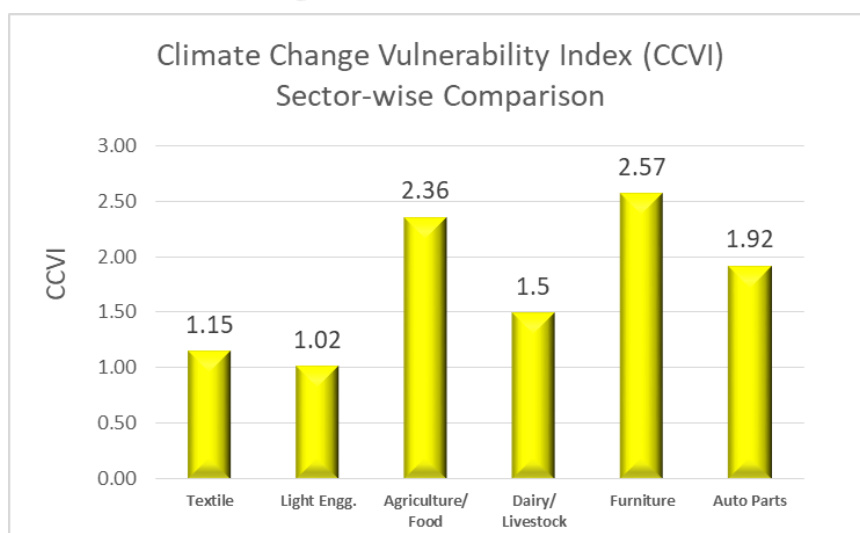
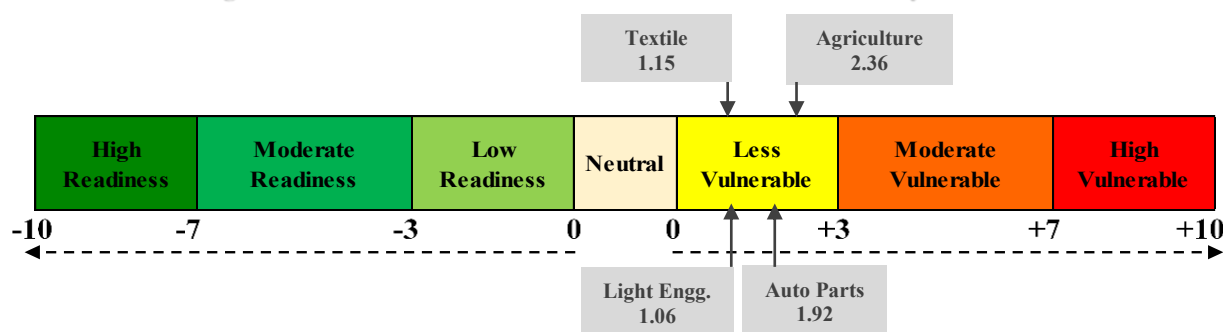


Figure 80 shows that all the average CCVI of all the sectors fall in 'Less Vulnerable' range, when seen on Readiness/Vulnerability band.

Figure 80 – Sector Placement on CCVI Readiness/Vulnerability Band

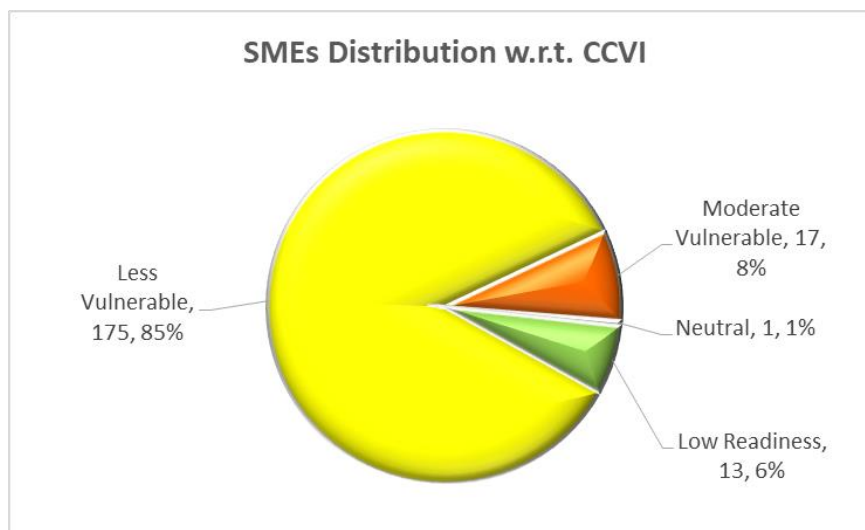


This means that the SMEs of these sectors are exposed to climate change effects but still have the capacity to withstand, adapt to, or recover from the negative effects of climate change. The positions of different sectors on the band show their relative vulnerabilities. None of the sectors was categorized as 'ready' since all the CCVIs lied on the right side of the neutral range.

8.3 SMEs Distribution w.r.t. CCVI

Of the total 206 SMEs surveyed from four districts of Punjab, majority was classified as ‘Less Vulnerable’ having their CCVIs falling between 0 and +3. Figure 81 shows the distribution of SMEs between different CCVI categories.

Figure 81 – SMEs Distribution w.r.t CCVI



It can be seen that 85% of the surveyed SMEs were rated as ‘Less Vulnerable’, indicating that the majority of SMEs in the sample were relatively less exposed to or better prepared for climate change risks. Moderate Vulnerable SMEs make up 17 businesses (8%), showing a smaller group that faced a noticeable but not critical level of vulnerability. 6% SMEs (13) were placed in Low Readiness category, meaning thereby that while they were not vulnerable but still had limited capacity or resources to respond effectively to climate change. 1 SME (1%) was categorized as Neutral, meaning that it was placed in between vulnerability and readiness, showing no tilt either way.

Distribution of the surveyed SMEs on the CCVI Readiness/Vulnerability band is shown in Figure 82.

Figure 82 – SMEs Distribution w.r.t CCVI on Readiness/Vulnerability Band

High Readiness	Moderate Readiness	Low Readiness	Neutral	Less Vulnerable	Moderate Vulnerable	High Vulnerable
0	0	13	1	175	17	0

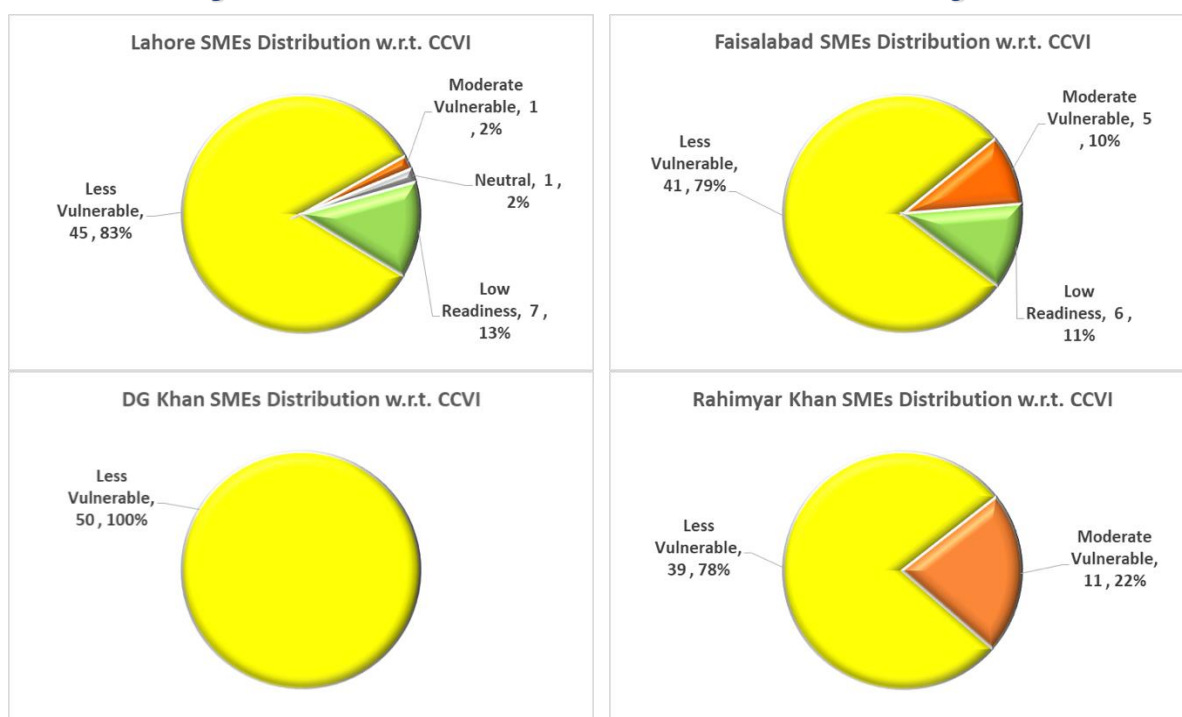
The distribution was concentrated towards the inner segments of the band, with no SME getting classified in the two extreme segments on both sides. With a score more than 0, 93% SMEs were found to lie on the Vulnerability side, and with a negative score, 6% SMEs lied on the Readiness side of the CCVI band. That indicated that the local SME sector has a definite exposure to climate change. However, this exposure is currently less pronounced and not critical, and can be handled by adopting necessary measures. The 13 SMEs which fell on the Readiness side of the band, were classified as having ‘Low Readiness’. That indicated that

even those SMEs which were classified as being not vulnerable, were not very well prepared to cope with climate change threats. They did possess some basic capacity but need to strengthen their capacity and resources to effectively protect them from the adverse effects of climate change. None of SME was classified in the segments of ‘High Vulnerable’ ‘Moderate Readiness’ or ‘High Readiness’.

8.3.1 District-Wise Distribution of SMEs between CCVI Categories

The distribution of SMEs between different CCVI categories differed slightly for the four target districts. Figure 83 shows the distributions.

Figure 83 – District-wise Distribution of SMEs between CCVI Categories



Looking at the four graphs, it can be seen that for the two less vulnerable districts (Lahore and Faisalabad), there were shares of ‘Low Readiness’ categories which meant that there were SMEs which lied on the left side of the neutral range on the Readiness/Vulnerability band. However, for the two more vulnerable districts, there was no SME in the ‘Low Readiness’ category. All the SMEs from DG Khan and Rahimyar Khan were categorized either as ‘Less Vulnerable’ or ‘Moderate Vulnerable’. In fact, for DG Khan, all the 50 SMEs were placed in ‘Less Vulnerable’ range. For Rahimyar Khan, 78% SMEs were placed in ‘Less Vulnerable’ and 22% in ‘Moderate Vulnerable’ category. This ultimately translated into a higher average CCVI for Rahimyar Khan, compared to that for DG Khan.

The distributions of SMEs with respect to CCVI categories for Lahore and Faisalabad were only slightly different from each other. For Lahore, 85% SMEs were placed in the ‘Vulnerability’ range (right side of Readiness/Vulnerability band), compared to 89% for Faisalabad SMEs. For Lahore 13% were placed in the ‘Readiness’ range (left side of the band), compared to 11% for Faisalabad SMEs. There was one SME (2%) in Lahore for which the CCVI was rated as neutral. The results of Lahore and Faisalabad also differed with respect to

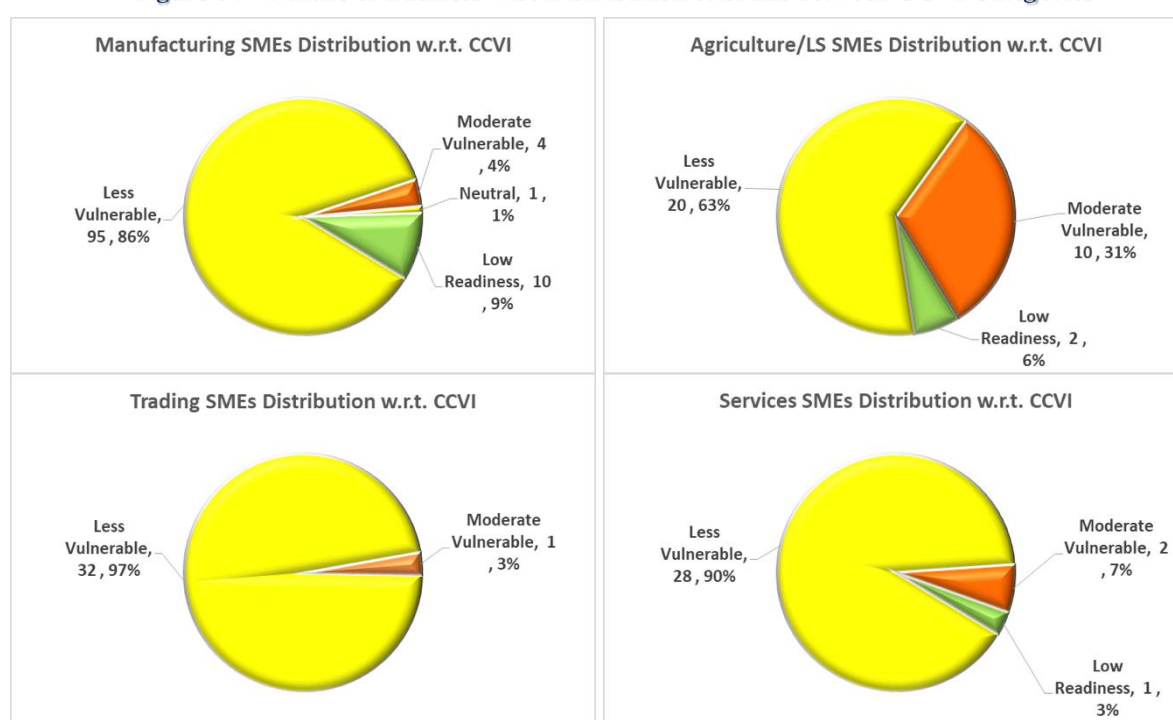
the shares of SMEs rated as ‘Moderate Vulnerable’ For Lahore, this share was only 2%, compared to 10% for Faisalabad. These results ultimately led to having a higher average CCVI for Faisalabad, compared to that for Lahore.

Overall, it can be inferred that in more developed cities of Lahore and Faisalabad (Central Punjab), there is a high awareness about climate change, compared to DG Khan and Rahimyar Khan, the two cities from Southern Punjab. This is the reason that the SMEs of developed cities managed to develop more resilience against the effects of climate change by adopting certain mitigation measures. Better access to resources and higher management capacity of the SMEs in the two less vulnerable districts also resulted in rating these districts with better average CCVI scores compared to those of more vulnerable districts.

8.3.2 Nature of Business-Wise Distribution of SMEs between CCVI Categories

The distributions of SMEs between different CCVI categories for different types of businesses are shown in Figure 84.

Figure 84 – Nature of Business-wise Distribution of SMEs between CCVI Categories



Trading is the only business type where all the surveyed SMEs were found to lie on the ‘Vulnerability’ side (right side) of the Readiness/Vulnerability band. Compared to that, all other three types of businesses had certain share (though small) of SMEs lying on the ‘Readiness’ side (left side) of the band also. The share of SMEs with scores of less than zero, and thus classified as having low readiness, was 9%. This was higher compared to comparable shares of 6% and 3% for Agriculture/Livestock and Services sectors.

Looking at the share of SMEs categorized as ‘Less vulnerable’, the highest share was obtained for Trading SMEs (97%). It was followed by 90% for Services SMEs and 86% for Manufacturing SMEs. While this share was lower for Agriculture SMEs (63%) it was

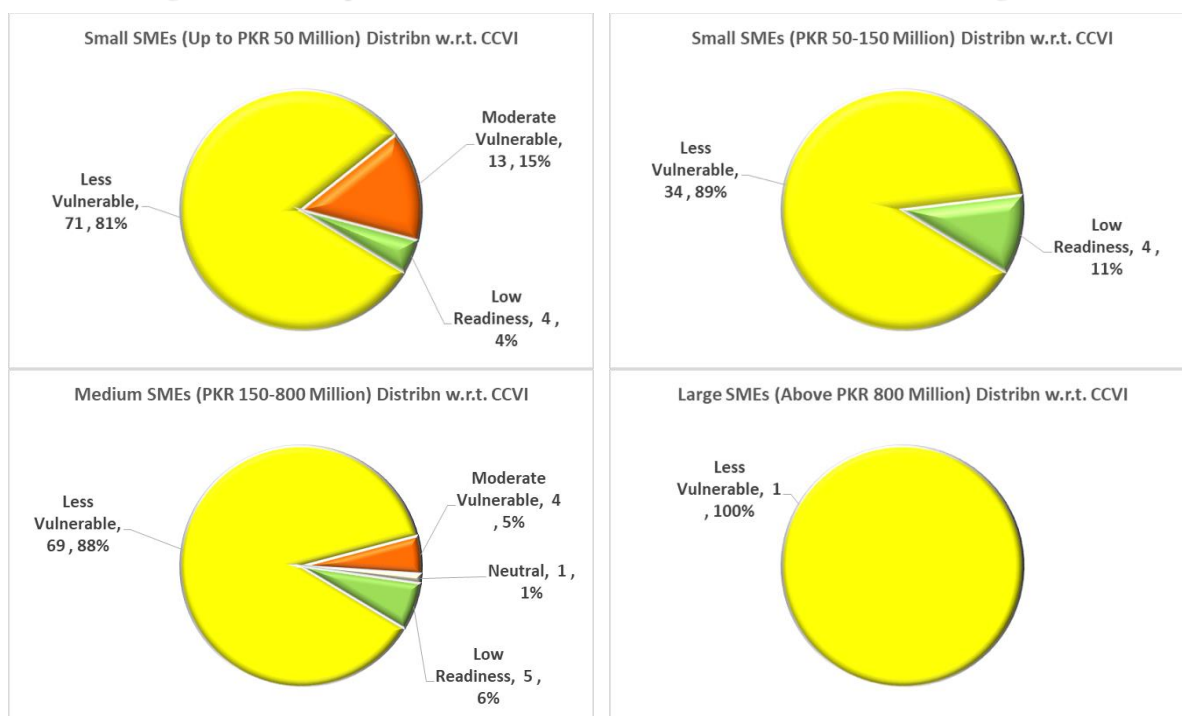
substituted by a bigger share of SMEs in ‘Moderate Vulnerability’ category (31%). This was the highest share in this category among all the four types of businesses. This led to Agriculture/Livestock/Dairy sector ending up with the highest CCVI of 2.12 among all the four sectors, rating it as the most vulnerable sector.

While the average rating of Manufacturing sector fell on the ‘vulnerability’ side of the Readiness/Vulnerability band, it had both the highest number and highest share of SMEs which had a CCVI in the Low Readiness range, lying between 0 and -3. It showed that manufacturing SMEs relatively more prepared to cope with the climate change impact compared to other three types of businesses.

8.3.3 Enterprise Size-Wise Distribution of SMEs between CCVI Categories

The distributions of SMEs between different CCVI categories for four sizes of enterprises (based on revenues) are shown in Figure 85.

Figure 85 – Enterprise Size-wise Distribution of SMEs between CCVI Categories



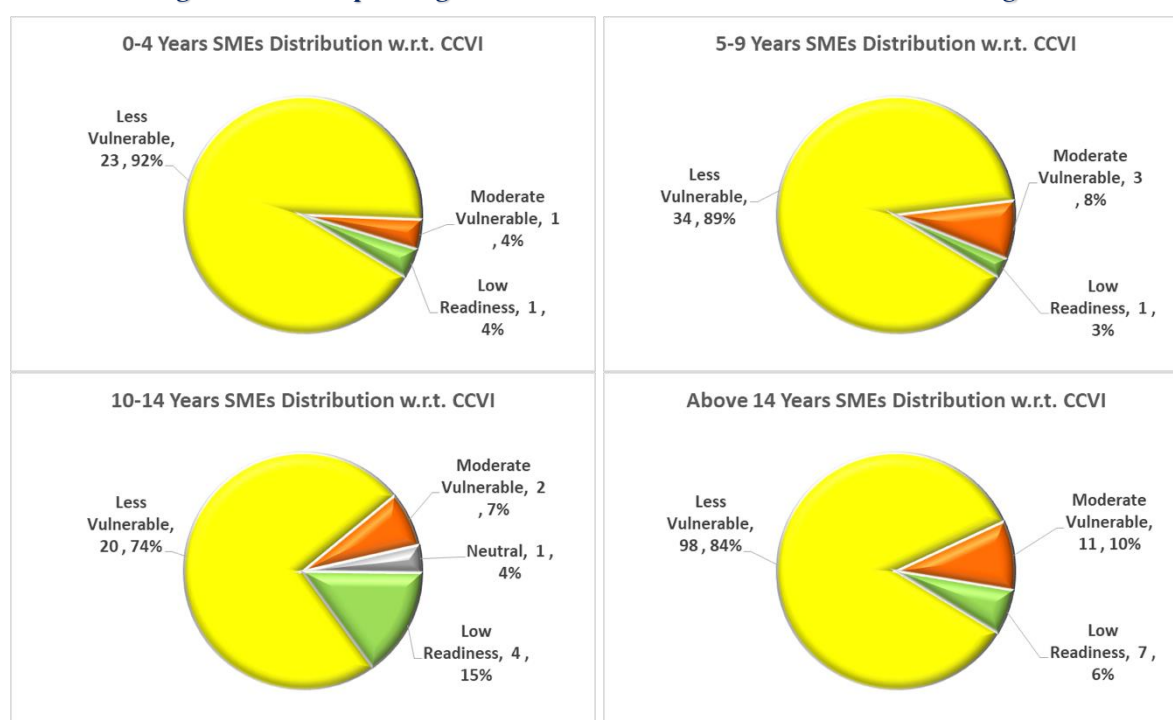
There was only one large enterprise in the sample of 206 which had CCVI in the ‘Less Vulnerable’ category. The profile of medium firms was the most diversified, with representation from four CCVI categories. The largest number of medium SMEs (88%) were rated as ‘Less Vulnerable’ and 5% were rated as Moderate Vulnerable. This meant that 93% of the total medium enterprises were placed in the ‘vulnerability’ side of Readiness/Vulnerability band. There was only one enterprise (1%) which had a CCVI of zero. The remaining 5 SMEs (6%) were placed on the ‘readiness’ side of the band, and were rated as having ‘Low Readiness’. This profile translated into an average CCVI of 1.50 for medium SMEs, rating them as the second most vulnerable group among the four different sizes of SMEs.

The small SMEs with revenue of up to PKR 50 million were distributed in three CCVI categories, whereas the small SMEs with revenue PKR 50-150 million were distributed in two categories. The first group had 81% SMEs in ‘Less Vulnerable’ and 15% in ‘Moderate Vulnerable’ category. This meant that 96% of the total small SMEs of revenue up to PKR 50 million were placed on the ‘vulnerability’ side and only 4% on the readiness side of the band. Compared to this, the other group of small enterprises had 89% share on the vulnerability side and 11% on the readiness side of the band. This ultimately translated into small SMEs with revenue up to PKR 50 million having the highest CCVI of 1.65, compared to 1.06 for the other group of small SMEs.

8.3.4 Enterprise Age-Wise Distribution of SMEs between CCVI Categories

The distributions of SMEs between different CCVI categories for four groups of enterprises of different ages are shown in Figure 86.

Figure 86 – Enterprise Age-wise Distribution of SMEs between CCVI Categories



All the four groups of SMEs had SMEs distributed in three CCVI categories of ‘Less Vulnerable’, ‘Moderate Vulnerable’ and ‘Low Readiness’. The SMEs in the age bracket of 10-14 years had the highest share of 15% for Low Readiness, that led to making this group the least vulnerable among the four groups of SMEs based on age. The one SME which was rated at neutral CCVI, also belonged to this age bracket. It showed that the SMEs in this age bracket have a higher tendency of getting themselves prepared to deal with climate change impact. These SMEs are usually in their growth phase and therefore more cautious of any potential threat which may become a hindrance in that.

The oldest SMEs (more than 14 years age) had the highest share in the total sample (116). 84% of these SMEs were rated as ‘Less Vulnerable’, 10% as ‘Moderate Vulnerable’ and 6% as having ‘Low Readiness’. This profile led to a CCVI of 1.71 which was the highest among all

the four groups of SMEs, thereby rating them as the group most vulnerable to climate change. The group had the highest number of SMEs which had a CCVI of less than zero (low readiness).

The CCVIs profiles of the other two groups of SMEs were quite similar. The SMEs of 0-4 years age (startups) had their 92% share in the 'Less Vulnerable' category, compared to 89% for the SMEs of 5-9 years age. Both the groups had one SME classified as having 'low readiness'. The only difference was in the category of 'Moderate Vulnerability' for which the SMEs of 0-4 years age had 4% share and the SMEs of 5-9 years had 8% share. It was due to this difference that the average CCVI of the latter group was slightly higher than that of the former one.

9.0 SME CLIMATE DASHBOARD

SME Climate Dashboard has been developed in Looker Studio (previously Google Data Studio). It is a free business intelligence (BI) and data visualization tool developed by Google. It allows users to convert raw data into interactive, shareable dashboards with charts, scorecards, and filters. Looker Studio acts as a bridge, taking data from a source (such as Google Sheets, Google Analytics, or databases) and presenting it in a way that is easy to explore and understand. Data is entered into the system by using Google Forms.

9.1 How does the Dashboard Work?

Data Source: The Climate Dashboard is connected to a Google Sheet. This sheet contains all the raw data collected from the surveyed SME businesses.

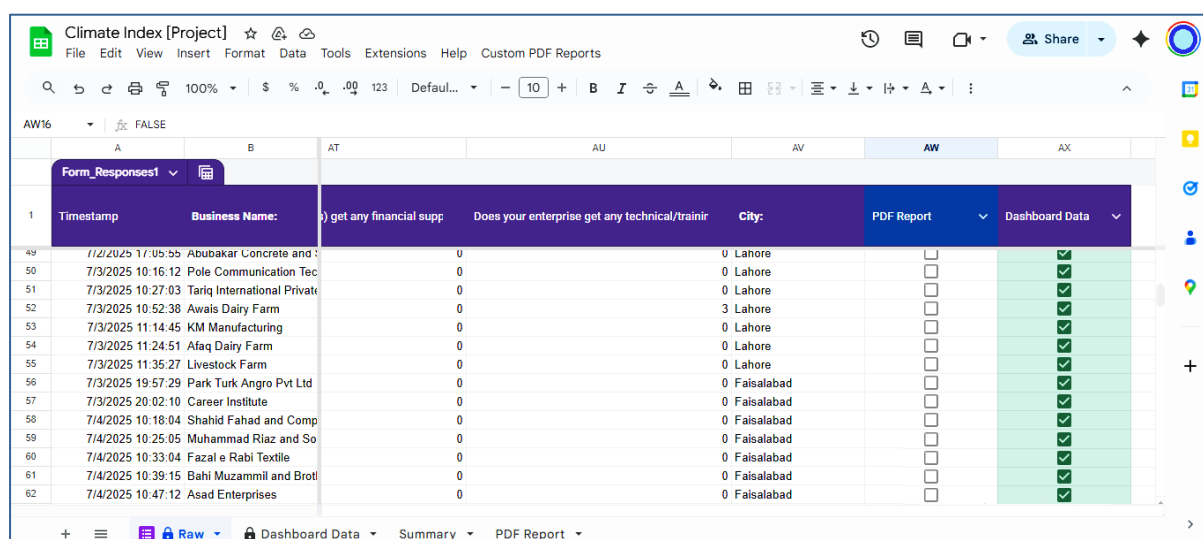
Processing: Looker Studio extracts the data and applies formulas, calculations, and visualizations to generate results.

Visualization: The results are displayed through different visualizations, including charts, scorecards, and tables that update dynamically when filters or selections are applied.

The dashboard is web-based, which means that information can be entered into the system from anywhere by using internet. Therefore, for protecting the database from irrelevant data getting entered, a check has been built in the system. As the data is entered through Google Form, it is treated as raw data and not as dashboard data. As a result, the dashboard results are not changed directly. This raw data can become dashboard data only when the administrator allows it by ticking a box in the column 'AX' of the dashboard.

A screenshot of Google Sheets is presented in Figure 87 which shows the tabs of 'Raw' and 'Dashboard Data'. It also shows the last column which has a tick box in all the rows, each of which is populated with the data of an individual SME. Raw data will become Dashboard Data only when that tick box is checked. Once that is done, the dashboard presentations will be automatically updated.

Figure 87 – Google Sheets Screenshot



	A	B	C	D	E	F	G
	Timestamp	Business Name	Does your enterprise get any financial supp	Does your enterprise get any technical/trainin	City	PDF Report	Dashboard Data
49	7/2/2025 11:05:55	Abubakar Concrete and	0	0	Lahore	☐	☒
50	7/3/2025 10:16:12	Pole Communication Tec	0	0	Lahore	☐	☒
51	7/3/2025 10:27:03	Tariq International Private	0	0	Lahore	☐	☒
52	7/3/2025 10:52:38	Awais Dairy Farm	0	0	Lahore	☐	☒
53	7/3/2025 11:14:45	KM Manufacturing	0	0	Lahore	☐	☒
54	7/3/2025 11:24:51	Afaq Dairy Farm	0	0	Lahore	☐	☒
55	7/3/2025 11:35:27	Livestock Farm	0	0	Lahore	☐	☒
56	7/3/2025 19:57:29	Park Turk Angro Pvt Ltd	0	0	Faisalabad	☐	☒
57	7/3/2025 20:02:10	Career Institute	0	0	Faisalabad	☐	☒
58	7/4/2025 10:18:04	Shahid Fahad and Comp	0	0	Faisalabad	☐	☒
59	7/4/2025 10:25:05	Muhammad Riaz and So	0	0	Faisalabad	☐	☒
60	7/4/2025 10:33:04	Fazal e Rabi Textile	0	0	Faisalabad	☐	☒
61	7/4/2025 10:39:15	Bahi Muzammil and Broth	0	0	Faisalabad	☐	☒
62	7/4/2025 10:47:12	Asad Enterprises	0	0	Faisalabad	☐	☒

The screenshot of the Google Form, used for data input, is shown in Figure 88. It has the questionnaire used to assess climate change vulnerability.

Figure 88 – Google Form Screenshot



S M E D A

Assessment of Climate Change Vulnerability of SMEs in Pakistan

abc@gmail.com [Switch account](#)

Not shared

* Indicates required question

Enterprise / Business Profile

Please provide your enterprise / business name, contact details, years in business, annual sales turnover, nature of business, operating sector, and location (province and district)

9.1.1 Climate Data

The climate data entered into the system, is of four main types:

- SME demographics
- Scores on nine external climate change factors
- Scores on twelve internal business factors, getting affected by climate change
- Scores on seventeen readiness factors, adopted to cope with climate change effects

9.1.1.1 SME Demographics

SME demographics include the following:

1. Business specific information (name, email, contact no.)
2. Province
3. District
4. Size (annual revenues)
5. Age,
6. Business nature
7. Sector

9.1.1.2 External Climate Change Factors

Scores are assigned by the SMEs on the following nine external climate change factors:

1. Rising temperature
2. Falling temperature
3. Precipitations
4. Droughts
5. Floods

6. Storms
7. Heat waves
8. Cold waves
9. Air, water & land contamination

9.1.1.3 Internal Business Indicators

Scores are assigned by the SMEs on the following twelve internal business indicators:

1. Raw materials
2. Depreciation
3. Logistics
4. Sales revenue
5. EBITDA
6. Overall expenses
7. Retained earnings
8. Location
9. R&D
10. Increased investment
11. Labor efficiency
12. Labor Absenteeism

9.1.1.4 Readiness Factors

Scores are assigned by the SMEs on the following seventeen readiness factors:

1. Develop new products
2. Improve existing products
3. Digital solutions
4. New customers
5. Supplier diversification
6. Insurance
7. Build insourcing capacity
8. Increased inventories
9. Increased R&D
10. Relocation of land
11. Relocation of labor
12. Relocation of equipment
13. Increased financial strength
14. Skillset upgradation
15. Machinery upgradation
16. Government financial support
17. Government training support

9.2 Key Features of Climate Dashboard

SME Climate Dashboard has the capability to analyze and present the climate data in different forms. Key features are narrated below:

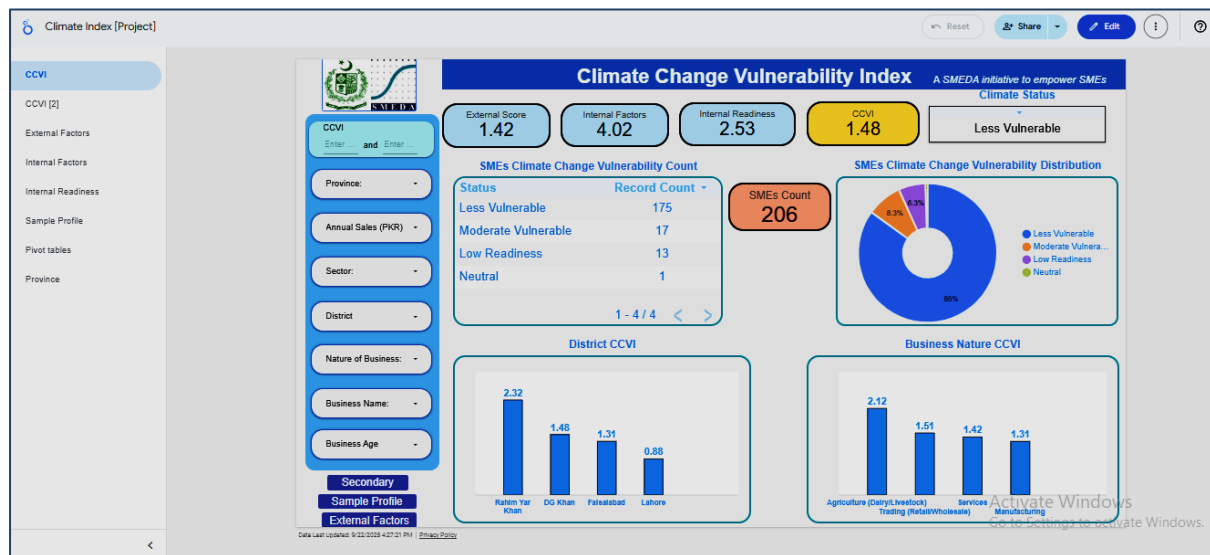
- Average scores of all the scores of external factors, internal factors and readiness can be calculated and viewed on the dashboard.
- The system can calculate Climate Change Vulnerability Index (CCVI) by applying the applicable formula.
- The results may be viewed either for the entire data or may be sliced with respect to desired demographic variables by using filters through dropdown menus. For example, when no filter is applied, the dashboard shows the results based on whole of data (SMEs from all provinces, from all districts, of all sizes, of all ages, of all types (nature) of businesses of all sectors). However, when data is filtered with respect to certain demographic variable, the results (average scores of external, internal and readiness factors and CCVI) of only that filtered data are shown.
- Cross-Filtering can also be done by clicking charts. For example, clicking directly on a bar (e.g., “Lahore”) in a chart automatically filters all other charts on the same page. Similarly, clicking on the bar for Agriculture in a sector chart, all other charts on that page will update to show only agriculture businesses.
- Buttons have been provided for navigation. They are placed at the bottom of each page for easy navigation. For example, Example: Home, Next Page, Back to Previous Page. Instead of scrolling or searching, one can simply click a button to jump between pages.
- Exact values of a chart element can be seen by hovering over it.

9.3 Dashboard Walk Through

This SME Climate Dashboard, built in Google Looker Studio, is a powerful yet easy-to-use tool for analyzing climate vulnerability among businesses. The dashboard has seven pages. Pages 1–5 provide detailed vulnerability analysis (overall scores, business characteristics, external/internal factors, and readiness). Pages 6–7 provide context and summary (data profile and pivot table). Interactive features like buttons for navigation and cross-filtering by clicking charts make exploration intuitive. Page-by-page explanation of dashboard is provided in the following paragraphs:

9.3.1 Page-1 – CCVI [1]

The screenshot of the title page of dashboard (Page-1) is shown in Figure 89.

Figure 89 – SME Climate Dashboard Page-1 Screenshot

At the top of the page, title is shown as ‘Climate Change Vulnerability Index’. Below that, four metrics are shown in four boxes.

- Average external factors score
- Average internal factors score
- Average readiness score
- Climate Change Vulnerability Index (CCVI)

These metrics are calculated by applying the relevant formulae and then presented in the boxes. Next to the CCVI box, the result of the assessment (status) is also shown. For example, at the CCVI of 1.48, the rating is showing as ‘Less Vulnerable’. For making it easier for the users, color change option has also been used. The box showing CCVI changes color according to the assessment status. For CCVI values more than 3, the color of the box turns red; for the value from 0 to 3, the color of the box turns yellow and for the value lower than zero) negative value), the color of the box turns green.

The page also shows the average value (metrics) of the CCVI in graphical form with respect to the following dimensions (demographic variables):

- Province
- District
- Business nature

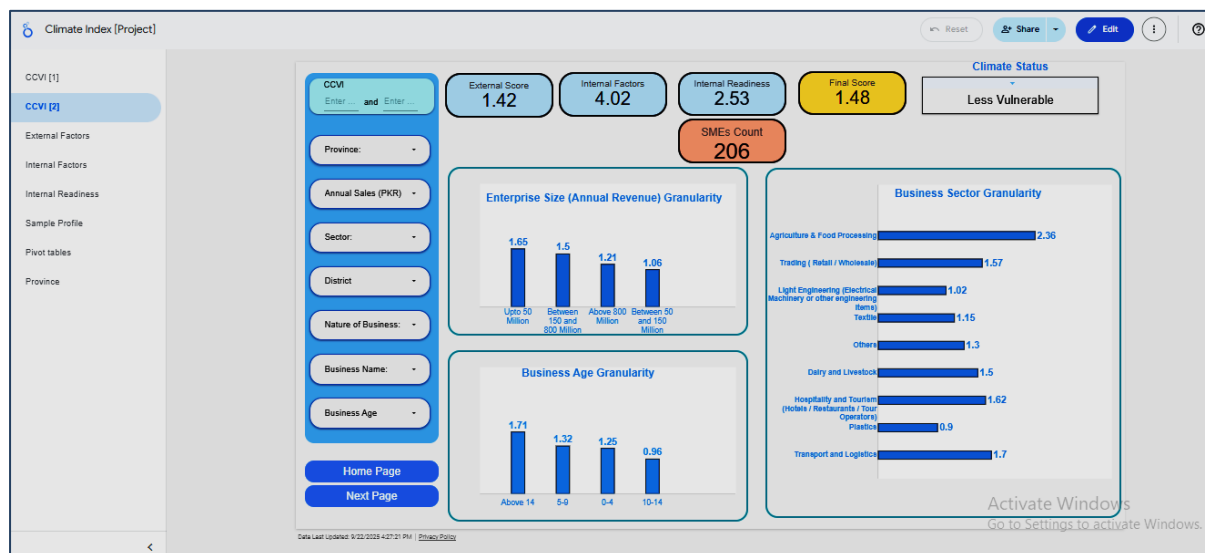
All the filtering buttons for different dimensions are placed in a vertical format at the left side of the page. The page also provides a special filtering option. The button at the top of all other filtering buttons gives the option of filtering data between two CCVI values.

The dashboard also provides climate change vulnerability information of individual SMEs also. There is a filtering button ‘Business Name’ through which any of the SME can be selected and the dashboard metrics will show the results of that particular SME only.

9.3.2 Page-2 – CCVI [2]

The screenshot of Page 2 of the SME Climate Dashboard is shown in Figure 90.

Figure 90 – SME Climate Dashboard Page-2 Screenshot



The metrics and filtering buttons on Page-2 are the same as on Page-1. Page-2 shows the average value (metrics) of the CCVI in graphical form with respect to the following dimensions:

- Enterprise size (annual revenue buckets)
- Business age (younger vs. older)
- Sector

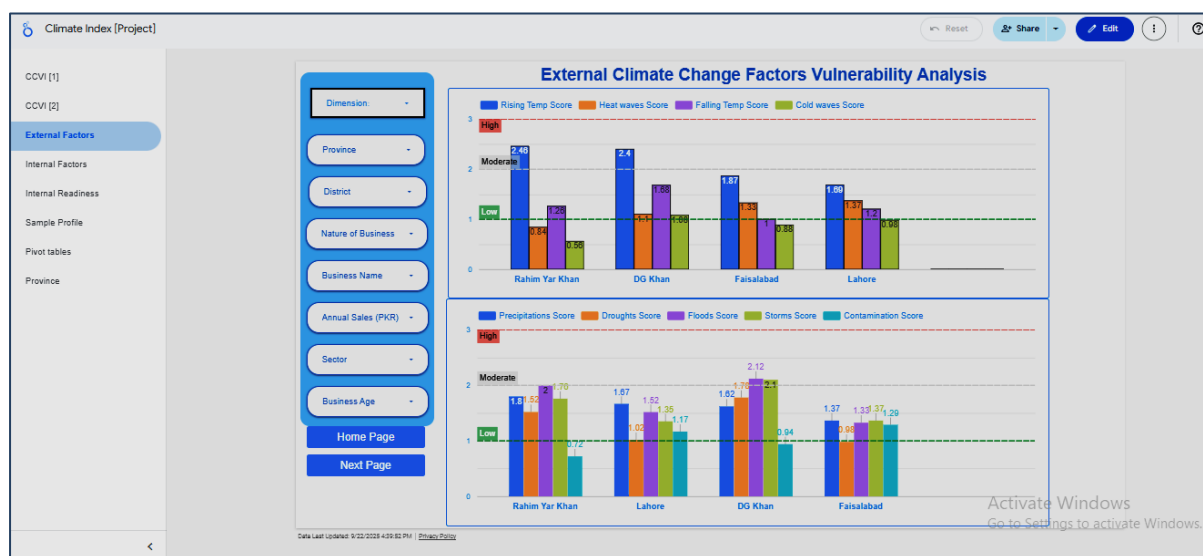
The option of getting climate change vulnerability information of an individual SMEs is also available on this page. The filtering button 'Business Name' can be used for that.

Navigation buttons of 'Home Page' and 'Next Page' are shown at the bottom left corner of Page-2.

9.3.3 Page-3 – External Factors Analysis

Page-3 of SME Climate Dashboard provides analysis of the nine external climate change factors. The dimensions used for filtering are the same as used on the previous two pages (province, district, size, age, business nature and sector). In addition, the assessment results of an individual SME can also be viewed.

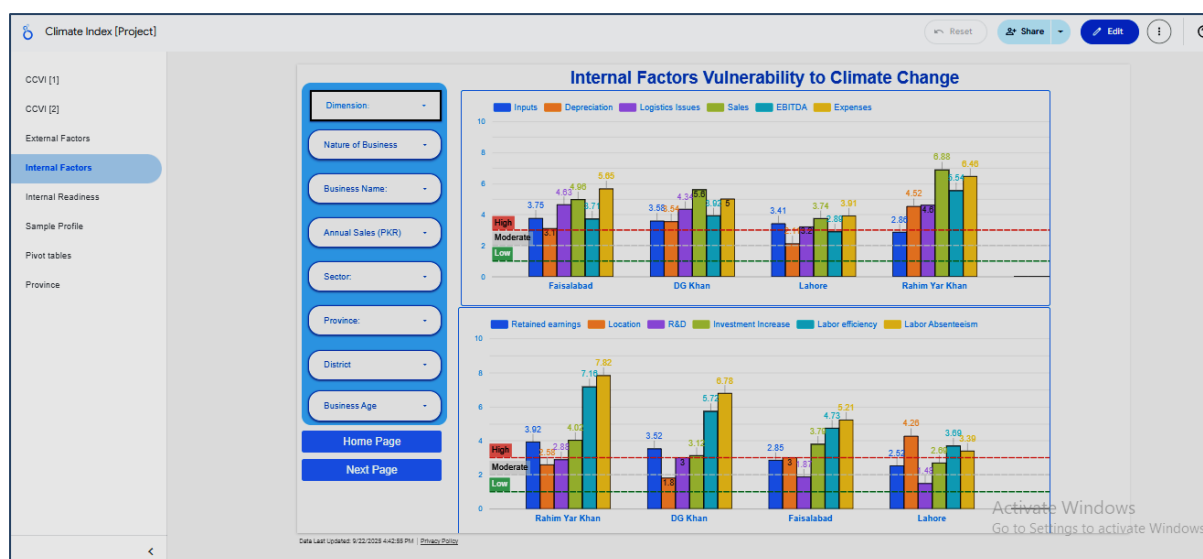
The system calculates average scores of nine external factors and presents those in graphical form on Page-3. This analysis helps identifying the external climate change factors which are more damaging compared to others. For making the view easier for the users, the graphs also show reference lines, indicating different degrees of vulnerability, corresponding to ranges, defined by average scores. The screenshot of Page-3 of the dashboard is shown in Figure 91.

Figure 91 – SME Climate Dashboard Page-3 Screenshot

9.3.4 Page-4 – Internal Factors Analysis

Page-4 of SME Climate Dashboard provides analysis of the nine external climate change factors. The dimensions used for filtering are the same as used on the previous pages (province, district, size, age, business nature and sector). In addition, the assessment results of an individual SME can also be viewed.

The system calculates average scores of twelve internal factors and presents those in graphical form on Page-4. This analysis helps identifying the internal climate change factors of SMEs which are more affected compared to others. For making the view easier for the users, the graphs also show reference lines, indicating different degrees of vulnerability, corresponding to ranges, defined by average scores. The screenshot of Page-4 of the dashboard is shown in Figure 92.

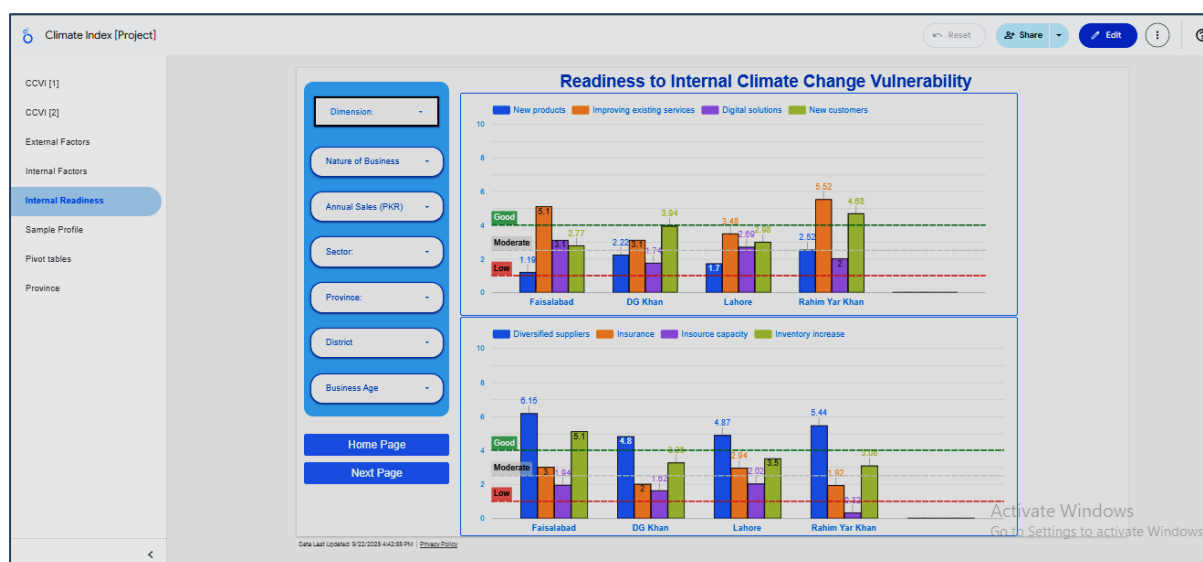
Figure 92 – SME Climate Dashboard Page-4 Screenshot

9.3.5 Page-5 – Internal Readiness Analysis

Page-5 of SME Climate Dashboard provides analysis of the seventeen readiness factors. The dimensions used for filtering are the same as used on the previous pages (province, district, size, age, business nature and sector). In addition, the assessment results of an individual SME can also be viewed.

The system calculates average scores of seventeen internal factors and presents those in graphical form on Page-5. This analysis helps identifying the readiness measures by SMEs which are used more frequently compared to others. For making the view easier for the users, the graphs also show reference lines, indicating different degrees of readiness, corresponding to ranges, defined by average scores. The screenshot of Page-5 of the dashboard is shown in Figure 93.

Figure 93 – SME Climate Dashboard Page-5 Screenshot



9.3.6 Page-6 – SME Sample Profile

Page-6 of SME Climate Dashboard shows the distribution of SMEs included in the database with respect to different demographic variables. The presentation is in the form of donut charts.

- Donut 1: Distribution by district
- Donut 2: Distribution by enterprise size (annual sales)
- Donut 3: Distribution by business age
- Donut 4: Distribution by business nature

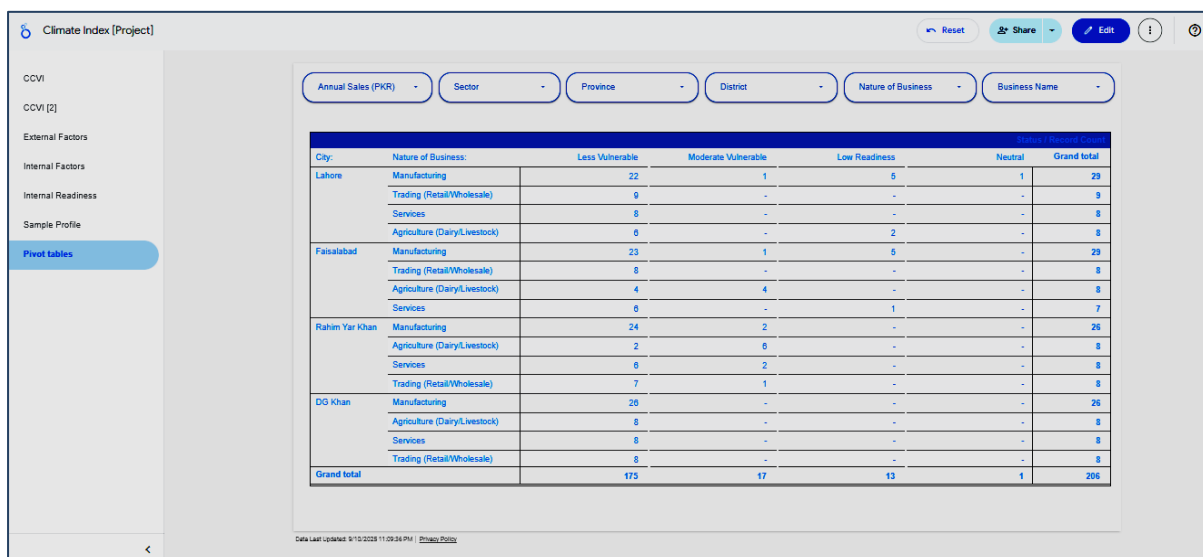
The screenshot of Page-6 of the dashboard is shown in Figure 94.

Figure 94 – SME Climate Dashboard Page-6 Screenshot

9.3.7 Page-7 – Pivot Table Summary

The screenshot of Page-7 of the SME Climate Dashboard is presented in Figure 95. It is a pivot table summary which shows the distribution of SMEs with respect to their CCVI status in different demographic groups.

The rows of this table show the district and the nature of business, whereas the columns show the CCVI status. The values are the unique count of businesses. Thus the analysis performs exact counts and comparisons for specific groups.

Figure 95 – SME Climate Dashboard Page-7 Screensho


City:	Nature of Business:	Less Vulnerable	Moderate Vulnerable	Low Readiness	Neutral	Grand total
Lahore	Manufacturing	22	1	5	1	29
	Trading (Retail/Wholesale)	6	-	-	-	6
	Services	8	-	-	-	8
	Agriculture (Dairy/Livestock)	6	-	2	-	8
Faisalabad	Manufacturing	23	1	5	-	29
	Trading (Retail/Wholesale)	8	-	-	-	8
	Agriculture (Dairy/Livestock)	4	4	-	-	8
	Services	6	-	1	-	7
Rahim Yar Khan	Manufacturing	24	2	-	-	26
	Agriculture (Dairy/Livestock)	2	6	-	-	8
	Services	6	2	-	-	8
	Trading (Retail/Wholesale)	7	1	-	-	8
DG Khan	Manufacturing	26	-	-	-	26
	Agriculture (Dairy/Livestock)	8	-	-	-	8
	Services	8	-	-	-	8
	Trading (Retail/Wholesale)	8	-	-	-	8
Grand total		175	17	13	1	206

The SME Climate Dashboard thus provides multifaceted analysis of the climate data and allows the users to get to his/her specific analysis needs by applying multiple types of filters. The dashboard can respond to most of the queries related to climate change data. Some example questions and the suggested approach to get their answers through this dashboard has been

provided in Annex II. Some suggested best practices to get correct insights through this tool have also been mentioned.

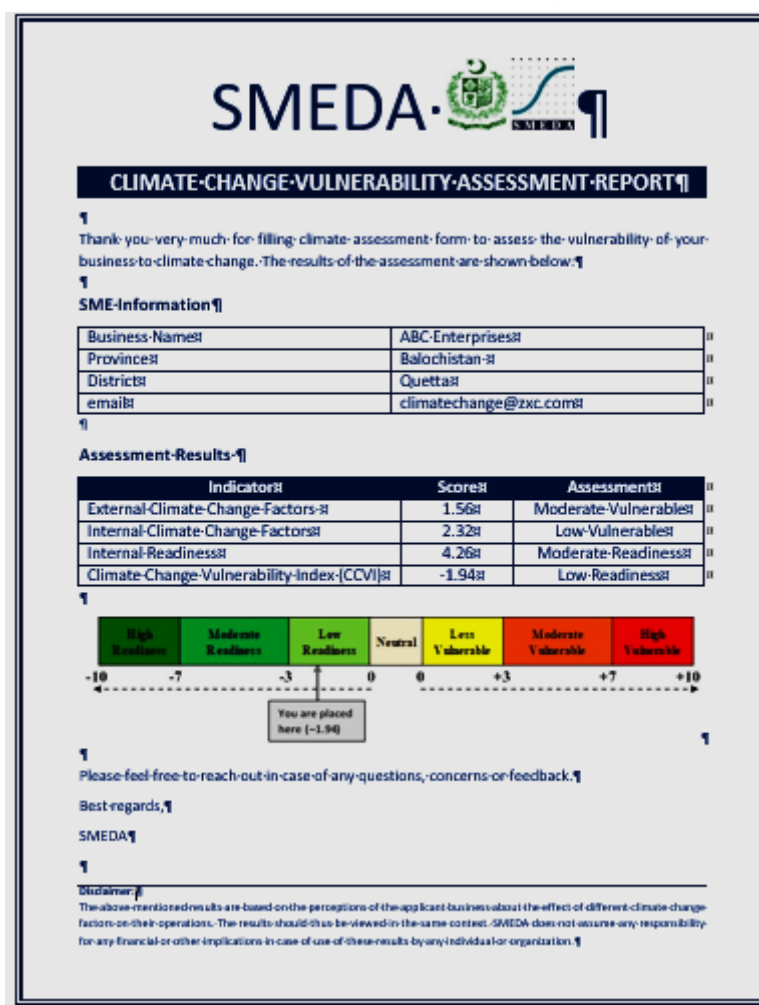
9.4 Climate Self-Assessment by SMEs

The dashboard can be directly used by SMEs to assess their climate vulnerability status. For doing that, the person will fill in the designated Google Form to input his/her information into the system. The information will be entered automatically into Google Sheets and the system will automatically perform the required calculations to generate the following four scores:

- External Climate Change Factors Score
- Internal Climate Change Factors Score
- Internal Readiness Score
- Climate Change Vulnerability Index (CCVI)

Report will be sent to the SME on the provided email in the form of a PDF document. It may be sent automatically by the system, or alternately, the administrator may opt for sending the report manually. The report will have the information of the business and the climate-assessment results in the form of the above-mentioned scores. A suggested format of the report is shown in Figure 96.

Figure 96 – SME Climate Assessment Report Format



SMEDA 

CLIMATE-CHANGE-VULNERABILITY-ASSESSMENT-REPORT

Thank you very much for filling climate assessment form to assess the vulnerability of your business to climate change. The results of the assessment are shown below.

SME-Information

Business-Name	ABC-Enterprises
Province	Balochistan
District	Quetta
email	climatechange@zxc.com

Assessment-Results

Indicator	Score	Assessment
External-Climate-Change-Factors	1.56	Moderate-Vulnerable
Internal-Climate-Change-Factors	2.32	Low-Vulnerable
Internal-Readiness	4.26	Moderate-Readiness
Climate-Change-Vulnerability-Index-(CCVI)	-1.94	Low-Readiness

High Readiness Moderate Readiness Low Readiness Neutral Less Vulnerable Moderate Vulnerable High Vulnerable

-10 -7 -3 0 3 7 +10

You are placed here [-1.94]

Please feel free to reach out in case of any questions, concerns or feedback.

Best regards,

SMEDA

Disclaimer:

The above-mentioned results are based on the perceptions of the applicant business about the effect of different climate change factors on their operations. The results should thus be viewed in the same context. SMEDA does not assume any responsibility for any financial or other implications in case of use of these results by any individual or organization.

9.5 Web Links of SME Climate Dashboard

The three web links, for accessing different components of SME Climate Dashboard, are shown in Table 14.

Table 14 – Web Links of SME Climate Dashboard

Component	Web Link
Dashboard	https://lookerstudio.google.com/reporting/39248b9e-61cf-473d-92e5-8a2002aa6fcc/page/rnuOF
Google Sheets	https://docs.google.com/spreadsheets/d/1yLSUpXWrsgTlsB2QWYphDUUI3P-1egdawdsGrAnz9vU/edit?pli=1&gid=277167483#gid=277167483
Google Form	https://docs.google.com/forms/d/e/1FAIpQLSebcJfPOUF0kIWRAObzVnaqZLICL1LIEBquH0Rmlrtz-vWPVQ/formResponse

10.0 RECOMMENDATIONS

The findings of this SME survey highlight the urgent and multifaceted challenges posed by climate change, as well as the vulnerabilities and adaptive capacities of the SMEs across different geographies and sectors. The findings underscore the critical ways in which climate change is shaping the operations, productivity, and long-term viability of the local SMEs. As key drivers of employment, innovation, and economic growth, SMEs face unique vulnerabilities to rising temperatures, erratic precipitation, floods, and droughts, while often lacking the resources and institutional support to cope with these challenges.

Building on the evidence collected, this chapter presents a set of recommendations designed to strengthen the adaptive capacity of SMEs, safeguard their profitability, and ensure their contribution to sustainable development in a changing climate. The recommendations aim to guide policymakers, development practitioners, SMEs, and local stakeholders toward more informed, coordinated, and resilient responses. The recommendations have been drawn mainly from the challenges and opportunities identified in the survey, and complemented by the insights gathered by reviewing the existing climate change literature. The recommendations reflect both immediate needs and long-term strategies to mitigate risks, strengthen adaptive capacity, and promote sustainable development.

The intent is not only to outline priority actions but also to encourage collaboration across sectors and governance levels, ensuring that responses to climate change are inclusive, evidence-based, and capable of safeguarding both livelihoods and ecosystems for the future.

10.1 Summary of Survey Findings

The recommendations emanate from the key findings of the survey, which have been summarized in the following paragraphs:

10.1.1 Impact of External Climate Change Factors

The survey results revealed that SMEs view rising temperatures as the most significant external climate threat, followed by floods, storms, precipitation, and heat waves—all with moderate perceived impacts. Other factors such as falling temperatures, droughts, and air and water pollution were considered less critical, with cold waves rated the least concerning. Overall, the average vulnerability score of 1.42 indicated that SMEs, across the surveyed districts, perceive external climate factors as having a moderate effect on their operations.

All four districts reported only a moderate effect of external climate change factors on SME operations, with average scores ranging between 1.2 and 1.6. DG Khan and Rahimyar Khan were found to be more vulnerable compared to Lahore and Faisalabad, confirming the hypothesis of higher exposure in Southern Punjab. Sector-wise, Agriculture/Livestock SMEs recorded the highest vulnerability due to their direct dependence on weather and open-field activities, while Manufacturing, Services, and Trading were comparatively less exposed, with the latter least vulnerable. Size-wise, smaller enterprises were most sensitive, while the single large enterprise was the least vulnerable. Age of enterprise did not show a clear trend, though startups (less than 4 years old) tended to be more sensitive to climate-related threats, while firms in the 5–9 year range appeared relatively less affected. No group, however, reported climate change impacts in the severe range, indicating that while exposure exists across districts, sectors, and firm sizes, effects are still moderate but concerning for agriculture and

smaller businesses. These findings reinforce the importance of differentiated policy responses that recognize varying degrees of vulnerability across geography, sector, size, and age of enterprises.

10.1.2 Impact on Internal Business Indicators

For internal factors, the overall average score was 3.92, placing climate change impacts in the moderate range. Labor-related indicators were most affected, with absenteeism and efficiency emerging as critical concerns. Profitability was also seen as vulnerable, particularly in terms of sales revenue, overall expenses, and EBITDA, while retained earnings were less affected though still moderate. Logistics showed moderate exposure, whereas investment, R&D, and location were considered minorly affected. Overall, SMEs perceived climate change as having its greatest influence on labor productivity and profitability.

For internal business indicators, SMEs across all districts and size categories perceived climate change impacts as moderate, with no group rating them severe. Rahimyar Khan and DG Khan showed higher vulnerability compared to Faisalabad and Lahore, confirming greater exposure in southern districts. By enterprise size, medium SMEs reflected the highest vulnerability, followed closely by large and small, though very small enterprises reported lower sensitivity. Sectoral patterns were also evident. Agriculture/Livestock SMEs faced the greatest exposure due to direct climate dependence and open-field operations, followed by Manufacturing, where risks stemmed from supply chains and labor. Trading SMEs were considered less vulnerable, while Services SMEs were rated as the least exposed, given their reliance on intangible assets and limited logistics. Overall, labor and profitability remained the most climate-sensitive internal factors.

10.1.3 Business Internal Readiness

SMEs rated their overall readiness against climate change as low, with an average score of 2.53 across seventeen indicators. Most adaptation options, especially relocation of land, labor, or machinery, were viewed as unfeasible, while expectations of government support—financial and training—were minimal, underscoring SMEs' reliance on their own resources. A few measures, though still in the low range, showed relatively higher adoption, such as insurance, digital solutions, and new product development. Seven indicators fell in the moderate range, led by supplier diversification, skillset upgradation, and machinery improvements. Other strategies included improving existing products and building inventories to cushion against supply chain disruptions. Overall, readiness remained limited, with SMEs depending mainly on incremental adjustments rather than systemic support or transformational adaptation.

Readiness levels across all four districts were rated low, with DG Khan showing relatively higher preparedness and Lahore the lowest. A clear trend emerged by enterprise size, where larger firms demonstrated stronger readiness, reflecting their greater access to resources. The single large enterprise surveyed scored in the moderate range, while medium and small enterprises remained in the low range. By business type, all sectors scored below 3.0, with Manufacturing SMEs showing the highest readiness and Services the lowest. Agriculture/Livestock SMEs and Trading fell in between. These patterns highlight that while overall readiness remains limited, variations across districts, size, and sectors point to opportunities for targeted capacity-building and policy support.

10.1.4 Climate Change Vulnerability Index

The overall Climate Change Vulnerability Index (CCVI), based on data from 206 SMEs across the four target districts of Punjab, was calculated at 1.48, placing these enterprises in the “Less Vulnerable” category. The Climate Change Vulnerability Index (CCVI) analysis showed that SMEs across districts, business types, sizes, ages, and sectors were generally classified as “Less Vulnerable”, though with notable variations in relative exposure. District-wise, Rahimyar Khan was the most vulnerable, followed by DG Khan, Faisalabad, and Lahore, aligning with the initial hypothesis of higher vulnerability of the districts from Southern Punjab. By business type, Agriculture/Livestock SMEs were the most exposed, while Manufacturing showed the least vulnerability. In terms of enterprise size, smaller firms had the highest CCVI, with medium enterprises close behind; larger firms demonstrated comparatively lower exposure. Age trends showed older enterprises as more vulnerable, while those falling in the middle age ranges were the least affected. Sectoral comparisons revealed Furniture and Agriculture & Food as the most vulnerable, with Textile and Light Engineering least affected. Despite these differences, all categories remained within the “Less Vulnerable” band, indicating exposure but also an inherent capacity to withstand and adapt to climate change impacts.

The distribution of SMEs on the CCVI Readiness/Vulnerability band shows that 85% were categorized as “Less Vulnerable”, reflecting relatively lower exposure to climate risks. A smaller share (8%) fell into the “Moderate Vulnerable” group, while 6% were placed in the “Low Readiness” category—indicating limited adaptive capacity despite low vulnerability. Only one SME was categorized as “Neutral.” Overall, 93% of SMEs were positioned on the vulnerability side of the band, while 6% fell on the readiness side, though at a low level. Importantly, none of the surveyed SMEs were classified as “High Vulnerable” or as having “Moderate” or “High Readiness.” This pattern highlights that while most SMEs are not critically exposed, their preparedness remains weak, requiring capacity-building to enhance resilience.

10.2 Urgency for Climate Action

To effectively address the challenges posed by climate change, it is essential to adopt targeted recommendations that focus on resilience, sustainability, and inclusive growth. In view of its critical importance, climate change is now a part of the national development agenda of all nations in the world. This carries an even higher importance for countries like Pakistan which are ranked among the top ten most vulnerable countries. The relevance looks even more pronounced for more vulnerable groups like SMEs which face the harshest impact but have the least resources to adapt. These enterprises lack the necessary financial buffers and insurance and do not have in-house expertise or risk management systems which endangers their survival and sustainable profitability. Many cases require an urgent action when climate change events like frequent floods, droughts, heatwaves, and storms create pressure for immediate adaptation and resilience-building measures. Since SMEs make up a large share of employment and GDP, a low-performing SME sector ultimately leads to slowing down the country’s overall economic growth. Avoiding such a situation demands having a clear vision and a well-defined strategy to help small and medium businesses adapt to climate change and reduce its harmful impacts.

It is also important to remember that climate change is a threat to entire human race and is therefore being dealt collectively by all nations. Pakistan is also a signatory to international frameworks and commitments, including the Paris Agreement, Sustainable Development

Goals (SDGs), and Nationally Determined Contributions (NDCs). These commitments also bind the country to have a clear action plan to deal with the rising effects of climate change.

SME climate change recommendations are not just about survival — they are also about compliance and competitiveness in a global market shaped by climate commitments. International buyers and investors increasingly demand compliance, climate disclosures, carbon footprint data, and green supply chains. SMEs that comply with recommendations are now better positioned in export markets. The EU Carbon Border Adjustment Mechanism (CBAM) and similar regulations are moving towards penalizing exports from countries/companies with weak climate compliance. Focused recommendations to remain climate compliant can thus help firms adapt early and remain competitive.

10.3 Key Pillars of Climate Change Recommendations

The recommendations to cope with climate change threat have been structured under the following pillars:

1. Governance, Policy Integration & Institutions
2. Climate Data
3. Adaptation and Resilience
4. Climate Finance and Green Investment
5. Awareness, Education & Social Inclusion
6. Capacity Building, Technology & Innovation
7. Monitoring, Evaluation & Transparency

Recommendations under each of these pillars have been described in the following paragraphs:

10.3.1 Governance, Policy Integration & Institutions

Effective climate action requires strong governance, coherent policies, and well-functioning institutions. Without clear frameworks and coordinated efforts, climate initiatives often remain fragmented and less impactful. Strengthening institutional capacity and aligning policies across sectors will ensure that climate priorities are integrated into national development goals and implemented in a transparent, inclusive, and accountable manner.

10.3.1.1 Integration of Climate Priorities into Policies

Integrating climate priorities into policies is essential to ensure that climate action becomes a cross-cutting element of Pakistan's overall development agenda rather than a standalone objective. For SMEs, fragmented governance and weak institutional coordination often limit their ability to respond to climate risks effectively. Embedding climate considerations into industrial, trade, energy, and SME development policies can create an enabling environment that aligns economic growth with sustainability. Such integration ensures that climate resilience and low-carbon practices are not optional add-ons but core requirements for competitiveness and long-term survival. It also allows SMEs to benefit from national commitments, such as the NDCs, through targeted incentives, sectoral guidelines, and streamlined regulatory frameworks.

10.3.1.2 Developing National–Provincial SME Climate Resilience Architecture

To strengthen SME resilience against climate risks, it is proposed to establish an “SME Climate Resilience Cell” within SMEDA, with corresponding focal points in the Ministry of Climate Change (MOCC) and Ministry of Industries & Production at federal level and Industries Departments, Planning & Development Departments, and Environmental Protection Agencies at provincial levels. The proposed Cell will work to mainstream climate resilience into SME development, reduce vulnerability to climate shocks, and enhance the competitiveness of Pakistani SMEs in local and global markets.

This Cell will perform the following specific functions:

- Serve as a central coordinating body to integrate climate considerations into SME policies, regulations, and development strategies.
- Provide technical support for climate risk assessments and help SMEs adopt adaptation and mitigation measures aligned with national climate commitments.
- Work with financial institutions to design green financing products, concessional credit, and investment pipelines tailored to SME needs.
- Organize and supervise training, awareness, and technical assistance programs to promote energy efficiency, waste reduction, and circular economy practices.
- Act as a regulatory support mechanism, guiding SMEs on compliance with environmental standards and simplified climate disclosure frameworks.
- Establish robust Monitoring, Reporting, and Verification (MRV) systems to track SME climate actions and contributions to Pakistan’s NDC targets.
- Connect the local SMEs with international donors, trade partners, and development agencies, opening avenues for knowledge transfer and resource mobilization.

10.3.1.3 Institutionalize SME Climate Risk Assessments

It is recommended to institutionalize annual, province-wise SME climate risk and readiness assessments using the Climate Change Vulnerability Index (CCVI) and the proposed interactive SME Climate Dashboard. These assessments will provide evidence-based insights into how SMEs are exposed and responsive to evolving climate risks. The process should generate disaggregated heat, precipitation, and flood risk maps, overlaid with major SME clusters such as textiles, light engineering, agriculture, livestock, and trading hubs. Such mapping will help identify climate “hotspots” where targeted resilience interventions are most urgently required. By repeating the assessments annually, trends can be monitored and comparative analysis across provinces will inform both national and provincial planning.

The availability of visual, user-friendly dashboards and risk maps will enhance transparency and enable policymakers, businesses, and financiers to make climate-smart decisions. Furthermore, these assessments will guide the design of tailored adaptation strategies, climate finance instruments, and localized infrastructure investments. Publishing the results in the public domain will also promote accountability, while encouraging SMEs to align operations with climate risk reduction measures. Over time, this system will contribute directly to NDC implementation and to positioning Pakistani SMEs as more resilient, sustainable, and competitive in regional and global markets.

10.3.1.4 Green Public Procurement

In order to actively encourage climate-smart practices among suppliers it is recommended to introduce green public procurement (GPP) criteria. These criteria should reward enterprises that demonstrate verified improvements in climate readiness, such as adopting heat-safe SOPs in service sectors or implementing water-efficiency measures in agro-processing operations. By linking procurement decisions to verified climate performance, the government can create a market pull for sustainable goods and services, incentivizing SMEs to invest in adaptation and mitigation measures. Verification can be facilitated through the SME Climate Dashboard or similar monitoring platforms, ensuring transparency and accountability.

GPP guidelines should be integrated across all levels of government procurement, including municipal, provincial, and federal projects, to maximize reach and impact. Training and awareness sessions for procurement officers and suppliers can help ensure proper implementation and understanding of these criteria. Over time, green procurement will stimulate innovation, adoption of best practices, and competitiveness in SMEs that meet climate standards. This approach not only strengthens market-based incentives for climate action but also aligns government spending with national adaptation and sustainability goals. By rewarding suppliers for measurable climate readiness improvements, the government can accelerate the transition to resilient, low-carbon supply chains across key sectors. Green public procurement thus serves as a strategic tool to mainstream climate-smart practices while supporting SMEs to enhance their resilience and competitiveness.

10.3.1.5 Reward Climate-Compliant Firms

It is recommended to fast-track permits and industrial estate allotments for firms that implement climate-resilient designs in their facilities. Such designs may include flood-proofed layouts, shaded work areas, efficient drainage systems, green buffers, and water-saving infrastructure, all of which reduce vulnerability to extreme weather events. By offering expedited regulatory approvals and allotments, the government provides a strong incentive for SMEs and other enterprises to invest in resilience measures from the outset. This reduces administrative delays and associated costs, making climate-smart construction more financially and operationally attractive.

Implementation should be coordinated across SMEDA, provincial industries departments, and urban planning authorities, ensuring standardized verification and monitoring of resilience features. Fast-tracking will help establish climate-resilient industrial clusters, demonstrating best practices for private and public sector developments. It also encourages SMEs to proactively integrate adaptation into business planning, aligning investment decisions with national climate goals. Additionally, this mechanism can complement other initiatives such as green public procurement and fiscal incentives, creating a cohesive policy framework.

10.3.2 Climate Data

In the absence of any centralized and; comprehensive database on the climate risks, emissions, or resilience of Pakistani SMEs, it is of utmost importance to start building such a database. The survey carried out under this project is a start in the right direction. The availability of comprehensive direct and authentic data will lay the foundation of targeted policies and interventions to develop resilience of the local SMEs against climate change.

The results of the survey carried out under this project have been uploaded on the SME Climate Web Dashboard. It is proposed to institutionalize this dashboard as the single source of truth for climate risk, readiness, and intervention performance across the country. This platform should serve as the central repository for data generated through annual CCVI assessments, provincial focal points, and sectoral studies. To ensure continuous data inflow, the dashboard has already been integrated with simple, user-friendly e-form that allows the enterprises to self-report key climate change indicators. In addition to SMEs doing climate self-assessments, SMEDA should also conduct more climate surveys of the SMEs. The survey done under this project has covered SMEs from four districts of Punjab. It is recommended to extend this survey also to cities from other provinces and regions of Pakistan, in SME clusters.

Generating climate data of SMEs will not only reduce information gaps but also encourage SMEs to actively participate in climate disclosure and performance tracking. By standardizing inputs, the dashboard can generate real-time analytics, visual maps, and progress trackers to guide policymakers, financial institutions, and business associations. Over time, the dashboard can evolve into a decision-support tool, enabling evidence-based prioritization of interventions, allocation of climate finance, and monitoring of Pakistan's NDC commitments. Embedding this platform institutionally within SMEDA and its provincial counterparts will ensure sustainability, credibility, and long-term ownership.

10.3.2.1 SME Climate Disclosure Lite Framework

It is proposed to introduce a minimal “SME Climate Disclosure Lite” framework⁶ consisting of no more than ten indicators to encourage climate-related self-reporting by SMEs. The framework should be designed around three key dimensions: exposure (heat stress, precipitation, and flood risks), sensitivity (business assets, supply chains, and operational disruptions), and adaptive capacity (finance, technology adoption, and insurance coverage). This simplified disclosure will allow SMEs to report only the most critical information without imposing high compliance costs or complex technical requirements. Data should be collected through simple e-forms linked with the national SME Climate Dashboard, ensuring that information can be aggregated and analyzed efficiently. At the backend, these inputs can be compiled into district- and sector-level analytics, producing maps and trend insights that highlight climate hotspots and resilience gaps. The results will feed directly into policy formulation, targeted incentives, and climate finance allocation for SME clusters most at risk. Over time, this disclosure system will also support SMEs in aligning with international trade requirements on sustainability reporting and reduce the risk of export market exclusion. By institutionalizing this approach, the government can build a progressive culture of climate transparency within the SME sector, while generating valuable evidence for national climate commitments. This “Lite” model should act as a stepping stone towards more advanced disclosure practices as capacities improve.

⁶ The SME Climate Disclosure Lite Framework is a simplified reporting system designed to help SMEs track, disclose, and communicate their climate-related risks and responses without overwhelming them with complex requirements. The Lite framework provides a minimal set of indicators (≤ 10) that are easy to report, low-cost, and highly relevant to SME operations.

10.3.2.2 Standards and Guidance

It is recommended to develop and issue sector-specific technical guides and standard operating procedures (SOPs) that provide clear, practical directions for SMEs to cope with climate risks. These guides should cover areas such as heat-safe workplaces to protect labor productivity and health, flood-resilient layouts to safeguard infrastructure and supply chains, and water stewardship practices to ensure sustainable use of scarce resources. By tailoring the content to different SME clusters like textiles, agro-processing, and light engineering, the guidance will remain practical and relevant. To encourage adoption, these standards and SOPs should be made a prerequisite for accessing concessional finance, tax rebates, or other government incentives, thereby linking compliance to tangible business benefits. Dissemination can be done through SMEDA, industry associations, and provincial focal points, ensuring that even small firms in vulnerable districts can access the information. Training and awareness workshops should accompany the rollout so SMEs understand not only the rules but also the business case for compliance. Over time, these technical guides will help build a culture of climate-smart operations within the SME sector. They will also strengthen the country's capacity to meet international standards and trade requirements, especially in export-oriented industries. Standardized guidance will thus provide a level playing field, enhance resilience, and support the transition towards sustainable and competitive SMEs in Pakistan.

10.3.3 Adaptation and Resilience

10.3.3.1 Align Industrial Infrastructure with Climate Change Adaptation Measures

It is recommended to incorporate climate risk considerations into the design and retrofitting of industrial estates, ensuring that business clusters are better equipped to withstand climate shocks. This includes the installation of modern drainage systems to reduce flood risks and protect critical infrastructure. Providing shade structures and ventilation solutions can help reduce heat stress for workers, safeguard productivity, and protect sensitive equipment. Establishing green buffers and landscaped zones within and around industrial estates will not only lower ambient temperatures but also improve air quality and contribute to healthier working environments. The use of sponge surfaces and permeable pavements can significantly improve rainwater absorption, reduce urban flooding, and recharge groundwater. Such climate-smart designs should be made a mandatory part of new estate planning and incentivized for existing estates undergoing retrofits.

Collaboration between SMEDA, provincial industries departments, and urban development authorities will be essential to mainstream these practices. Financing packages, tax rebates, or concessional loans could be linked to compliance with climate-resilient design standards. Over time, this approach will help create safer, more resource-efficient industrial zones, while reducing economic losses from extreme weather events, thereby enhancing business continuity and national climate resilience.

10.3.3.2 Implement Climate-Smart OHS Measures

It is recommended to ask for the adoption of climate-smart Occupational Health and Safety (OHS) measures in SMEs and industrial workplaces. These measures should include heat action protocols, provision of shaded rest areas, adequate hydration facilities, and adjustments to shift timing to reduce exposure during the hottest parts of the day. Labor inspections

conducted during the high-risk months of May to September should specifically monitor compliance with these measures.

By embedding climate considerations into OHS enforcement, regulators can ensure that workers' health and productivity are protected against rising temperatures (the biggest climate change factor identified by the surveyed SMEs). These protocols should be supported by training and awareness campaigns, helping both management and staff understand their importance and implementation. Compliance could be linked to incentives, recognition, or certifications, encouraging proactive adoption rather than reactive enforcement. Over time, integrating climate-smart OHS measures will reduce workplace illnesses, absenteeism, and heat-related accidents and build broader climate resilience within SME clusters, while demonstrating the business case for adaptation.

10.3.3.3 Strengthen Disaster Risk Reduction and Early Warning Systems

Under the Adaptation & Resilience pillar, it is recommended to strengthen disaster risk reduction (DRR) and early warning systems tailored to the needs of SMEs. These systems should provide timely and localized alerts on heatwaves, heavy rainfall, floods, and other climate hazards, enabling businesses to take preventive action. Integration with digital platforms, SMS services, and the SME Climate Dashboard can ensure rapid dissemination of warnings to enterprises across sectors and districts. SMEs should be trained on how to interpret alerts and translate them into operational responses, such as adjusting work shifts, securing assets, or activating contingency plans. Collaboration between SMEDA, NDMA, PDMA, and meteorological departments is essential to ensure reliability and consistency of information. In addition, disaster risk mapping and vulnerability assessments should be conducted at the cluster and district levels, so that high-risk areas receive targeted preparedness support. For example, the survey results show the districts of southern Punjab to be more vulnerable which mandates assigning more attention to those areas.

Insurance products and contingency financing can be linked with early warning systems to enhance financial readiness. Over time, these mechanisms will reduce losses, improve business continuity, and protect livelihoods. Embedding DRR into SME planning also supports national disaster management strategies and global climate adaptation commitments. Ultimately, robust early warning and risk reduction systems will serve as a lifeline for SMEs, strengthening resilience against escalating climate threats.

10.3.4 Climate Finance and Green Investment

10.3.4.1 Develop Green Finance Products

It is recommended to establish a blended “SME Resilience Window” within Pakistan’s climate finance architecture to provide targeted financial support for SMEs. This window should operate through three dedicated shelves to address distinct climate priorities.

- The first shelf would finance adaptation capital expenditures, such as investments in cooling and insulation systems, flood-proofing of premises, and water-use efficiency technologies.

- The second shelf would support business continuity solutions, including climate-risk insurance, early warning systems, and contingency equipment to minimize downtime during extreme weather events.
- The third shelf would promote low-carbon investments with co-benefits, such as solar energy solutions and energy efficiency measures that also reduce operating costs.

To ensure accessibility, the facility should blend concessional credit, first-loss guarantees, and results-based grants, thereby reducing risk for lenders and encouraging SME participation. Disbursements and incentives can be tied to verified key performance indicators (KPIs) tracked through the SME Climate Dashboard, ensuring transparency and accountability. Over time, this window would crowd in private investment, reduce climate vulnerability of SME clusters, and align enterprise-level actions with Pakistan's NDC and SDG commitments.

10.3.4.2 Resilience-Linked Loans

It is recommended to encourage banks and development finance institutions (DFIs) to offer resilience-linked loans to SMEs. These loans would feature step-down interest pricing tied to verified performance improvements in key operational and environmental indicators, such as energy intensity reduction, water savings, and downtime minimization. Verification of these KPIs can be conducted through the SME Climate Dashboard, ensuring transparency, accuracy, and alignment with national climate and resilience objectives.

By linking financial incentives directly to measurable improvements, SMEs are motivated to adopt climate-smart and efficiency-enhancing practices. Such loans not only reduce the financial burden of investing in adaptation or mitigation measures but also help banks manage credit risk by supporting more resilient enterprises. The program can be structured with technical assistance, helping SMEs identify and implement the interventions necessary to meet KPI targets. The proposed resilience-linked loans can stimulate market-driven adoption of best practices, creating a culture of continuous improvement. This approach also strengthens the link between financial performance and climate performance, demonstrating that sustainability and profitability can go hand-in-hand. The proposed resilience-linked financing will ultimately lead to expanding access to green and climate-aligned capital, improving SME competitiveness, and building systemic resilience across industrial clusters.

10.3.4.3 Risk-Informed Compliance

For promoting Climate Finance & Green Investment, it is recommended to establish a system of risk-informed compliance in SME lending practices. This would require financial institutions to gradually phase in mandatory climate risk screening for all new SME loans above a specified threshold (e.g., PKR 20 million). The screening process should use the SME Climate Disclosure Lite checklist, enabling lenders to assess exposure, sensitivity, and adaptive capacity in a standardized manner. By linking loan approvals to climate disclosure, banks and DFIs can protect their portfolios from climate-related default risks while promoting sustainable enterprise growth.

To incentivize compliance, interest rate rebates or lower capital charges should be offered to SMEs that achieve higher climate readiness scores on the SME Climate Dashboard. This creates a strong business case for SMEs to adopt adaptation and resilience measures, since improved practices translate directly into cheaper and more accessible credit. Over time, such

climate-aligned lending mechanisms will help normalize green banking standards across Pakistan's financial sector. The aggregated analytics from SME screenings can also feed into policy and governance frameworks, creating a feedback loop between finance and regulation. By positioning climate risk as a core criterion in SME finance, Pakistan can both unlock green investment flows and ensure that its enterprises remain competitive in increasingly sustainability-driven markets. Ultimately, risk-informed compliance will deepen access to climate-smart finance and accelerate the transition to a resilient, low-carbon SME sector.

10.3.4.4 Fiscal Incentives

For promoting climate-resilient investment by SMEs, it is recommended to introduce targeted fiscal incentives. These incentives could take the form of time-bound tax credits or accelerated depreciation on capital expenditures that enhance adaptation, such as insulation, reflective roofing, efficient cooling systems, water-reuse kits, and flood barriers. By reducing the effective cost of these investments, SMEs are encouraged to adopt measures that protect their assets, workforce, and operations against climate hazards. Time-bound measures create a sense of urgency, motivating SMEs to act promptly rather than postponing resilience investments. Over time, such fiscal incentives can crowd in private finance, helping SMEs scale up adaptation across clusters. They also align with national climate goals and international commitments, making enterprises more competitive in green markets. Additionally, combining these incentives with training and technical guidance will maximize their impact. Such targeted fiscal measures reduce the financial barriers to climate adaptation and strengthen the overall resilience and sustainability of the SME sector.

The fiscal incentives should be clearly defined, easy to access, and communicated widely through SMEDA, chambers of commerce, industry associations and provincial industries departments. Linking these incentives to verified adoption, for example via the SME Climate Dashboard, ensures accountability and proper utilization of public funds.

10.3.4.5 Reduced Duties

It is recommended to introduce reduced import duties on certified adaptation and efficiency equipment for SMEs. This would lower the upfront cost of critical technologies such as variable-speed drives, high-efficiency chillers, and leak-detection kits, making them more accessible to SMEs and they can then more readily adopt measures that improve energy efficiency, reduce water losses, and enhance climate resilience. The duty reductions should apply only to certified and verified equipment, ensuring quality and effectiveness. For ensuring that, the government agencies, in coordination with SMEDA and provincial industrial departments, can maintain an approved list of eligible technologies. This approach encourages SMEs to invest in modern, climate-smart machinery without incurring prohibitive costs. Linking duty reductions to capacity-building programs and technical support will maximize adoption and proper use. Over time, such measures will stimulate green technology markets, create incentives for suppliers, and promote innovation, thereby strengthening both financial and operational resilience of SMEs against climate risks.

10.3.4.6 Parametric Micro Insurance

It is recommended to launch a parametric micro-insurance pilot for SMEs to safeguard against climate shocks, with an initial focus on heat stress and precipitation-related disruptions (the two factors getting highest vulnerability scores in the survey). The pilot should be implemented

in two districts, one categorized as “less vulnerable” and another as “more vulnerable,” based on CCVI assessments, in order to compare performance across different risk contexts.

Parametric insurance, unlike traditional indemnity-based models, pays out pre-agreed amounts once a climate threshold (e.g., temperature above 45C for three consecutive days, or rainfall above 100 mm in 24 hours) is triggered, ensuring quick and transparent payouts to SMEs. To encourage uptake, the government should provide premium support for the first two years, gradually phasing it out as awareness and trust in the product grows. The scheme should be developed in partnership with insurance providers, banks, and development partners, with technical inputs from the proposed SME Climate Resilience Cell. Data from the pilot can be linked to the SME Climate Dashboard to verify trigger events, monitor payouts, and generate analytics on financial resilience. The pilot will also test the willingness-to-pay, affordability, and effectiveness of parametric tools for SMEs in Pakistan. Successful implementation can pave the way for scaling up insurance solutions nationally, reducing vulnerability of SME clusters to climate shocks while deepening access to climate finance.

10.3.4.7 Insurance Premium Subsidies

For lowering the cost of insurance to make it more accessible to SMEs, it is recommended to introduce premium subsidies for SME climate insurance, particularly when bundled with loans or integrated into digital payment platforms. These subsidies should especially be provided to SMEs in high-risk sectors like agriculture/livestock. By linking insurance to financial products, SMEs can protect their assets and operations against climate-related shocks such as floods, heatwaves, and supply chain disruptions.

SMEDA should design this program in coordination with banks, DFIs, and insurance providers, ensuring seamless enrollment and claim processing. Integration with digital platforms can facilitate automated premium payments, risk monitoring, and claims verification, enhancing efficiency and reducing administrative burden. Verified adoption and performance could be tracked via the SME Climate Dashboard, creating accountability and enabling future policy adjustments. Subsidized climate insurance will reduce financial vulnerability, improve business continuity, and encourage SMEs to invest in adaptation measures. Bundling insurance with loans also reinforces the link between resilience and financial performance, creating incentives for proactive risk management.

10.3.5 Awareness, Education & Social Inclusion

The survey results indicated a low awareness about the climate change impact on the business operations. Majority of the SMEs fell in the ‘less vulnerable’ range of CCVI. There was only a small percentage of the total SMEs which were found to have a readiness (though low) against climate change threats. This low awareness stems from several interconnected factors. Most of the business owners lack technical knowledge and access to climate information that is tailored to their sector or district, making the issue seem distant or irrelevant. Their focus is often on short-term survival and profitability, leaving little room to prioritize long-term climate risks. Weak policy outreach and limited engagement of business associations further reduce the chance of climate information reaching the enterprise level. Also, low financial literacy prevents SMEs from seeing the clear link between climate shocks and business risks such as supply chain disruptions or export restrictions. It is therefore recommended to increase awareness about climate change.

10.3.5.1 Climate Education and Awareness Campaigns

It is recommended to strengthen awareness, education, and social inclusion as an integral part of SME climate resilience and national adaptation strategies. Climate education and awareness campaigns should be designed in multiple forms, including:

- General public awareness (climate risks and community preparedness)
- Technical awareness (energy efficiency, water management, adaptation technologies)
- Policy awareness (regulations, incentives, disclosure requirements)
- Financial awareness (climate finance instruments, insurance, green investment opportunities)

To foster behavioral change towards sustainable consumption and production, targeted campaigns should promote efficient use of resources, waste minimization, and the uptake of eco-friendly products and practices. Successful case studies of SMEs that have adopted resilience measures should be showcased to demonstrate the economic and social benefits of green practices. Long term awareness building should target embedding climate education in school curricula, vocational training centers, and SME support programs. Collectively, these actions will cultivate an informed, inclusive, and proactive society that is better equipped to cope with climate change while contributing to sustainable development.

Being the apex government body working for SMEs, SMEDA can play a central role in increasing climate awareness among SMEs. SMEDA is well placed to translate complex climate information into simple, business-relevant knowledge. It can design and deliver awareness campaigns, training programs, and sector-specific guidelines on how rising temperatures, floods, and energy shortages affect SME operations. Through its regional offices and collaboration with industry associations, chambers of commerce, and provincial focal points, SMEDA can ensure that climate awareness reaches diverse SME clusters across the country. By developing climate toolkits, self-assessment checklists, and success stories, it can demonstrate the practical benefits of adopting green technologies and resilience measures. Additionally, SMEDA can integrate climate education modules into its capacity-building programs and link SMEs with finance providers, insurers, and technology suppliers to turn awareness into action.

SMEDA can use the SME Climate Dashboard as a powerful tool for creating awareness and driving action. By hosting and managing this platform, SMEDA can provide SMEs with real-time, easy-to-understand insights on climate risks such as heat, precipitation, and flood exposure at the district and sector level. The dashboard can include interactive maps, trend graphs, and sector snapshots, allowing SMEs to visualize how climate change directly affects their business clusters. Through integrated self-reporting e-forms, SMEs can input their data on different climate change related indicators and instantly receive their CCVI and feedback on their resilience gaps compared to local averages. This two-way system not only builds awareness but also creates a sense of ownership and participation among enterprises. SMEDA can further use dashboard analytics to design targeted awareness campaigns, training sessions, and financial products for more vulnerable clusters. By publishing aggregated results and success stories on the dashboard, SMEDA can also demonstrate the benefits of climate-smart practices, motivating broader adoption.

10.3.6 Capacity Building, Technology & Innovation

10.3.6.1 Research and development for Climate-Smart Solutions

The survey results showed the average readiness score for R&D factor fall in the low range, showing that this factor was not perceived as very relevant to cope with the climate change threat. It is therefore recommended to strengthen R&D to provide climate-smart solutions tailored to SMEs. Public and private research institutions should collaborate to develop adaptation and mitigation technologies, including energy-efficient machinery, water-saving devices, flood-resistant infrastructure, and low-emission production processes. Dedicated R&D funding programs and grants can support pilot projects, prototypes, and scaling of innovative solutions. SMEs should be engaged directly in R&D efforts to ensure technologies are practical, cost-effective, and sector-specific. Knowledge generated from these initiatives should be disseminated through training programs, technical guides, and workshops to facilitate adoption. Partnerships with universities, think tanks, and innovation hubs can foster co-creation of solutions and accelerate technology transfer. Intellectual property rights and incentives for commercialization should be clearly defined to encourage private sector participation. Over time, systematic R&D will enhance SME competitiveness, resilience, and compliance with national and international climate standards.

10.3.6.2 Transfer of Clean Technologies

Transfer of clean technologies should be promoted to SMEs to enhance mitigation and adaptation efforts. This may include introducing energy-efficient machinery, renewable energy systems, water-saving equipment, and low-emission production processes. Government agencies, research institutions, and private sector partners should collaborate to facilitate technology transfer agreements, licensing, and joint ventures. Incentives such as tax breaks, and concessional finance can encourage SMEs to adopt these technologies. The proposed technology should be accompanied by capacity building programs and training workshops to ensure effective installation, operation, and maintenance. Special focus should be given to sector-specific solutions, such as, solar-powered water pumps for agro-processing or efficient chillers for textile units. Partnerships with international organizations can help import proven climate-smart technologies while adapting them to local conditions. Systematic technology transfer will reduce emissions, enhance resilience, and improve resource efficiency in SMEs, thereby strengthening competitiveness, compliance with climate standards, and long term sustainability.

10.3.6.3 Skill Development and Training for Workforce

The survey results indicated that labor inefficiency and labor absenteeism were the two most vulnerable internal indicators. The results of the readiness part of the survey also indicated that upgradation of labor skills was rated as the most important factor to cope with the adverse effects of climate change. The climate change management strategy should therefore essentially include sensitizing the workforce on climate change effects by conducting skill development and climate-focused training programs for small and medium businesses.

Key areas to be covered under this training will be climate-smart practices, occupational health and safety under extreme weather, energy and water efficiency, and disaster preparedness. Programs should target both management and operational staff to ensure that climate adaptation and mitigation measures are effectively implemented at all levels. Special emphasis

should be placed on engaging women, youth, and marginalized groups to promote inclusive participation in the transition to sustainable practices.

Training can be delivered through vocational centers, industry associations, online platforms, and workshops, ensuring accessibility for SMEs across urban and rural areas. Certification programs can provide recognition for climate-competent skills, enhancing employability and professional development. Integration with technical guides and SOPs, will help workers translate knowledge into practical action. Partnerships with universities, training institutes, and NGOs can help tailor content to sector-specific needs. Continuous monitoring and refresher courses will ensure up-to-date knowledge on emerging climate risks and solutions. In that way, this skill development exercise will strengthen SME resilience, operational efficiency, and competitiveness, while promoting a culture of climate awareness and proactive adaptation.

10.3.6.3.1 Knowledge Sharing Platforms

It is recommended to develop knowledge-sharing platforms that facilitate the exchange of climate-smart practices, adaptation strategies, and success stories among SMEs. These platforms could include online portals, interactive dashboards, webinars, forums, and regional workshops, allowing enterprises to access sector-specific guidance and real-world examples. The survey results showed that all the SMEs were not using all the readiness measures, indicated by the average scores of many of the indicators lying in the low range. Mutual sharing of experiences between SMEs can allow learning from each other's experiences. Integration with the SME Climate Dashboard can enable sharing of verified data on energy use, water efficiency, and resilience measures, helping SMEs benchmark their performance.

Knowledge-sharing should target all stakeholders, including business owners, operational staff, and policymakers, fostering a collaborative approach. Special efforts should be made to include women, youth, and marginalized groups to ensure inclusivity and broader adoption of sustainable practices. Partnerships with industry associations, universities, NGOs, and government agencies can help maintain updated and credible content. Platforms should provide practical tools, technical guides, and step-by-step SOPs for SMEs to implement climate-smart measures effectively. Feedback mechanisms can help capture local innovations and lessons learned, creating a dynamic learning ecosystem.

10.3.7 Monitoring, Evaluation & Transparency

10.3.7.1 Data-Driven Systems for Tracking Progress

It is recommended to have data-driven systems to continuously track progress on SME climate resilience and adaptation measures. These systems should collect real-time information on energy use, water consumption, emissions, losses, and adaptation actions, feeding into the SME Climate Dashboard as the single source of truth. Standardized digital reporting formats and simple e-forms should be available to SMEs to make it easier for them to submit data. Integration with national databases, meteorological services, and disaster management systems will enrich analysis and provide evidence-based insights for policy adjustments. Dashboards should generate sector- and district-level analytics, enabling policymakers to identify trends, gaps, and success stories. Verification protocols must be in place to ensure data accuracy, reliability, and transparency. Over time, predictive analytics and AI can be integrated to provide foresight on climate risks and resilience outcomes. Linking financial incentives and compliance requirements to verified data will encourage honest reporting and proactive action.

The proposed data-driven tracking systems will create a feedback loop between SMEs, policymakers, and financiers, ensuring that climate interventions remain effective, measurable, and scalable.

10.3.7.2 Regular Reporting and Independent Reviews

It is recommended to institutionalize regular reporting and independent reviews of SME climate actions and resilience measures. SMEs should be encouraged to submit annual climate disclosure reports using simplified formats such as the Disclosure Lite framework, covering exposure, sensitivity, and adaptive capacity. These reports should feed into the SME Climate Dashboard, enabling policymakers to track progress at the district and sector levels. Independent third-party reviews should be conducted periodically to ensure accuracy, credibility, and transparency of reported data. Such reviews can also validate the effectiveness of interventions, highlight best practices, and identify gaps requiring corrective action. Findings should be shared through publicly accessible summaries, strengthening accountability and stakeholder trust. Linking finance, incentives, and procurement eligibility to verified reporting will encourage SMEs to comply consistently. Government institutions like SMEDA, P&D departments, and environmental authorities should coordinate the review process, supported by donor agencies and industry associations. Such routine reporting, combined with independent verification, will create a robust accountability framework, making climate interventions more reliable and scalable.

10.3.7.3 Alignment with Global Commitments

Rigorous monitoring is recommended to ensure that SME climate actions remain closely aligned with global commitments, particularly the Paris Agreement and the Sustainable Development Goals (SDGs). This alignment requires embedding SME-focused adaptation and mitigation measures within Pakistan's Nationally Determined Contributions (NDCs) and related climate strategies. By linking SME climate disclosures, resilience investments, and emissions reductions to these frameworks, Pakistan can strengthen its reporting and compliance capacity at the international level. The SDGs provide a broader context, especially SDG 7 (clean energy), SDG 8 (decent work and economic growth), SDG 9 (industry, innovation, infrastructure), SDG 12 (responsible consumption and production), and SDG 13 (climate action). Ensuring SME contributions to these goals will enhance coherence between national policies and international obligations. Coordination between SMEDA, federal ministries, provincial departments, and international partners is crucial to streamline reporting and avoid duplication. Regular updates on SME climate performance should be integrated into global monitoring platforms, showcasing Pakistan's progress. Accessing climate finance and green investment opportunities from multilateral funds will also depend on such alignment. Positioning SME climate action within global commitments will enhance credibility, unlock financing, and strengthen resilience at both the enterprise and national levels.

10.4 Interventions

10.4.1 No-Regret Programs⁷

The interventions suggested under this head fall under Adaptation & Resilience pillar.

⁷ In climate policy and adaptation, “no-regret programs” are measures or investments that deliver benefits regardless of how severe or uncertain future climate impacts turn out to be. They are called “no-regret” because

10.4.1.1 Heat Action Program

Rising Temperature was identified as the most threatening external climate change factor in the SME survey results. Therefore, it is recommended to launch a dedicated Heat Action Program for SMEs. The objective of the program will be to reduce productivity losses, worker health risks, and downtime during extreme heat periods. It will lead to building enterprise-level resilience, safeguarding worker welfare, and strengthening economic continuity under rising temperatures. Key features of the program follow:

- The program should provide micro-grants and toolkits to support practical workplace interventions, including reflective coatings, thermal insulation, cross-ventilation systems, and energy-efficient fans or chillers. Micro-grants should be tied to verified adoption, with monitoring through the SME Climate Dashboard.
- SMEs should receive occupational health and safety (OHS) training for workers, focusing on hydration practices, heat stress recognition, and safe work scheduling.
- An SMS-based early warning system should be integrated, delivering real-time heat alerts to SME owners and workers to trigger precautionary actions.
- The program should be piloted in less vulnerable districts such as Lahore and Faisalabad and later be refined and scaled to other more vulnerable districts like DG Khan and Rahimyar Khan.
- Implementation should be coordinated by SMEDA, provincial industries departments, and labor authorities, ensuring outreach across diverse clusters. Partnerships with insurance providers, technology suppliers, and NGOs can expand coverage and sustainability.

10.4.1.2 Flood-Ready Supply Chains Program

Precipitations and Floods were identified as the more threatening external climate change factors during the SME survey. For protection against that, it is recommended to launch Flood-Ready Supply Chains Program. The initiative will enhance supply chain reliability, reduce economic downtime, and strengthen resilience of SMEs against future flood shocks. Key features of the program follow:

- The program should provide micro-support for drainage improvements, installation of modular flood barriers, and elevation of critical equipment in SME facilities to reduce damage during inundation.
- The initiative will promote vendor route-diversification plans, ensuring that supply chains are not overly dependent on single routes or suppliers that may be disrupted during floods.
- SMEs should be encouraged to maintain off-site data backups and digital record-keeping systems to safeguard operations against physical disruptions and ensure business continuity.
- Financial assistance in the form of micro-grants, concessional loans, or first-loss guarantees can be tied to adoption of these resilience measures.

even if climate risks are lower than expected, the programs still create economic, social, or environmental gains. This makes them safe, practical, and cost-effective choices for governments, businesses, and communities.

- Training sessions can help SMEs prepare business continuity plans tailored to flood risks.
- The program should be piloted in the two most vulnerable districts Rahimyar Khan and DG Khan, which are highly exposed to flood risks. It can generate best practices for replication across other flood-prone clusters.
- Technical guidance, including flood-resilient layouts and SOPs, should be issued by SMEDA in collaboration with local disaster management authorities. Performance and adoption should be tracked through the SME Climate Dashboard, linking resilience investments to incentives and recognition.

10.4.1.3 SME Water Stewardship Program

A dedicated SME Water Stewardship Program should be initiated to promote sustainable water management in industrial and commercial clusters. The program will safeguard critical resources, strengthen climate resilience, and enhance competitiveness of SMEs. Key features of the program follow:

- The program will conduct leak audits and offer low-cost metering solutions, enabling SMEs to detect losses and improve efficiency in water use.
- Training and technical assistance should be provided for process optimization, helping enterprises reduce unnecessary water consumption without compromising productivity.
- Practical interventions such as rainwater harvesting, grey-water reuse, and recycling of process water should be encouraged through technical guides and matching grants.
- At the cluster level, shared wastewater treatment facilities can be developed under public-private partnership (PPP) models.
- The initiative should provide awareness on the economic benefits of water stewardship, linking efficiency with lower costs and reduced vulnerability during droughts or shortages.
- SMEs adopting water-smart practices should be recognized on the SME Climate Dashboard and made eligible for incentives like concessional finance.
- Partnerships with universities and R&D institutes can support innovation in low-cost water-saving technologies suitable for SMEs.
- Piloting in water-stressed districts like DG Khan and Rahimyar Khan can generate lessons for scaling across agro-processing, textiles, and light engineering sectors.

10.4.1.4 Business Continuity Planning (BCP) Clinics

It is recommended to establish Business Continuity Planning (BCP)⁸ Clinics for SMEs across more vulnerable districts. Through these BCP Clinics, SMEs can minimize downtime, protect workers, and sustain competitiveness in the face of increasing climate variability. Key features of the program follow:

- These will be 1-day training and hands-on clinics designed to help enterprises prepare for climate shocks and disruptions.

⁸ Business Continuity Planning (BCP) is the process of preparing an enterprise to continue operating during and after disruptions, whether caused by natural disasters, climate shocks, supply chain breakdowns, or technical failures. It ensures that businesses can protect critical assets, safeguard employees, and minimize downtime in any such event.

- The clinics will provide template BCPs tailored to different sectors, ensuring SMEs have a structured approach to safeguard operations.
- Participants will be guided to prepare asset inventories, identifying critical equipment and resources that need protection. The program will develop emergency communication trees, ensuring that workers, suppliers, and customers can be reached during crises.
- SMEs will be trained to maintain inventory buffers, helping them withstand temporary supply chain disruptions.
- All BCP documents and checklists can be digitally uploaded to the SME Climate Dashboard, where verification can link them to incentives or risk-screened finance.
- Delivery will be coordinated by SMEDA, chambers of commerce, and disaster management authorities, with sector-specific customization.

10.4.1.5 Climate Insurance On-Ramp⁹

It is proposed to develop a Climate Insurance On-Ramp that enables SMEs to access affordable and user-friendly risk-transfer solutions. This will reduce financial vulnerability, enhance resilience, and protect livelihoods against rising climate risks. This approach avoids lengthy claim assessments, ensuring fast and transparent payouts. Key features of the program follow:

- The initiative should broker partnerships with insurance companies, mobile operators, and financial intermediaries to deliver simple parametric insurance covers, triggered automatically by predefined climate indicators like extreme heat days or flood levels.
- Claim settlements should be routed through mobile wallets and digital payment systems, making the process convenient and accessible for SMEs, particularly those in remote or vulnerable areas.
- To encourage uptake, premium subsidies or first-year discounts can be provided, especially for small enterprises with limited financial capacity.
- The product design should be linked to SME Climate Dashboard risk scores, aligning coverage with actual exposure levels. Pilot programs can be launched in flood-prone districts (DG Khan, Rahimyar Khan) and heat-prone districts (Lahore, Faisalabad) to test viability and refine offerings.
- Awareness campaigns and training sessions should build SME understanding of how parametric insurance works and its role in business continuity. Over time, bundled products (e.g., loans with embedded climate insurance) can deepen penetration.

10.4.2 Sector-Specific Packages

The interventions suggested under this head fall under Adaptation & Resilience pillar.

10.4.2.1 Suggested Packages for Agriculture/Dairy & Agro-Processing

Agriculture/dairy/livestock was found to have the highest vulnerability to climate risks in factors such as heat stress, drought, and floods. By combining on-farm resilience, cold-chain strengthening, and contamination controls, this package will protect livelihoods, enhance food

⁹ A Climate Insurance On-ramp is a mechanism that makes it easier for SMEs to start accessing climate risk insurance. SMEs in developing countries, like Pakistan, are usually not familiar with insurance products or find them too complex, costly, or slow to pay out. An “on-ramp” creates a simplified, affordable, and accessible entry point into climate insurance.

security, and improve competitiveness in climate-stressed regions. Following measures are proposed to protect the SMEs from climate change risks:

- On-farm measures like shade provision, cooling structures, drought-tolerant crop varieties, and micro-irrigation systems can significantly reduce exposure and water stress and should be promoted.
- Protecting water quality through proper storage, filtration, and runoff management¹⁰ should be promoted to safeguard livestock and crop health. SMEs should be guided to implement low-cost runoff management practices to prevent pollutants from entering nearby water bodies.
- Cold-chain reliability should be strengthened, with investments in pre-cooling systems, insulated transport vehicles, and energy-efficient chillers to reduce post-harvest losses.
- Agro-processing units must adopt soil and water contamination controls, such as routine testing and adherence to standard operating procedures (SOPs), to ensure food safety and environmental protection.
- Technical assistance and capacity-building programs should be launched to help farmers and processors adopt these practices effectively.
- Financial support through adaptation grants, concessional loans, or tax incentives should be tied to adoption of the suggested resilience measures.
- Monitoring and verification of adoption should be integrated into the SME Climate Dashboard for policy learning and transparency.

10.4.2.2 Suggested Packages for Manufacturing

The manufacturing sector—including textiles, light engineering, plastics, furniture, auto parts, etc. should adopt targeted measures to strengthen resilience against climate risks. The suggested measures will help the manufacturing SMEs maintain operational continuity, reduce losses, and stay competitive in a climate-stressed environment. Following are the measures, proposed to protect the SMEs from climate change risks:

- At the plant level, retrofits for heat management, such as thermal insulation, ventilation corridors, and reflective roofing, will protect workers and maintain productivity during heat waves.
- To minimize flood damage, SMEs should elevate or relocate critical equipment to flood-safe areas and ensure drainage systems are well maintained.
- For cutting operational costs, while reducing emissions, energy efficiency retrofits, such as variable frequency drives (VFDs), motor upgrades, and compressed-air leak detection and repairs should be promoted.
- Rooftop solar systems combined with demand-side management tools will strengthen energy security and reduce downtime from grid instability, particularly during peak climate events.
- For supply chain resilience, SMEs should implement supplier delivery-window staggering, ensuring materials are received before or after monsoon disruptions.

¹⁰ Runoff management refers to methods used to control and treat rainwater, irrigation water, or industrial wastewater that flows off farms, factories, or processing units into surrounding land and water bodies. If not managed, runoff can cause soil erosion, flooding, waterlogging, and contamination of rivers, canals, and groundwater with chemicals, oils, or organic waste.

- Alternative routing arrangements should be pre-identified with logistics partners to avoid transport delays.
- The suggested interventions should be supported through fiscal incentives, concessional credit, and technical assistance.
- Monitoring of adoption can be integrated into the SME Climate Dashboard, with readiness scores tied to financing or procurement incentives.

10.4.2.3 Suggested Packages for Trading & Services

The trading and services sector—including retail, hospitality, logistics, and IT firms—requires tailored interventions to cope with climate risks. The suggested actions will ensure that trading and service SMEs remain operational, competitive, and resilient in the face of rising climate shocks. Following measures are proposed to protect the trading and services SMEs from climate change risks:

- Retail outlets and small shops should adopt storefront shading, passive cooling designs, and hybrid UPS/solar systems to remain operational during power outages and extreme heat.
- In flood-prone areas, simple steps such as re-slotting inventory to higher shelves can protect goods from damage. Logistics SMEs should deploy courier re-routing algorithms and contingency planning to ensure delivery continuity during storm or flood days.
- In hospitality, heat protocols—including designated cooling rooms, potable water stations, and worker rest breaks—will protect guests and staff during peak summer months.
- IT and data-driven service firms must prioritize off-site backups, cloud storage solutions, and HVAC redundancy to safeguard digital assets.
- Awareness campaigns and sector-specific technical guides should be developed to help SMEs understand and adopt these measures effectively.
- Financial incentives like adaptation tax credits, micro-grants, or concessional loans can accelerate uptake among small enterprises.
- Progress should be tracked via the SME Climate Dashboard, where firms report adaptation measures and receive resilience scores.

10.4.3 People and Champions

These interventions falls under Awareness, Education & Social Inclusion pillar.

10.4.3.1 Climate Champions

“Climate Champions” within SME cluster associations can serve as dedicated focal points to drive awareness and action on climate resilience. These champions would organize peer-learning sessions, where businesses share practical solutions and success stories, and host vendor days to connect SMEs with suppliers of climate-smart technologies and services. By acting as role models, they can demonstrate low-cost, high-impact measures such as water efficiency, energy savings, or workplace cooling. Their presence helps create a culture of collective responsibility, where SMEs learn from each other rather than working in isolation. Over time, this approach strengthens trust, accelerates adoption of climate-friendly practices, and ensures that resilience measures spread organically across clusters.

10.4.3.2 Accredited Local Installers

SMEs often lack access to reliable, affordable, and technically sound services for climate retrofits such as cool roofs, improved drainage systems, and water-saving kits. Many installations fail because of poor workmanship or lack of technical expertise, which reduces SMEs' trust in such investments. Accreditation creates a quality assurance system, and accredited local installers for adaptation retrofits can play a critical role in ensuring quality, trust, and effectiveness of climate-smart solutions for SMEs. By certifying installers, SMEs can be assured that they are hiring trained and certified professionals and that their installations meet technical standards and deliver real benefits. These accredited service providers would not only improve workmanship but also encourage wider adoption by reducing the risks of poor or failed installations. To strengthen accountability, performance-based bonuses can be introduced, released only after independent on-site verification confirms that the retrofit is functioning effectively. This model incentivizes quality, creates jobs for local technicians, and ensures that adaptation investments yield measurable resilience outcomes. Over time, it can help build a skilled ecosystem of trusted providers, making climate solutions more accessible and scalable for SMEs.

10.5 3-Year Implementation Roadmap

Based on the recommendations discussed above, a 3-year implementation roadmap has been proposed and is shown in Table 15.

Table 15 – 3-Year Implementation Plan (Actions & KPIs)

Phase 1 (0–6 months)	
Actions	Key Performance Indicators (KPIs)
Establish the SME Climate Resilience Cell within SMEDA and assign provincial focal points	- SME Climate Resilience Cell staffed and operational within 6 months - Disclosure Lite checklist adopted by at least 100 SMEs in pilot districts - MOUs signed with at least 1 bank and 1 insurance company
Finalize the SME Climate Disclosure Lite framework with ≤10 indicators	
Launch two district pilots—one for heat risks (e.g., Lahore/Faisalabad) and one for flood risks (e.g., DG Khan/Rahimyar Khan)	
Secure participation of two banks (for resilience-linked loans) and one insurer (for parametric covers)	
Operationalize the SME Resilience Window (adaptation, business continuity, decarbonization)	
Phase 2 (6-18 months)	
Actions	Key Performance Indicators (KPIs)
Expand pilots to four districts, ensuring representation of different vulnerability profiles	≥1,000 SMEs on-boarded onto the dashboard 4 districts with functioning pilot programs 1000 parametric insurance policies issued; claim settlement T+5 days - Resilience Window opened in financial institutions - Average heat-related downtime reduced ≥10% in participating SMEs. - Energy intensity −5% and process water use −5% in retrofitted firms. - At least 5% of public procurement contracts screened for resilience criteria - Scorecards publicly available and cited in at least two policy updates
Institutionalize green procurement criteria across select ministries/departments	
Publish first SME Resilience Scorecards, disaggregated by district and sector (e.g., textiles, agro-processing)	
Provide capacity-building clinics for BCPs, OHS measures, and cluster-level adaptation	
Phase 3 (18-36 months)	
Actions	Key Performance Indicators (KPIs)

Scale up implementation to all provinces and priority SME clusters nationwide	• ≥ 3000 SMEs covered in dashboard reporting • 5000 parametric insurance policies issued • At least 10% of public procurement contracts screened for resilience criteria • Average heat-related downtime reduced by $\geq 20\%$ in participating SMEs • Energy intensity -10% and process water use -15% in retrofitted firms. • Losses from monsoon disruptions (as % of monthly revenue) -25% in targeted clusters • At least 2 banks/DFIs and 2 insurers offering climate-linked products • Annual national SME Climate Resilience Report published
Integrate climate-resilient industrial estate retrofits (drainage, shading, green buffers)	
Develop policy feedback loops from district/sector analytics into national strategies	
Expand financing partnerships to include DFIs and multilateral funds	

10.5.1 Quick wins (first 90 days)

- Publish Heat-Safe SME SOPs and launch a micro-grant window for reflective roofs and shade.
- Sign MoUs with 2 banks + 1 insurer; announce premium support for first 1,000 policies.
- Train 100 inspectors/extension officers on climate smart OHS and water stewardship.
- Turn on district-level heat/flood alerts integrated with the SME dashboard.

11.0 ANNEXES

11.1 Annex I – Survey Questionnaire

Small and Medium Enterprises (SMEs) are vital to national and global economies but often struggle to manage climate change risks. This is especially true in developing regions with limited institutional support. Unlike larger corporations, SMEs lack the resources and expertise to effectively respond to climate disasters such as flooding, droughts and extreme weather. Recognizing this urgency, SMEA is conducting a survey to evaluate the vulnerability of SMEs to climate change impacts. The survey aims to gather data on these vulnerabilities. This data will be used to analyse the level of risk and preparedness of Pakistan's SMEs to climate change impacts. Ultimately, this will help in developing targeted policies and strategies to enhance SME resilience against climate change. Notably, Pakistan is ranked as the 5th most vulnerable country to climate change according to the Global Climate Risk Index, underscoring the critical need for this initiative. *

Indicates required question

Enterprise / Business Profile

Please provide your enterprise / business name, contact details, years in business, annual sales turnover, nature of business, operating sector, and location (province and district).

- Enterprise / Business Name *
- Your Email ID
- Your contact Number *
- Number of years in business *Mark only one oval.
 0 112
 5 112
 10 --- 14
 Above 14
- Annual sales turnover (PKR) Mark only one oval.
 Up to PKR 50 Million
 Above PKR 50 Million to PKR 150 Million
 Above PKR 150 Million to PKR 500 Million
 Above PKR 500 Million
- Nature of Business * Mark only one oval.

☐ Manufacturing
☐ Services
☐ Trading (Retail / Wholesale)
☐ Agriculture / Dairy and Livestock

Act Go it

7. Sector *

Mark only one oval.

- ☐ Agriculture & Food Processing
☐ Dairy and Livestock
☐ Electric Fans
☐ Textile
☐ Light Engineering (Electrical Machinery or other engineering items)
☐ Sports
☐ Pharmaceuticals
☐ Chemical Leather
☐ Footwear
☐ Carpets, Rugs & Mats
☐ Surgical/Medical Instruments
☐ Cutlery
☐ Onyx, Gems & Jewelry
☐ Furniture
☐ Handicrafts
☐ Plastics
☐ Marble and Granite
☐ Ceramics
☐ Hospitality and Tourism (Hotels / Restaurants / Tour Operators)
☐ Transport and Logistics
☐ IT (Information Technology)
☐ Auto Parts
☐ Trading (Retail / Wholesale)
☐ Others
☐

8. Province *

Mark only one oval.

- ☐ Punjab
☐ Sindh
☐ Balochistan
☐ Khyber Pakhtunkhwa
☐ Gilgit-Baltistan
☐ Azad Jammu and Kashmir

9. District *

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External Factor: Climate Change Indicators & Effects

This section aims to assess how climate change directly affects your business and its operations. Please rate the following indicators according to the impact of climate change on your business. If these indicators do not have a direct effect on your business, then rate the indicators keeping in mind the impact they may have on your business in next 5 to 10 years.

10. What effect does the rising temperature have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

11. What effect does the falling temperature have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

12. What effect does the precipitations have or may have on your business? *

(While answering this question, please keep in mind that precipitations refer to heavy rains and snow storms)
Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

13. What effect does the droughts have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

14. What effect does the floods have or may have on your business? *

Mark only one oval.

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- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

15. What effect does the storms have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

16. What effect does the heat waves have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

17. What effect does the cold waves have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

18. What effect does the contamination of air, water, land have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

Internal Factors: Potential Impact of Climate Change on SME

This section aims to assess the potential impact of climate change on your business, specifically focusing on how it affects the internal operations of your business. Please rate the following indicators on a scale from 0 to 10, where 0 indicates no impact and 10 indicates a high impact on your business' internal operations due to climate change.

11/1/32

19. Are the Inputs (raw materials) of your enterprise / business affected by climate change?

(While answering this question, keep it in mind that the climate change impacts the raw materials and inputs of a business by altering the availability and quality of natural resources. Shifts in temperature and precipitation can affect agricultural yields, while extreme weather events can disrupt supply chains and damage infrastructure. These changes can lead to shortages, reduced quality of inputs, and increased operational costs, affecting overall business sustainability and profitability.) Mark only one oval.

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20. Does climate change contribute to the depreciation of your enterprise's equipment and machinery? *

(While answering this question, you should consider whether environmental factors related to climate change—such as increased temperatures, humidity, or severe weather events—are accelerating the wear and tear or reducing the lifespan of your business equipment and machinery.) Mark only one oval.

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- ☐ No Effect
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☐ Significant Effect

15. What effect does the storms have or may have on your business? *

Mark only one oval.

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☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

16. What effect does the heat waves have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

17. What effect does the cold waves have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

18. What effect does the contamination of air, water, land have or may have on your business? *

Mark only one oval.

- ☐ No Effect
☐ Minor Effect
☐ Moderate Effect
☐ Significant Effect

Internal Factors: Potential Impact of Climate Change on SME

This section aims to assess the potential impact of climate change on your business, specifically focusing on how it affects the internal operations of your business. Please rate the following indicators on a scale from 0 to 10, where 0 indicates no impact and 10 indicates a high impact on your business' internal operations due to climate change.

11/1/32

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(While answering this question, keep it in mind that the climate change impacts the raw materials and inputs of a business by altering the availability and quality of natural resources. Shifts in temperature and precipitation can affect agricultural yields, while extreme weather events can disrupt supply chains and damage infrastructure. These changes can lead to shortages, reduced quality of inputs, and increased operational costs, affecting overall business sustainability and profitability.) Mark only one oval.

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20. Does climate change contribute to the depreciation of your enterprise's equipment and machinery? *

(While answering this question, you should consider whether environmental factors related to climate change—such as increased temperatures, humidity, or severe weather events—are accelerating the wear and tear or reducing the lifespan of your business equipment and machinery.) Mark only one oval.

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21. Does your enterprise / business face **logistics issues (product delivery)** due to the impacts of climate change?

(This question is asking whether your business has difficulties in delivering products because of climate change-related events. For example, extreme weather like heavy rains, floods, or hurricanes might block roads or damage transportation infrastructure, making it hard to get products to customers. It's important to know this because such disruptions can affect how smoothly your business runs, possibly leading to delays in delivering goods, and increased costs for finding alternative routes or methods.) *Mark only one oval.*

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22. Does climate change affect the **sales/revenues** of your business?

(This question is asking if changes in the climate are impacting how much money your business makes. Climate change can affect your business financially in several ways. For instance, if severe weather makes it hard for your products to reach customers, you might see a drop in sales. Or, if the raw materials you need become more expensive or difficult to get because of environmental changes, your costs could go up, which might also lower your profits. Additionally, if the general public becomes more aware of climate issues, they might start preferring products that are more environmentally friendly, which could influence your sales if your products are perceived as harmful to the environment.) *Mark only one oval.*

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23. Has climate change affected the EBITDA (Earnings Before Interest, Taxes, Depreciation, and Amortization) of your business?

(This question investigates whether climate change has impacted your business's EBITDA, a key financial metric that reflects your company's operational performance by measuring profits before accounting for interest, taxes, depreciation, and amortization. Climate change can affect EBITDA through increased operational costs if supply chains are disrupted or infrastructure is damaged. It can also influence market demand as weather changes affect consumer behavior and sales cycles. Additionally, if raw materials become scarcer due to environmental impacts, their costs may rise, further impacting your expenses and reducing EBITDA.) Mark only one oval.

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24. Have the climate change had any effect on the overall expenses of your business?

(This question is checking whether changes in climate have led to an increase or decrease in the costs your business has to pay to operate, including heating and cooling costs. The reasoning behind asking this is to understand how climate change might be affecting your company's financial health. For instance, if the climate has become warmer, your business may incur higher costs to cool your facilities, impacting your overall expenses. Similarly, more frequent extreme weather events, like storms or heatwaves, might require spending on repairs or infrastructure modifications to withstand these conditions. Additionally, disruptions in the supply of key raw materials due to environmental changes could increase sourcing costs or necessitate finding alternative suppliers at higher prices.) Mark only one oval.

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25. Does climate change affect the **retained earnings** of your business?

(This question seeks to understand whether climate change has influenced the retained earnings of your business. Retained earnings are the portion of profits that are kept by the company after dividends are paid to shareholders and are used for reinvesting in the business or to pay off debt. Climate change could impact retained earnings in several ways. For instance, if extreme weather events become more frequent or severe, your business might face increased operational costs or disruptions, leading to lower profits. Similarly, changes in climate could affect market demand for your products or services, potentially reducing sales revenues. Additionally, increased costs for energy, like heating or cooling due to temperature fluctuations, could also diminish profits.) *Mark only one oval.*

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26. Is your business located at a place which is directly affected by climate change (impacts of climate change)?

Mark only one oval.

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27. Does the climate change increase the **research and development** expenses of your business in any way?

(This question is asking whether your business has had to spend more on research and development (R&D) because of climate change. The idea here is to find out if your company is investing more in creating new technologies or modifying existing products to adapt to or mitigate the effects of changing climate conditions. For example, if temperatures are rising, you might need to develop products that can withstand more heat or use less water. This could lead to higher expenses as you invest in studying these new requirements and developing solutions.) *Mark only one oval.*

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28. Has climate change necessitated **Increased Investment** in your business to adapt your operations or develop new products to address climate change?

(This question is asking if you've had to spend more money on your business because of climate change. Specifically, it's looking to see if you've needed to invest in new technologies or upgrade your infrastructure to handle the effects of changing weather patterns, such as more extreme temperatures or more frequent storms. It also explores whether you've had to spend more on research and development to create products or services that can withstand these new conditions or to meet new environmental regulations. This could include anything from making your facilities more energy-efficient, to developing new products that are more environmentally friendly.)

Mark only one oval.

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29. Does climate change affect the efficiency of your labor/staff?

(While answering this question, please keep in mind that climate-related health issues, extreme weather conditions, and stress can affect workers' performance and attendance.)

Mark only one oval.

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Assessment of Climate Change Vulnerability of SMEs in Pakistan

30. Does climate change affect the labor/staff absenteeism of your business? *

Mark only one oval.

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Internal Factors: Readiness of SMEs for Climate Change Impacts

This section aims to assess the readiness of your enterprise / business to respond to the impacts of climate change on its operations. Please rate the indicators on a scale from 0 to 10, where 0 indicates no action taken and 10 indicates active involvement in responding to climate change impacts.

31. Is your enterprise developing new product and services which are less vulnerable to climate change or to the impacts of climate change?

Mark only one oval.

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32. Is your enterprise improving existing services and products to become less vulnerable to climate change or to the impacts of climate change?

12/1/32

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33. Do you use digital solutions which are less vulnerable to climate change or to the impacts of climate change?

(This survey question asks if your business has adopted digital solutions that are less susceptible to the effects of climate change. The purpose here is to evaluate how prepared your enterprise is to handle the disruptions caused by climate changes through the use of technology. Digital solutions might include cloud computing to avoid data loss during natural disasters, using online platforms to maintain sales during extreme weather, or implementing remote working technologies that reduce the need for commuting during hazardous conditions.) Mark only one oval.

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12/2/32

34. Is your enterprise continuously **targeting new customers** to become less dependent on previous customers?

(The rationale behind this question is to assess how prepared your business is to handle potential disruptions from climate change by diversifying its customer base. By targeting new customers, you can spread risk and potentially stabilize revenue streams, even if climate-related challenges impact certain markets or customer groups more heavily than others. For instance, if extreme weather events frequently affect a particular region where a large segment of your current customers reside, having customers in other, less affected regions can help maintain your business operations and financial stability.) Mark only one oval.

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123/132

35. Do you (your business) have **diversified suppliers**?

(The goal here is to determine if your enterprise has diversified its supply sources as a strategy to buffer against disruptions that might arise from climate change impacts, such as natural disasters, resource scarcities, or transportation issues affecting specific regions. Diversifying suppliers means that if one supplier is unable to deliver because of a climate-related event, your business can still obtain necessary materials or services from others, thereby minimizing operational disruptions and maintaining steady production and service levels.) Mark only one oval.

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36. Are you **opting for insurance** for your business to mitigate climate-related risks?

(This question is asking if your business is using insurance to protect against potential losses caused by climate change.)

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124/132

37. Does your enterprise **insource capacity** which was previously outsourced from third party?

(This question is asking if your enterprise has shifted any work or production processes in-house that were previously handled by external suppliers or service providers. The aim is to assess how your business is adjusting its operations to manage potential vulnerabilities associated with climate change impacts.)

Bringing services or production in-house, often referred to as insourcing, can be a strategic move to increase control over production processes and reduce dependencies on external suppliers, who might be disrupted by climate-related events. This might involve anything from manufacturing components yourself that were previously bought from others, to handling logistics internally instead of relying on third-party shipping companies.)

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125/132

38. Have you **increased the inventories** of your enterprise over time?

(This question is asking whether your enterprise has increased its stock levels over time as a strategy to mitigate potential disruptions caused by climate change. The purpose here is to evaluate how prepared your business is to handle interruptions that might arise from environmental changes, such as delayed shipments due to extreme weather events or scarcity of raw materials caused by climate impacts.)

Increasing inventory can be a precautionary measure to ensure that your business can continue to operate smoothly without running out of essential supplies or products, even if supply chains are temporarily disrupted. It reflects an investment in building resilience against the unpredictability of supply due to climate change.)

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39. Are you (your business) spending more on **research and development**?

(This question is asking if you investing more in research and development (R&D) activities of your business as a way to adapt to and mitigate the impacts of climate change. The intent is to determine how actively your enterprise is engaging in innovation to enhance its resilience against climate-related challenges. This could involve developing new products that are more sustainable or climate-resistant, improving existing services to be more environmentally friendly, or finding more efficient processes that reduce your climate footprint.) *Mark only one oval.*

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40. Are you planning to relocate the **land** (of your enterprise) due to climatic issues?

(This question is asking if you are considering moving or has moved the physical location of your enterprise due to the impacts of climate change. The purpose here is to gauge whether climate-related issues, such as frequent flooding, rising sea levels, or extreme weather conditions, are influencing your decision to relocate your operations to a safer or more stable environment.) *Mark only one oval.*

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41. Are you planning to relocate the **labor** (employees of your enterprise) due to climatic issues?

(This question is asking if your business is considering relocating or have relocated its employees due to the impacts of climate change. The intent is to determine whether environmental issues, such as extreme temperatures, rising sea levels, or increased frequency of natural disasters, are prompting you to move your workforce to safer or more climatically stable areas.) *Mark only one oval.*

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42. Are you planning to relocate the **equipment** of your firm due to climatic issues?

(This question is asking if you are considering moving or have moved the equipment (of your enterprise) due to the impacts of climate change. This could involve relocating machinery, technology, or other vital tools to areas less affected by environmental issues like flooding, extreme temperatures, or other weather-related disturbances.)

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43. Is your firm trying to become more financially strong to cope with the impacts of climate change?

(This question seeks to understand whether you (your firm / business) are building up its financial resilience to better handle the costs and disruptions that might arise from climate-related events, such as extreme weather, supply chain disruptions, or increased operational expenses. Mark only one oval.)

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44. Is your firm trying to upgrade employees skillset to cope with the effects of climate change? *

(This question is asking if your business is actively working to improve the skills of your employees to better handle the challenges posed by climate change. This might involve

training staff on new technologies, emergency procedures related to extreme weather events, or sustainability practices that reduce environmental impact.) Mark only one oval.

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45. Are you trying to upgrade the machinery of your firm to cope with the effects of climate change?

(The purpose here is to evaluate if your enterprise is making technological and hardware improvements that can handle climate-related challenges, such as increased temperatures, higher humidity, more frequent storms, or resource scarcity.

Upgrading machinery could involve investing in more robust equipment that is resistant to extreme weather conditions, or it might mean implementing more energy-efficient or environmentally friendly technologies that help reduce the company's carbon footprint and enhance operational resilience.) Mark only one oval.

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46. Do you (your business) get any financial support from government to mitigate the impacts of climatic * change? *

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47. Does your enterprise get any technical/training support from government to mitigate climatic issues? *

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11.2 Annex II - Example Questions & How to Answer Them through Dashboard

The CCVI Dashboard is not just about seeing numbers, it is designed to support analytical exploration. Below are some questions one might ask. The approach to extract the answers using the dashboard has been explained for each question.

Question: Is there a correlation between CCVI scores and Business Age?

How to explore:

1. Go to Page 2 (CCVI by Business Characteristics).
2. Review the CCVI by Business Age bar chart.
3. Use cross-filtering: Click on a specific age bracket (e.g., “less than 5 years”) and observe how the other scorecards and charts update.
4. Compare across age groups to identify whether younger businesses are consistently more vulnerable.

Question: Do medium or large enterprises show lower vulnerability compared to smaller ones?

How to explore:

1. Go to Page 2 and look at the CCVI by enterprise size (annual revenue) chart.
2. Compare the CCVI scores of low-revenue businesses (e.g., under 50 million) with high-revenue ones (e.g., above 800 million).
3. Apply filters (e.g., Province or Sector) to check if this pattern holds across different regions or industries.

Question: Which external factors are most critical for specific districts?

How to explore:

1. Go to Page 3 (External Factors).
2. Set the dimension to District.
3. Compare the nine external factor scores across districts.
4. Identify which factors spike in particular areas — e.g., “District A is especially affected by Factor X.”

Question: Which business sectors are least prepared (low internal readiness)? (want to identify the focus of interventions)

How to explore:

1. Go to Page 5 (Internal Readiness).
2. Use the dimension control to set the breakdown by Business Sector.
3. Review the comparative bar chart to see which sectors score lowest on readiness.
4. Cross-filter by clicking on one vulnerable sector (e.g., Dairy & Livestock) and see how the other scorecards adjust.

Question: Does vulnerability vary significantly between provinces for the same business type?

How to explore:

1. Go to Page 1 (Overview).
2. Filter by a single Nature of Business (e.g., Agriculture).
3. Observe the Province-level CCVI chart to compare vulnerability across provinces for that same business type.
4. Use the District-level chart for a deeper breakdown.



Tip

Each of these questions can be further refined by applying filters (Province, District, Sector, etc.) and cross-filtering on charts to dig deeper into specific groups. The combination of scorecards (numbers) + charts (visual comparisons) + pivot table (exact counts) allows triangulating insights.

11.2.1 Best Practices for Users

1. Always check the date range and filters before drawing conclusions.
2. Use cross-filtering for quick insights instead of repeatedly changing filters.
3. Keep comparisons fair — e.g., compare businesses in the same sales bracket or sector.
4. When in doubt, reset filters to view the full dataset again.
5. Use the last two pages (sample profile & pivot table) to validate the data before making interpretations.

11.3 Annex III - Key References

- IPCC Sixth Assessment Report (AR6), 2023: <https://www.ipcc.ch/assessment-report/ar6/>
- World Health Organization (WHO): <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>
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- Pakistan's Updated Nationally Determined Contributions (NDC), 2021: <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pakistan%20Updated%20NDC%202021.pdf>
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- National Climate Finance Strategy, 2024 (MoCC)
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- *Climate Change Vulnerability Index of SMEs in Pakistan* – RRI&A, SMEDA
- *Impacts of Climate Change on Small and Medium Sized Enterprises in Pakistan* – Centria University of Applied Sciences
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- *Climate Vulnerability Index – LoGIC Programme, Bangladesh* – UNDP & UNCDF
- *Climate Change and SMEs in South Asia: Risks and Responses* – SAARC Development Fund
- *Are SMEs Ready for Climate Action? Sharing Global Experiences on Capacity-Building* – UNFCCC
- *Small Business and Climate Change* – World Trade Organization (WTO)
- *The Climate Impact of SMEs – Evidence from the UK* – Sage & Oxford Economics
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- *ND-GAIN Country Index* – University of Notre Dame
- *IPCC Sixth Assessment Report (AR6), Working Group II: Impacts, Adaptation and Vulnerability* – IPCC