

Article

A Resilience-Enhancing Strategy for SMMEs in Disaster-Prone Areas

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Abstract: The purpose of this research was to develop a resilience-enhancing strategy for SMMEs in disaster-prone areas, particularly in developing countries where resilience-enhancing strategies are limited. The research was done quantitatively, and an online survey was utilised to collect data from all registered SMMEs in uMhlathuze Municipality in KwaZulu-Natal, South Africa. The survey was conducted using a structured, self-designed questionnaire distributed online via a Google Forms link. Data collected was analysed quantitatively using a computer and Stata 19 Data Analysis Software. Regression analysis was employed to analyse the data. Capitalising on connections created through regression modelling, the resilience-enhancing strategy suggested shows that disaster preparation and response are key to SMME resilience. To prepare and cope well with disasters, SMMEs need to identify underlying challenges that undermine their ability to do so. Thereafter, preparedness and response strategies should be modified to align with underlying challenging factors to lessen their impact. Based on the suggested strategy, the researchers recommend that SMMEs should strive to identify challenges that hinder preparedness and response capabilities and adapt preparedness and response strategies accordingly. In addition, the government should simplify aid application procedures so that more SMMEs can access government aid.

Keywords: Resilience, Disaster, Strategy, Response, SMMEs

1. Introduction

Natural disasters are destructive events that lead to economic losses, dislocation of communities, loss of life, damage to or destruction of property, and more (Bridger, 2020). These catastrophic occurrences are mainly driven by hydrometeorological, geophysical or biological variables (Mensah, Akanpabada, Diko, Okyere & Benamba, 2022; World Disasters Report, 2022). Since the 1970s, the intensity and frequency of natural disasters related to hydrometeorological causes (floods, storms, droughts, heatwaves, and more) and biological causes (pandemics and epidemics) have been on the rise globally (World Disasters Report, 2022; Bridger, 2020). In South Africa, disaster frequency has largely been noted in coastal provinces like KwaZulu-Natal (KZN), where a series of floods, droughts, wildfires, heatwaves, etc, have been experienced in recent years (Department of Cooperative Governance and Traditional Affairs (COGTA), 2023; Ngcamu, 2023). Disaster frequency has a greater impact on the survivability and profitability of small, medium, and micro enterprises (SMMEs) than on big businesses for a variety of reasons. For example, many SMMEs are small and resource-deficient, lack economic diversification, and struggle to get funding from public and private platforms. (Phiri & Ramasimu, 2025; Ladzani, 2022). Therefore, a surge in hydrometeorological and biological disasters and concomitant challenges associated with such phenomena, such as increases in operating costs, loss of critical human resources, a contraction or loss of markets, and the like, is detrimental to SMME survival (Biyela & Utete, 2024; Kukkamala & Koporcic, 2024; Mafimisebi Obembe & Ogunsade, 2023).

Despite their susceptibility to natural disasters, SMMEs are vital components of many economies globally. They play an essential role in employment creation, contribute to the gross domestic product (GDP) of host economies, foster innovation, uplift standards of living, and more (Department of Small Business Development (DSBD), 2023; Bartlett & Morse, 2021; Dilling-Hansen, 2017). As such, the SMMEs' adaptability to natural disasters is of paramount importance. Kimaro, Chiutsi, Heita, Lendelvo, Tawodzera, Kazembe and Muhoho-Minni (2023) unequivocally state that, consequent to the socioeconomic importance of SMMEs in developing countries, their resilience to disasters is imperative. Resilience is a broad term that requires one to be context-specific in its application. In the context of disasters, SMME resilience refers to the capability of SMMEs to rebound to normalcy after a severe disruption of the normal day-to-day operations by disasters (Mafimisebi et al., 2023). Similarly, Steinerowska-Streb, Glod,

and Steiner (2022) define it as the capacity of SMMEs to cope with external shocks or challenges arising from a disaster. In simple, resilience is the ability to fully recover or bounce back from disaster-induced challenges.

Against this background, the literature indicates that, despite the socioeconomic role of SMMEs in developing countries, research on SMME resilience in Africa and the rest of the developing world is limited (Delladio, Caputo, Magrini, & Pellegrini, 2023; Bridger, 2020). Accordingly, resilience guidelines to assist SMMEs in these places are in short supply. As a result, SMMEs in developing countries, including South Africa, are sometimes forced to adopt resilience guidelines or strategies developed for SMMEs in developed economies, where much research on SMME resilience has been conducted (Delladio et al., 2023; Atiase, Agbanyo, Ganza, Sambian, 2022). This could be problematic given contextual differences in the environments in which SMMEs in developed and developing countries operate (Saad et al., 2021). Therefore, resilience strategies that align with the needs of SMMEs in Africa, South Africa and the rest of the developing world are needed. This research gap is addressed by developing a strategy that enhances SMME resilience in the context of disasters, using SMMEs in uMhathuze Municipality, KZN, South Africa. UMhathuze Municipality experienced several disasters in recent years; hence, SMMEs in the municipality were fit to be utilised for this research because of their experiences with disasters.

In summary, the paper will unfold as follows: the literature review will be presented in the next section. Thereafter, the methodology, strategy development and recommendations will be outlined in the respective order.

2. Literature Review

Across the globe, SMMEs are more susceptible to disasters than large businesses because of an array of factors (COGTA, 2023; Ladzani, 2022; Saad Hagellar, van der Velde, & Omta, 2021). However, SMMEs in developing countries operate in challenging economic and social environments when compared to their counterparts in developed economies (Saad et al., 2021). Consequently, disaster resilience frameworks suitable for SMMEs in developing and developed countries are likely to differ owing to the contextual differences in which the two sets of SMMEs operate. Against this background, this section of the article will first provide a succinct discussion of the concept of resilience. Thereafter, factors responsible for the vulnerability of SMMEs to natural disasters will be provided prior to a discussion of some of the various disaster resilience strategies current literature suggests.

2.1 The Concept of SMME Resilience

As mentioned earlier, SMME resilience in the context of disasters is the ability of SMMEs to persevere through disaster challenges and bounce back to pre-disaster level (Zhong, Lu, Hanafiah, Yazid & Muhamad, 2024; Mafimisebi et al., 2023). Elaborating further, Mithani (2020) posits that, after recovery, if an SMME rebounds to its original position or equilibrium prior to the disaster, it is said to exhibit static resilience. When it adapts and recovers in a different position from the one it was before the disaster, it is called dynamic resilience (Mithani, 2020). Therefore, depending on the nature of recovery, SMME resilience in the frame of disasters could be static or dynamic. From a similar perspective, Ali, Hanafiah, and Magindol (2023) postulate that resilience can be either planned or adaptive. The former pertains to all strategies designed by an SMME to persevere through disaster challenges, while the latter concerns post-disaster efforts directed at learning and adapting to disaster-induced changes. Drawing on the views of Ali et al. (2023) and Mithani (2020), it's likely that planned resilience aligns with static resilience, while dynamic resilience aligns with adaptive resilience.

Regardless of the nature of resilience at play, Zhong et al. (2024) and Ducheck (2019) reveal that the resilience process constitutes disaster anticipation and preparation, response (coping) and adaptation and growth. Anticipation involves continuous surveillance of the environment to detect disasters and disaster risks in advance and prepare accordingly (Trunk & Berkel, 2022). Disaster anticipation sets the stage for disaster preparation, which can be done in both the long and short-term (Zhong et al., 2024; Bridger, 2020). Without disaster anticipation, the need for disaster preparation may not be realised. Coping or response relates to the designing and implementation of strategies aimed at surviving disaster challenges (Delladio et al., 2023; Ducheck, 2019). It is a process that occurs just before or during the course of a disaster. Given that disasters usually alter the operating environment, SMMEs must adjust to the changes they bring (Zhong et al., 2024; Trunk & Berkel, 2022). Adaptation is therefore the process of transforming and aligning with new disaster-induced changes (Trunk & Berkel, 2022). These resilience processes are intertwined and not sequential per se (Ducheck, 2019). For example, some risks that will shape future disaster preparations, for example, are learnt during the adaptation process, while lessons learnt during response can be used to inform future disaster preparations as well. However, Amaral and Da Rocha (2022) argue that anticipation is only possible for predictable disasters such as storms and droughts. With unpredictable disasters like pandemics or epidemics, anticipation is often impossible. In such cases, the resilience process will only include response and adaptation.

2.2 SMME Vulnerability to Disasters

Several scholars assert that SMMEs are susceptible to disasters, a situation made worse by the fact that disasters are increasingly becoming frequent. A variety of intrinsic and extrinsic factors contribute to SMMEs' vulnerability to natural disasters. Regarding the intrinsic elements, SMMEs often lack adequate business skills, technological and financial resources required to prepare for, respond and adapt to disasters (Phiri & Ramasimu, 2025; Muzi, Jolevski, Ueda & Viganola, 2022). In agreement, Braunerhjelm (2021) express that a deficiency of critical resources (financial, technological, business experience, vital skills, and more) prevents many SMMEs from responding to disasters through business model changes, relocating, tapping into other markets, and the like. Regarding skills, Msomi, Olarewaju and Ngcobo (2021) state that sound financial management skills are critical during disasters, and many SMMEs are limited in this regard, making them more susceptible to disasters. In a similar vein, Mafimisebi et al. (2023) and Kaiser (2022) indicate that most SMMEs do not develop disaster management plans to guide their disaster response and adaptation efforts due to skill deficiencies. As such, when disasters strike, they find themselves floundering through trial and error and, in the process, poorly responding to disasters. In another finding, Mafimisebi et al. (2023) note that SMMEs do not prepare for disasters because of mistaken beliefs that they are immune to disasters and/or a lack of knowledge about the importance of disaster preparation. Similarly, Bridger (2020) expresses that many SMMEs expect the government to rescue them whenever disasters strike. Consequently, that expectation deters them from identifying and managing disaster risks beforehand. Iwasaki, Kocenda and Shida (2022) also posit that the small size of SMMEs prevents them from diversifying economic activities, something that limits their capability to adapt to disaster-induced changes. In agreement, Dilling-Hansen (2017) assert that many SMMEs focus more on profit maximisation than growth, hence will remain small. Since small size is synonymous with limited resources (Iwasaki et al., 2022) SMMEs may find it hard to deal with disaster challenges whenever disasters occur.

With reference to extrinsic factors that expose SMMEs to disaster challenges, Saad et al. (2021) reveal that, in particular, structural weaknesses in host countries indirectly affect SMMEs' capacity to deal with disasters. For example, a weak and less developed financial and credit system of a country, which makes it difficult for SMMEs to acquire loans, indirectly affects these entities' ability to prepare for and respond to disasters (Saad et al., 2021). Additionally, poorly constructed and less maintained infrastructure, like roads, canals, bridges, etc, compounds the vulnerability of SMMEs to disasters (Nkoe & Ramasimu, 2025; Ngcamu, 2023). Apart from structural issues, Bridger (2020) mentions that when disasters strike, governments' rescue efforts usually prioritise big businesses over SMMEs despite the substantial economic benefits SMMEs contribute to economies. In addition, limited government resources, cumbersome aid application processes, minimum requirements to qualify for government aid, and so forth often make it a challenge for SMMEs to access government aid (Nkoe & Ramasimu, 2025; Statistics South Africa (Stats SA), 2020). In the process, difficulties in accessing government aid contribute to the vulnerability of SMMEs to disasters. In a different vein, Mafimisebi et al. (2023:2) declare that crises can trigger complex situations in the operating environment, difficult for SMMEs to handle or contain. This is particularly so when disasters result in prolonged business and border closures, significant changes in interest and exchange rates, the dislocation of communities, and more. (Mafimisebi et al., 2023).

2.3 Strategies for Enhancing SMME Resilience in the Context of Disasters

Disaster impact on SMMEs varies according to the intensity and frequency of hazards that trigger the disasters as well as the exposure and vulnerabilities of the SMMEs (Bridger, 2020; Grey & Dunn, 2020). Therefore, resilience-enhancing strategies that researchers propose are usually informed by contextual factors. In line with this, the discussion that follows identifies some resilience-enhancing strategies put forward by some researchers.

According to Czainska, Sus, and Thalassinou (2021), one strategy that enhances resilience in the frame of disasters involves the identification of crucial or strategic partners/ resources prior to or during the course of a disaster and establishing sustainable relationships with the strategic partners. The strategic partners include critical members of the SMME's value chain, such as key customers, suppliers, and distributors (Czainska et al., 2021; Bridger, 2020). Following the identification of the strategic resources/partners, collaborative relationships or networks must be developed between the SMMEs and all strategic-resource partners in such a way that all partners, including the environment in which the partners operate, benefit (Czainska et al., 2021). Collaborative relationships enhance the resilience of each network member because, in the event of a disaster, all strategic partners will strive to ensure they have provided their partners with the resources/services needed to survive and adapt to the disaster (Czainska et al., 2021). This strategy assisted many SMMEs in Poland to survive the COVID-19 pandemic, according to Czainska et al. (2021). Nonetheless, because of the strong interdependence between network partners, if some members of the network are paralysed by the disaster, the whole network may also fail.

From another perspective, Bridger (2020) and Gray and Dunn (2020) suggest that enhancing SMME resilience within the framework of disasters requires SMMEs to conduct vulnerability analysis before any disaster. This is done to identify hazards and/or risks that may affect SMMEs, so they can proactively prepare. The vulnerability analysis process can be done by subgrouping an SMME's operational activities into subgroups such as production, marketing, human resources, finance and the like, and identifying

risks connected with each group (Gray & Dunn, 2020). The identified risks will have to be managed or mitigated through the various disaster risk management strategies (risk avoidance, risk reduction, risk transfer and risk retention) (Bridger, 2020; Gray & Dunn, 2020).

Apart from vulnerability analysis, Steinerowska-Streb et al. (2022) propose that to boost SMME resilience in the frame of disasters, SMME engagement in internationalisation is required. According to these scholars, this strategy is most suitable for preparing for or mitigating the negative effects of a global disaster, such as the 2008/2009 financial crisis or the COVID-19 pandemic, on SMMEs. The proposition is that when a global disaster such as COVID-19 or the 2008/9 financial crisis strikes, economies and regions across the world are impacted differently and also recover at different paces (Steinerowska-Streb et al, 2022; Bridger, 2020). Therefore, expanding business beyond one's national borders enables an SMME to spread risks during disasters by capitalising on markets least affected and/or those recovering fast. That way, the SMME's resilience will be enhanced. However, among other challenges, internationalisation is a risky and costly strategy, which many SMMEs in developing countries might find less lucrative and difficult to adopt (Bridger, 2020)

Establishing business and social networks is another strategy that enhances the resilience of SMMEs in the context of disasters, according to Czainska et al. (2021), Castro and Zermeno (2020) and Liu and Yang (2019). Business networks are inter-relationships established between the SMME and its suppliers, customers, competitors, distributors, and the like, (Czainska et al., 2021; Liu & Yang, 2019). Similarly, social networks are relationships established between an SMME, friends, family, community and so forth (Castro & Zermeno, 2020). Getting assistance from both networks during disasters is much easier for SMMEs since, in many instances, no formal procedures or requirements are involved (Liu & Yang, 2019). According to these scholars, many SMMEs are resource constrained and also struggle to access help from the government and private financial institutions. Therefore, establishing networks is a resilience-enhancing strategy since SMMEs can easily access resources, information, and the like during disasters. However, if network members get debilitated during the crisis, networks will cease to be resilience enhancers.

Under a strategy proposed by Koporcic, Kukkamala, Markovic and Maran (2025), the resilience of SMMEs in the frame of disasters is enhanced by grouping disasters first, and establishing how each disaster type impacts SMME resilience. Following the categorisation of disasters, the SMMEs should develop their internal and external capacities to deal with the disasters when they eventually unfold. The process of boosting internal capacity includes cultivating competent leadership and a good culture, as well as nurturing optimistic and resilient mindsets. (Koporcic et al. 2025; Duchek, 2019). External capacity is enhanced by forming collaborations with key members of the value chain (suppliers, distributors, financiers, and more) Koporcic et al. 2025; Duchek, 2019). According to Koporcic et al. (2025: 318), the final part of this strategy involves "the development of coping strategies to counteract the impact of the crises". This final part may include formulation of business continuity plans, adoption of resilience enhancing technology and creation of beneficial collaborations (Koporcic et al. 2025). Nonetheless, given the emergence of novel disasters in recent years like COVID-19, Zika virus and more (World Disasters Report, 2022), identifying potential disasters and their likely impact can be a challenge for the SMMEs.

3. Methodology

This research followed the positivist research philosophy; hence, it was conducted quantitatively. An online survey was used to collect data from 136 respondents (SMMEs from uMhlathuze Municipality). The large data set of 136 respondents, coupled with the need to collect comparable data and to minimise researcher bias, motivated the use of an online survey. Before data collection, a pilot test was conducted with 14 SMMEs in the municipality, but not on its database. Convenience sampling was utilised to select the 14 pilot test respondents. Through email addresses or WhatsApp, a Google Forms questionnaire was distributed to the respondents. Data from the pilot survey were not included in the main research. The purpose of the pilot test, among others, was to assess respondents' attitudes toward the survey and the reliability of the questionnaire constructs. Results from the pilot study demonstrated a positive attitude towards the survey and questions that needed rewording or rearrangement were also noted.

3.1 Data Collection

An online survey used a Google Forms questionnaire to collect data for this research from all 136 SMMEs on the uMhlathuze Municipality's database. As such, a census sampling technique was utilised. Census sampling was used to increase the reliability of the findings. Again, the online survey employed made it easy to reach all 136 SMMEs in the municipality. The questionnaire was self-designed, with structured (closed-ended) questions, and consisted of six sections. The first two sections captured biographical and SMME details. Section C had questions on disaster risks and how the SMMEs prepare for disasters. Section D contained questions about how SMMEs respond to disasters. In the respective order, the last two sections (E and F) contained questions on

the resources required to prepare for and respond to disasters, as well as the challenges SMMEs encounter in their efforts to do so. A total of 128 SMMEs responded to the questionnaire.

3.2 Data Analysis

The Stata 19 analysis software was used to analyse the data. Using the software, data were first cleaned by checking the completeness of responses submitted, among other issues. Afterwards, regression analysis was utilised to analyse the data. SMME response to disasters is a critical component of SMME resilience in the face of disasters (Amaral & Da Rocha, 2022; Duchek, 2019). Therefore, the first part of the data analysis involved modelling relationships between SMME disaster response (dependent/outcome variable) and five predictor/ independent variables related to disaster response. The dependent variable (disaster response) was coded as 'Res' and its indicators (sub-questions asked regarding how the SMMEs responded to disasters) as 'response'. The five independent variables coded as indicated in brackets were:

Level of SMME awareness about disaster effects (Effect).

The SMMEs' capacity to identify important factors supporting their resilience (Importance)

Perception of disaster risks and hurdles (Risks)

Access to disaster information and support channels (Access)

Strategies SMMEs employ to prepare for disasters (Pre).

In the respective order, the indicators of these independent variables were coded as q5, secd-q5, secf-q1, secf-q3, and prepare.

The path analysis (part of regression modelling) was used to model relationships between the outcome variable 'Res' and independent variables. Through this analysis, the direction and strength of relationships between the outcome and independent variables were to be established. To model more relationships from path analysis outcomes, factor analysis based on eigenvalues (part of PLS-SEM) was employed. Results obtained from both path analysis and factor analysis are discussed in the next section.

4. Results

4.1 Path Analysis Outcomes

Table 1 below shows results that were obtained when the path analysis was employed to model relationships between 'Res' and the predictor variables (Effect, Importance, Risks, Access and Pre),

Table 1. Structural model: Standardised path/regression coefficients of 'Res' and predictor variables.

Predictor variable	Res
Effect	-0.180 (0.017)
Importance	-0.163 (0.036)
Risk	0.106 (0.163)
Access	0.114 (0.176)
Pre	0.566 (0.000)
r ² a	0.570
<i>P-values in parentheses</i>	

With reference to Table 1 above, the figures not in brackets are the standardised path/regression coefficients which indicate the direction and strength of links between 'Res' and the predictor variables. A coefficient value of less than 0.3 signals a weak relationship, between 0.3 and 0.49 indicates an average relationship, and 0.5 or more indicates a strong relationship (Madsen, 2016; Saunders, Lewis & Thornhill, 2016). A negative sign on the coefficient values shows an inverse relationship between 'Res' and predictor variables. By the same token, a positive sign indicates a direct or positive relationship between 'Res' and predictor variables. The figures in brackets (p-value in parentheses reveal the importance of the link between 'Res' and the independent variables. A significant correlation between 'Res' and each of the independent variables exists when the p-value is 0.05 or less.

In light of this, path analysis findings shown in Table 1 demonstrated that Effect, Importance, Risk, and Access have weak relationships with the outcome variable 'Res'. In other words, these variables have minimal effect on how the SMMEs respond to disasters. Nonetheless, notable correlations of p-value 0.017 and 0.036 existed between 'Res' and 'Effect' and 'Importance', respectively. As such, further research using a large data set may be required to model relationships between these variables. However, 'Pre' was the only predictor variable that demonstrated a positive and significant correlation (coefficient value of 0.566) with 'Res'. This possibly indicates that greater disaster preparation leads to more effective SMME disaster response, whereas the opposite is true. In terms of p-values, a strong correlation of 0.000 existed between 'Res' and 'Pre', implying that changes in 'Pre' would affect changes in 'Res' in a predictable manner. For instance, investing in disaster readiness measures will lead to a better response to disasters.

4.2 Factor Analysis Outcomes

Since 'Pre' was the only predictor variable that demonstrated a strong correlation with 'Res', further relationships between the two variables were modelled using the factor analysis technique and eigenvalues, as stated earlier. Aligning with this, factor analysis was utilised to identify the principal underlying challenges to both 'Res' and 'Pre' from a list of 14 surveyed factors affecting SMMEs in uMhlathuze Municipality in preparing for and responding to disasters. The 14 factors were coded as 'factor 1, factor 2, factor 3' and so on. Results obtained after checking for underlying factors that affect 'Pre' only from the list of 14 surveyed factors are tabled in Table 2 below.

Table 2. Principal underlying factor identification (1).

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.43860	1.71407	0.2456	0.2456
Factor2	1.72453	0.52004	0.1232	0.2688
Factor3	1.20448	0.12551	0.0860	0.4548
Factor4	1.07898	0.05249	0.0771	0.5319
Factor5	1.02648	0.09395	0.0733	0.6052
Factor6	0.93293	0.13438	0.0666	0.6719
Factor7	0.79856	0.12257	0.0570	0.7289
Factor8	0.67599	0.02939	0.0483	0.7772
Factor9	0.64659	0.02574	0.0462	0.8234
Factor10	0.62085	0.06405	0.0443	0.8677
Factor12	0.54522	0.14373	0.0389	0.9464
Factor13	0.40148	0.05297	0.0287	0.9751
Factor14	0.34851	.	0.0249	1.0000

Eigenvalues stand for the number of principal themes or issues explained by a variable, and only those factors with eigenvalues above 1 are considered crucial (Madsen, 2016; Wiid & Diggins, 2013). Therefore, based on results shown in Table 2, five factors that had eigenvalues above 1 were the principal underlying challenging factors that correlated with (affected) how SMMEs in this municipality prepared for disasters. The principal challenging factors were:

1. Limited government assistance (factor 1)
2. Challenges getting government assistance (factor 2)
3. Barriers to public and private financial assistance (factor3).
4. Financial constraints (factor4).
5. Limited capacity to develop business continuity plans (factor5).

Subsequent to identifying the principal underlying challenging factors, factor loadings were used to reveal the strength and direction (positive or negative) of the correlations linking 'Pre' to the identified underlying principal challenges. The results obtained after factor loadings are shown in Table 3 below.

Table 3. Factor loadings (pattern matrix) and unique variances.

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Uniqueness
prepare1	0.3712	-0.4869	-0.4557	-0.2056	-0.2968	0.2870

prepare2	0.6359	-0.2647	-0.1644	-0.2832	0.3253	0.3124
prepare3	0.7501	0.0023	-0.1266	-0.1869	-0.0941	0.3775
prepare4	0.2972	-0.5325	0.1045	0.4223	-0.2704	0.3657
prepare5	0.5096	0.1823	0.3573	-0.2001	-0.3157	0.4398
prepare6	0.5891	-0.2821	0.3350	-0.1459	-0.1350	0.4216
prepare7	0.3795	-0.0531	0.3685	0.5182	0.2928	0.3631
prepare8	0.4860	0.4641	-0.4361	0.0626	0.2967	0.2668
prepare9	0.3042	-0.3101	0.4807	-0.1804	0.3761	0.4063
prepare10	0.4570	0.2107	-0.1748	0.5466	0.0036	0.4175
prepare11	0.2547	0.6004	0.2099	-0.2005	0.0124	0.4902
prepare12	0.4434	0.5159	0.1672	-0.0563	-0.1857	0.4716
prepare13	0.6466	0.1094	-0.1077	0.1859	-0.3335	0.4126
prepare14	0.5268	-0.1535	-0.1782	-0.0134	0.4150	0.4948

Regarding factor loadings, correlation values of less than 0.3 are considered weak, 0.3 to 0.5 moderate/meaningful, and greater than 0.5 strong (Madsen, 2016; Saunders et al., 2016). The negative sign indicates an inverse relationship between the factor and the variable/construct, whereas a positive sign indicates the opposite. According to Table 3 above, some correlations between ‘prepare’ and ‘factor’ variables were strong, while others were weak. For example, the correlation between prepare 3 and factor 1 was strong, while that between prepare 14 and factor 2 was weak. Pertinent to our discussion is that with factor loadings, only moderate and strong loadings should be considered when establishing relationships (Wiid & Diggins, 2013). Consequently, the factors were rotated to reveal the ‘prepare’ variables that they strongly loaded with, as shown below in Table 4.

Table 4. Rotated factor loadings: Prepare constructs.

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Uniqueness
prepare1			0.8403			0.2870
prepare2			0.4148	0.6199		0.3124
prepare3	0.4536		0.4462			0.3775
prepare4					0.6686	0.3657
prepare5	0.7191					0.4398
prepare6	0.4319			0.4705		0.4216
prepare7					0.6429	0.3631
prepare8		0.8427				0.2668
prepare9				0.7381		0.4063
prepare10		0.5089			0.5367	0.4175
prepare11	0.5551					0.4902
prepare12	0.6616					0.4716
prepare13	0.4782					0.4126
prepare14		0.4493		0.4872		0.4948

Results from Table 4 demonstrate that after factor rotation, a clearer view of ‘prepare’ variables closely associated with each of the five underlying challenging factors was obtained. Limited government assistance (factor 1) remained the most significant factor, correlating with six ‘prepare’ strategies namely:

Building staff disaster management skills (prepare 3).

Networking with other small businesses for mutual disaster support (prepare 5)

Forming alliances with big businesses (prepare 6)

Diversifying suppliers and distributors (prepare 11).

Diversifying business activities (prepare 12).

Developing contingency plans (prepare 13)

Factor 2 (challenges getting government assistance) strongly loaded with three ‘prepare’ strategies specifically:

Choosing businesses less vulnerable to local disasters (Prepare 8)

Shifting operations from disaster prone zones (Prepare 10).

Tracking news for early warnings (Prepare 14).

Factor 3 (Barriers to public and private financial assistance) correlated with three ‘prepare’ strategies, which are:

Taking out insurance (Prepare 1)

Setting aside contingency funds (Prepare 2)

Building staff disaster management skills (Prepare 3)

Factor 4 (Financial constraints) aligned significantly with the four ‘prepare’ strategies, namely:

Setting aside contingency funds (Prepare 2)

Forming alliances with big businesses (Prepare 6)

Siting operations in lower disaster risks areas (Prepare 9).

Tracking news for early warnings (Prepare 14).

Factor 5 (Inability to create business continuity plans (BCPs) correlated strongly with three ‘prepare’ strategies, namely:

Building strong and resilient buildings (Prepare 4).

Networking with the community for crisis support (Prepare 7).

Shifting operations from disaster prone areas (Prepare 10).

Subsequent to identifying the principal negative factors that undermine the SMMEs’ disaster preparation efforts, the same process was used to identify those that limit the SMMEs’ disaster response attempts. Using factor analysis and eigenvalues, factors 1 to 5 in Table 5 below were identified as the principal challenging factors impacting SMMEs’ response efforts.

Table 5. Rotated factor loadings: response variables.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Uniqueness
response1				0.8427		0.1788
response2			-0.8829			0.1289
response3					0.8521	0.2325
response4		0.7856				0.3347
response5		0.7617				0.3638
response6		0.4655				0.5155
response7			0.8049			0.3227
response8	0.6169					0.3938
response9	0.7279					0.3183
response10	0.7308					0.3157
response11	0.6339					0.4778
response12				0.4747		0.5378
response13	0.5981			0.4100		0.4512
response14				0.8912		0.1889
response15	0.5266					0.6416
response16		0.5446				0.5241

Table 5 demonstrates that principal underlying challenging factors that limited disaster response efforts of SMMEs in this municipality were:.

Limited government assistance (factor 1)

Challenges getting government assistance (factor 2)

Barriers to public and private financial assistance (factor3).

Financial constraints (factor4).

Limited capacity to develop business continuity plans (factor5).

These results show that the same principal underlying challenging factors that compromised the SMMEs’ preparedness efforts also limited their response efforts. This similarity could result from the strong, positive correlation between the variables illustrated in Table 1 above. Just like with disaster preparation variables, limited government assistance (factor 1) emerged as the biggest underlying challenge strongly correlating with the following 6 response strategies:

Leveraging business networks for support (response 8)

Turning to public and private financial institutions for financial assistance (Response 9)

Tapping into personal and business reserves (response 10).

Mobilising personal networks including the community for support (response11).

Finding alternative income sources (response 13).

Switching to a profitable niche or sector (response 15).

The second negative challenge, ‘challenges getting government assistance’ strongly connected with four response strategies, namely:

Identifying essential resources for crisis survival such as money, machinery, and the like (response4).

Gathering important resources needed to survive (response 5).

Creating communication plans for key stakeholders like suppliers, customers and the like (response 6).

Identifying strategies to lessen future disaster effects (response 16).

The third factor (Barriers to public and private financial assistance) associated strongly with:

Determining disaster impact on operations, supply chains and customers (response 2).

Seeking urgent government support (response 7).

Factor 4 (Financial constraints) correlated with four response strategies:

Establishing as quickly as possible the disaster’s severity (response1)

Rationing available resources (response 12).

Finding alternative income sources (response 13).

Finding ways to cut expenses and costs (response 14).

Factor 5 [Limited capacity to develop business continuity plans (BCPs)] strongly correlated with only one response strategy, which was: Forming a disaster response task force that coordinate response efforts of everyone in the organisation (response 3)

5. Discussion of Findings

Results from the path analysis demonstrated that a positive correlation exists between ‘Pre’ (disaster preparedness) and ‘Res’ (disaster response), hence, disaster preparedness enhances disaster response. In line with this research, this finding suggests that disaster preparedness efforts of SMMEs in UMhlathuze Municipality lead to better disaster response outcomes. In support of this finding, Zhong et al. (2024) and Bridger (2020) affirm that the extent to which SMMEs prepare for disasters, determine how effectively they will be able to respond to disasters.

Findings from the factor analysis established five principal underlying challenging factors that compromised the SMMEs’ preparedness and response endeavours. In other words, disaster preparedness and response efforts of SMMEs in this municipality were undermined by the same underlying challenges. This similarity could result from the strong, positive correlation between these variables, a view shared by Zhong et al. (2024) and Ducheck (2019). The identified principal underlying challenges to disaster preparedness and response for SMMEs in this municipality were:

Limited government assistance (factor 1)

Challenges getting government assistance (factor 2)

Barriers to public and private financial assistance (factor3).

Financial constraints (factor4).

Limited capacity to develop business continuity plans (factor5).

These principal challenging factors influence, or shape how the SMMEs in this municipality prepare for and respond to disasters. In other words, the principal challenging factors compromised the ability of SMMEs in this municipality to effectively prepare for and respond well for disasters. Concurring with this finding, COGTA (2023), Ngcamu (2023), Ladzani (2022) and Bridger (2020) affirm that lack of or inadequate institutional support, limited financial resources and the ability to develop BCPs hamper SMMEs disaster preparedness and response.

Research findings also revealed the correlations between the principal underlying challenges and preparedness and response strategies. For example, principal factor 1 (limited government support), connected strongly with SMME disaster preparedness strategies namely:

Building staff disaster management skills (prepare 3).

Networking with other small businesses for mutual disaster support (prepare 5)

Forming alliances with big businesses (prepare 6)

Diversifying suppliers and distributors (prepare 11).

Diversifying business activities (prepare 12).

Developing contingency plans (prepare 13)

Possible explanations of these correlations could be that in the absence of government support, preparing for disasters through ‘Building staff disaster management skills’, for example, would give rise to skilled employees who can come up with innovative ways of surviving disaster challenges. ‘Networking with other small businesses for mutual support’ would help reduce the impact of limited government assistance’ when business partners fill the void by assisting the SMMEs with business advice, financial and

technological resources, and disaster-related information. Similarly, ‘forming alliances with large businesses could mitigate the lack of government support when the big businesses assist the SMMEs during disasters with disaster information, financial help, etc.

Results also confirmed that the same principal challenging factor 1 (limited government assistance) correlated strongly with six response strategies namely:

- Leveraging business networks for support (response 8)
- Turning to public and private financial institutions for financial assistance (Response 9)
- Tapping into personal and business reserves (response 10).
- Mobilising personal networks including the community for support (response 11).
- Finding alternative income sources (response 13).
- Switching to a profitable niche or sector (response 15).

Regarding these connections, the proposition is that in the absence of government support, ‘turning to business connections/ networks for support’ would, for example, enable the SMMEs to obtain resources, information etc, from network members that could not be provided by the government. Lack of government support could also be mitigated by turning to public and private financial institutions for assistance, tapping into personal and business reserves, mobilising personal networks including the community for support, and so forth. By resorting to these strategies, the SMMEs would offset the negative consequences of the lack of government support on their response endeavours.

With reference to principal factor 2 (Challenges getting government assistance), this study established that there is a strong connection between this factor and three ‘prepare’ strategies:

- Choosing businesses less vulnerable to local disasters (Prepare 8)
- Shifting operations from disaster prone zones (Prepare 10).
- Tracking news for early warnings (Prepare 14).

In this regard, it is likely that challenges in accessing government aid might motivate the SMMEs to reduce the need for government assistance by investing in business that is less vulnerable to local disasters. The SMMEs could also lower the demand for government assistance by moving away from disaster prone areas and tracking news for early warnings. In these cases, these strategies curb the need for state aid.

By the same token, principal challenging factor 2 also strongly connected with four response strategies, namely:

- Identifying essential resources for crisis survival such as money, machinery, and the like (response 4).
- Gathering important resources needed to survive (response 5).
- Creating communication plans for key stakeholders like suppliers, customers and the like (response 6).
- Identifying strategies to lessen future disaster effects (response 16).

As for these associations, it is possible that when the SMMEs are aware that government assistance is difficult to come by, they may try to identify all the resources they need to survive the disaster in order to prioritise the acquisition of the most important. They may also decide to devise plans on how to keep in touch with crucial members of the value chain (suppliers, distributors, customers, and the like) in order to reduce as much as possible, disruptions to operations. Knowing that government assistance is hard to get could also motivate the SMMEs to reduce the need for state aid in the long-term by finding possible ways of reducing the effects of the disasters in future.

In summary, more possible scenarios/ relations can be established with respect to the associations between the rest of the principal underlying challenges and preparedness and response strategies for SMMEs in this municipality. Furthermore, The associations outlined above between the underlying challenging factors and the SMMEs’ preparedness and response strategies suggest that, in the face of each of the principal underlying challenges, the SMMEs need to adopt preparedness and response strategies that lessen the challenges’ impact. For example, as indicated before, in the absence of government support, SMMEs need to embrace response strategies such as turning to social networks for support, using business and personal savings, and the like.

5.1 The SMME Resilience Strategy

Based on the possible associations highlighted by path analysis, SMME disaster preparedness is strongly connected to SMME disaster response. This suggests that for SMMEs to achieve resilience, they need to prepare and respond well to disasters. This view is shared by Amaral and Da Rocha (2022) and Duchek (2019) that SMME disaster preparedness and response are vital resilience elements.

Furthermore, factor analysis identified principal underlying challenges that compromise the ability of SMMEs in this municipality to prepare for and respond well to disasters. In addition, factor analysis also revealed correlations between each principle challenging factor and the various preparedness and response strategies. The identification of principal underlying challenges and resultant correlations demonstrate that to achieve resilience, SMMEs ought to identify underlying challenges that

negatively impact their disaster preparation and response efforts. Thereafter, the SMMEs should adopt preparedness and response strategies that mitigate the impact of the underlying challenges on their preparedness and response efforts. As noted earlier for example, to mitigate ‘lack of government support’, on disaster preparation efforts, SMMEs need to collaborate with other SMMEs and big businesses, equip staff with disaster management skills, and more.

In summary, for every identified principal challenge that reduces an SMME’s ability to prepare for and respond well to disasters, it should be neutralised by adopting preparation and response strategies that mitigate its effect. The idea is for the SMMEs to embrace informed disaster preparedness and response strategies that help them effectively prepare for and respond to disasters, while at the same time mitigating the effects of underlying challenges. Mitigated underlying challenges as well as informed disaster preparedness and response strategies/ efforts will all lead to SMME resilience.

6. Conclusions and Recommendations

The purpose of this article was to develop a resilience-enhancing strategy for SMMEs in disaster-prone areas like UMhlatuze Municipality in KZN, South Africa. Using relationships modelled via path and factor analysis (components of PLS-SEM), the strategy developed demonstrates that, for SMMEs to achieve resilience in the face of disasters, disaster preparation and response are vital. To effectively prepare for and respond to disasters, the strategy suggests that SMMEs identify underlying challenges that undermine their ability to prepare and respond effectively. Thereafter, preparedness and response strategies that mitigate the effects of the underlying challenging factors should be adopted.

With reference to the research’s limitations, the research took place with registered SMMEs in the uMhlatuze Municipality to the exclusion of unregistered SMMEs in the municipality and all the SMMEs in the whole of KZN and South Africa. Furthermore, the research adopted the quantitative research approach and the survey research technique to collect data, leaving out other design approaches (qualitative and mixed methods) and data collection techniques that could be employed in a research of this nature, such as interviews, grounded research and more. These limitations could affect the outcomes of this research.

Following the findings of this research, the following recommendations were advanced to both the SMMEs and policymakers. Disaster preparedness and response are key to SMME resilience. Hence, SMMEs should identify challenges that compromise their preparedness and response efforts in order to adapt their preparedness and response strategies.

SMMEs should also prioritise collaborating with other SMMEs and big businesses, as this assists in mitigating underlying challenges such as a lack of government support.

SMMEs should also strive to have some savings aside as these cushions them against challenges such as lack of government support, difficulties accessing financial assistance from banks, the government, etc.

The research revealed that a lack of institutional support is one of the key underlying challenges that affect SMME disaster preparedness, response, and ultimately resilience. Therefore, the researchers recommend that the government streamline aid application processes and make them less bureaucratic, so that more SMMEs can access government aid. In addition, the government should incentivise financial institutions to assist SMMEs.

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