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COPING STRATEGIES ADOPTED BY INHABITANTS WITH ASBESTOS CEMENT ROOF HOUSES IN SOUTH AFRICAN LEGACY TOWNSHIP

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ABSTRACT

The apartheid regime's housing development policy, whereby asbestos was used in roofing these houses, still exists in several towns in South Africa. One such community is Phomolong, where several houses are still roofed with dilapidated asbestos, posing a threat to households living in these houses. The study aimed to ascertain the coping strategies adopted by the inhabitants to navigate the challenges posed by the asbestos-cement roofing in Phomolong. A qualitative research approach was adopted to interview inhabitants living in asbestos-cement-roofed houses in Phomolong via face-to-face interviews with a structured interview guide. The interviews were recorded, transcribed and analysed using a thematic content analysis approach to identify main and sub-themes. The findings show that Phomolong inhabitants with asbestos-cement roofed houses experience several challenges. In coping with these challenges, inhabitants adopt strategies including placing materials such as tyres and rocks on roofs, sealing and painting roofs inside, placing buckets when it rains, and using binding wire on walls to hold roofing, among others. Due to the post-apartheid government's slow pace in replacing asbestos-cement roofing from legacy houses, inhabitants continue to experience hardships, forcing them to adopt an unconventional strategy to survive living in these houses. This situation, therefore, leaves them exposed to dangers associated with asbestos, posing further health risks to the community. The study contributes to the growing academic knowledge of challenges related to asbestos-containing material (ACMs) in non-occupational settings. It has outlined the lived experiences of a legacy township's inhabitants in South Africa, challenges and strategies they used to contain them, thereby making their plight further known to the government for possible intervention.

Keywords: *Asbestos; Cement Roof; Coping Strategies; Houses; Legacy Townships; South Africa.*

1. INTRODUCTION

South Africa's asbestos cement roofs have come into the spotlight with media coverage of the State Capture Commission's report. As a result, there has been public fear regarding the possible impacts of asbestos cement roofs in non-occupational settings (Gibson et al.,

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2021). Communities will continue to live with these asbestos cement roofs for decades before removing them completely, making it essential for academia to bring attention to the challenges associated with them (Gibson et al., 2021). This study investigates the challenges that inhabitants face in asbestos-cement roofed houses in a South African legacy township of Phomolong. Some previous studies believe there is no scientific proof outlining the exposure threshold free from asbestos; as such, all forms of asbestos are carcinogenic (Frank & Joshi, 2014). Additionally, Kottek and Yuen (2021, p.158) state that "the measurability or non-measurability of risk does not indicate the public health significance of the risk". This means that epidemiology has limited ability regarding the measurability of people living or working around Asbestos-Containing Materials (ACMs); such communities living with these materials cannot be ruled out of risk.

The traditional perspective that does not see ACMs as a risk argues that asbestos bound to some bonding agent, such as cement, posed no danger. However, there is growing evidence that this is not the case, as these ACMs age and can get damaged (Ervik et al., 2021). ACMs can be regarded as materials that create an ongoing risk of asbestos exposure. This could result from renovations, damage, replacement, weathering or natural disasters (Kottek & Yuen, 2021). In support of this statement, Oberta et al. (2018) illustrated that uncoated asbestos fibres get released. Similarly, Ervik et al. (2021) found that asbestos cement roof weathering in the layer of loosely bound fibres on the surface occurs.

According to the National Institute for Communicable Diseases of South Africa (NICD) (2010), reporting on a study conducted by Phillips et al. (2009) states that the presence of asbestos cement roofs on houses that were built over 50 years ago presented a concern. This provides more evidence than what had initially been erroneously found in previous studies. Phillips et al. (2009), using 61 households, provided evidence that asbestos was present in the soil around all these houses. It was proven that weathering of asbestos cement roofs around these houses had occurred and resulted in the leaching of asbestos.

Considering the findings by Phillips et al. (2009), it can be suggested that all asbestos exposure should be regarded as a risk. Thus, the presence of asbestos cement roofs in Phomolong poses risks for the residents. According to Bates (2020), asbestos abatement continues to be slow in the Free State province; thus, the effects of these asbestos cement roofs on the residents should indicate the sense of urgency for their removal, especially those damaged. Additionally, some households scheduled for the asbestos removal project in the Free State are uninformed of the dangers of damaged asbestos cement roofs (Felix, 2021). Despite these ascertions, past studies have not significantly dealt with how inhabitants staying in these houses manage to navigate the challenges posed by these dilapidated asbestos-roofed houses. For instance, Bates (2020) focused on the corrupt activities associated with the asbestos roof removal in the Free State, whilst Cilia et al. (2025) focused on the weathering aspects of the asbestos roof. Likewise, Gibson et al. (2021) and Kottek and Yuen (2021) focused on the health aspects of asbestos cement roofs on inhabitants. As such, it is necessary to identify how the residents of Phomolong are coping with the challenges posed by the dilapidated asbestos roofing and make it known to the policy implementers.

2. LITERATURE REVIEW

2.1 ASBESTOS CONCEPT

According to Hart (1988), the term asbestos has a Greek origin and stands for an "inextinguishable flame". Asbestos refers to a group of fibrous silicate minerals (Cilia, et al., 2025). These naturally occurring minerals are broadly grouped into two types, namely, amphiboles and serpentines. When assessed microscopically, one key differentiating characteristic is that straight needle-shaped fibres characterise the amphibious group, while the serpentine group has spiral fibres (Frank & Joshi, 2014; Hart, 1988).

The amphiboles group consists of amosite, crocidolite, tremolite, anthophyllite, and actinolite, respectively, commonly referred to as brown-, blue-, grey-, yellow-, and green-asbestos. In contrast, serpentines mainly consist of only one type of asbestos, named chrysotile, commonly known as white. Only the amosite, chrysotile and crocidolite were mined in South Africa (Hart, 1988). Globally and in South Africa, the commonly found asbestos type used in producing ACMs (such as asbestos cement roofs) is chrysotile (Frank & Joshi, 2014). The popularity of using ACMs in construction was attributed to the asbestos mineral characteristics: impeccable heat resistance, durability and somewhat weatherproof (Ervik et al., 2021). Additionally, the low-cost factor that these products offered made them a common choice. There are over 3000 products in which asbestos has been used (Subramanian & Madhavan, 2005). These products were used in construction and industries such as power engineering, transport, and textiles (Szymanska & Lewandowska, 2019).

2.2 ACM MANAGEMENT AND REMOVAL CHALLENGES

Studies documenting asbestos cement roof weathering specifically can be traced back to the 1980s (Spurny, 1989). According to a Polish study by Szymanska and Lewandowska (2019), several challenges can arise during the disposal of asbestos or ACMs. The first is that the co-financing mechanisms to facilitate removal projects can have slow implementation. Secondly, they do not have a complete inventory list of existing ACMs and locations. This can result in incomplete information for proper management and removal project planning. The third is that in cases where government interventions are not in place, not all communities have prepared or have the means to organise their ACM removal projects. As such, they continue living with them (even when damaged). The last challenge is that society may have a high number of people with little awareness of the harmful effects of asbestos waste on human health or how to properly handle the removal of such material to minimise atmospheric dispersion of the asbestos fibres.

In Africa, where several countries are dealing with ACMs installed over fifty years ago, are now presenting a problem of hazardous waste management and have been associated with other varied problems (Gebremedhin et al., 2018). According to Lacourt et al. (2013), irrespective of the considerable academic interest in studies related to exposure to asbestos, be it directly or indirectly or the aftereffects, there is still a vast number of countries that produce or use ACMs and those that use poor ACM disposal methods.

2.3 LEGISLATION RELATED TO ACMS IN SOUTH AFRICA

Nationally, the phasing out of asbestos in South Africa began in 2004 and was solidified by the approval of regulations prohibiting the use, processing, and import/export of asbestos or ACMs in 2008 under the guidance of the Environment Conservation Act of 1989. Initially, it regulated asbestos and ACMs through the Asbestos Regulation (2001), which related to the employer or self-employed person. This restricted them from doing work that may harm any person because of asbestos exposure. However, this regulation was repealed by the Asbestos Abatement Regulations (2020), which came into effect on 10th November 2020, with exceptions on two regulations (regulations 3 and 20) only coming into effect 18 months after the effective date mentioned. This change has made regulations more aligned with international standards, such as the clear labelling of asbestos waste as per United Nations (UN) Recommendations on transporting dangerous goods (Collier & Ilsley, 2020).

As per the regulations, several conditions must be met when conducting ACM removal activity. These are:

1. A registered asbestos contractor must carry out the work (types 2 and 3) with an asbestos removal certificate.
2. Before the removal, all asbestos materials that may become airborne must be identified to prevent exposure and adequate control measures must be placed.
3. The handling and disposal of the ACM must be done following Regulation 21 of the Asbestos Regulations 2020.
4. When the removal and disposal of existing asbestos roof sheets are completed, a certificate that indicates the safe disposal of the hazardous material must be produced.

Some of the differences between the old and new regulations include dividing work into three types of asbestos. Under the new regulations, only types two and three require that they be carried out by contractors registered as asbestos specialists. Additionally, now it is mandatory to conduct an asbestos inventory and risk assessment and to create a management plan for removal, repairs and phasing out (Collier & Ilsley, 2020).

3. RESEARCH METHODOLOGY

3.1 RESEARCH APPROACH

This research adopted the qualitative research approach. The quantitative research approach is regarded as objective in nature, while qualitative research is subjective. Creswell & Creswell (2017) define qualitative research as an approach that explores the understanding and meaning of a social or human problem experienced by an individual or a group. The decision on which approach to adopt mainly depends on the purpose of the study and the type of data required (Naoum, 2019). Since the study's purpose is to ascertain the lived experiences of how inhabitants with dilapidated asbestos-cement roofed houses cope, the qualitative research approach was suitable as it allowed the researcher to focus on gaining in-depth stories of the participants.

3.2 TARGET POPULATION AND SAMPLING METHODS

The population of this study consisted of the inhabitants of asbestos-cement roofed houses in the Phomolong township. The study adopted the purposive sampling method.

Purposive sampling was selected because it involves carefully selecting potential participants who could provide insight into the lived experiences of asbestos-cement roofed houses (Kumar, 2014). The participants' inclusion criteria for this study were people residing in Phomolong who had lived in asbestos-cement roofed houses for over a year and were willing to partake in the study. Thus, inhabitants residing in Phomolong but staying in houses without asbestos-cement roofs and those who have lived in asbestos-cement-roofed houses for less than a year were excluded.

3.3 DATA COLLECTION METHOD

The semi-structured interviews with participants were conducted by the researcher visiting the study site during weekends to increase the chances of finding more participants at home who have time to spare for the interviews. When entering a potential participant's house, the researcher entered with a third party accompanying them to ensure their safety and permission to conduct an interview. If granted, the researcher and participant would then conduct the interview. The third-party accompanying the researcher would wait outside to ensure the confidentiality of the participant. The interviews with the participants were conducted in Sesotho, IsiXhosa, or English, depending on the participant's preference. The interviews started with the researchers formally introducing themselves to establish rapport and explaining the purpose and other information about the study. This included asking permission to record the interview and their willingness to partake. When participants agreed, the researcher asked them to sign the consent form. The researcher recorded the interviews. Each interview took about 20 to 30 minutes to complete. To anonymise and separate the different participants, the researcher allocated each participant a unique participant number, such as P1, P2, etc. The interview guides had three parts: the participants' demographic information, the challenges they experienced and the coping strategies to overcome them. In all, 11 participants were interviewed, and although the researcher reached saturation after conducting the 10th interview.

3.2 DATA ANALYSIS

The data analysis process within the qualitative approach is when the collected data is processed by organising, analysing, and interpreting the data (Johnson & Christensen, 2019). The data collected were analysed using the thematic content analysis approach. This analysis approach was chosen as it is an analysis that allows novice researchers to better understand how qualitative data analysis is conducted, with the vast literature available. In this analysis approach, the data were reduced, displayed, and then coded to identify emerging themes and create a narrative (Johnson & Christensen, 2019). The data was processed by translating and transcribing the interviews, familiarising the researcher with the data. This was done by reading through the transcriptions, identifying the initial patterns from the transcripts, and using the initial patterns to identify the main patterns. Similar themes were then grouped into themes and sub-themes. The Excel statistical tool was then used to calculate the frequencies and percentages of the participants' demographic data and formulate the theme items.

4. FINDINGS

4.1 DEMOGRAPHIC DATA OF PARTICIPANTS

The table presents the demographic data of the participants sampled. Male participants constitute 55% males and females 45%. Most participants (91%) have lived in the house for over 5 years. Most participants (73%) indicated that the asbestos cement roofs are over 30 years old. 82% of the participants' houses are owned by the participants' late parents or grandparents. 55% of the participants reside in four-roomed houses, whilst 45% reside in three-roomed houses. The employment analysis indicated that 55% were either unemployed or studying.

Table 1: Demographic factors of participants

Demographic factors		Number of participants	Percentages
Gender profile of participants	Male	6	55%
	Female	5	45%
	Total	**11**	**100%**
Number of years as a resident in the current house	Under 5 years	1	9%
	Between 5 and 30 years	3	27%
	Over 30 years	7	64%
	Total	**11**	**100%**
The estimated number of years the current roof has been used	Under 5 years	0	0%
	Between 5 and 30 years	3	27%
	Over 30 years	8	73%
	Total	**11**	**100%**
Ownership status of houses where participants live	Owned by late parent(s)/grandparent(s)	9	82%
	Renting	2	18%
	Total	**11**	**100%**
House Size where participants live	3 rooms	5	45%
	4 rooms	6	55%
	Total	**11**	**100%**
Employment status	Unemployed	4	36%
	Self/temporarily employed	3	27%
	Employed	2	18%
	Student	2	18%
	Total	**11**	**100%**

4.2 COPING STRATEGIES

Having identified the challenges faced by the participants, such as poor living conditions inside these houses, difficulty in maintaining the asbestos roof, removal and disposal difficulties and health concerns, they asked the participants to describe navigation

strategies to overcome their challenges with asbestos-cement roofed houses. The responses to the coping strategies were analysed to determine initial patterns, coded, and grouped into the different themes, as presented in Table 2. This table indicates three strategic coping mechanisms used by the participants, namely sealing and painting roofs inside, placing materials such as tyres and rocks on roofs and other intermediate strategies such as placing buckets when it rained and binding wires on walls to hold down the roofs.

Table 2: Participants' coping strategies for asbestos cement roof challenges

Main themes	Sub-themes
Placing material on the roof	Tyres and rocks
	Replacement sheet - asbestos or corrugated iron sheets
Sealing and painting the roof inside	Sealing holes from inside
	Painting the roof inside
Other strategies	Placing buckets
	Binding wire on walls

4.2.1 Theme 1: Placing Material on the Roof

The first strategic theme mentioned by the participants is placing materials on the roof when raining and providing support to roofs on windy days. Four participants placed tyres or rocks on their asbestos cement roofs. It was established that they do this as a preventative measure to prevent their roofs from getting blown away. During site visits, the researcher also noticed that this strategy was used in different asbestos-cement roofed houses in the neighbourhood. Depicting these strategies, Figure 1, picture A, illustrates two households where the material was placed on roofs to support the roof against the wind. The comments made by participants P1 and P10 also gave directions for their reasons for putting these on the roofs.

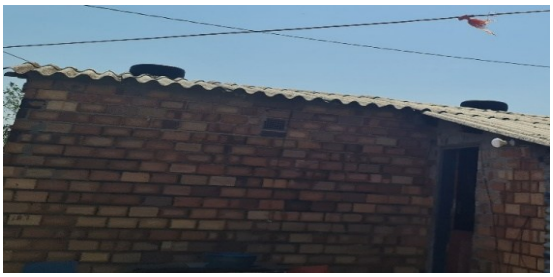
P10: *"... This is why we put tyres to secure the roofs from flying away",*

P1: *"To prevent it from going up we have placed rocks on top of roofs".*

Other participants indicated that they sourced replacement sheets of asbestos or corrugated iron sheets. They stated that the asbestos-containing cement material sheets could not be bought, so they sourced them from people who had removed their asbestos roofs. For example, P2 said the corrugated iron sheets are sourced second-hand or purchased at a building supply shop.

P2: "*If it gets a hole for example, you get another piece from someone else who has taken it out and close the space in your house"*

The sheets are replaced or placed on top/below the existing asbestos sheet. In most instances, these were installed near the chimney or where there were big holes in the sheet. For instance, Figure 1, picture B indicate houses where this strategy was used. Noticeably, they additionally place supportive material, in this case, rocks. The first image also illustrates where corrugated iron was added under the asbestos-containing roof, where the redundant chimney is located.



Picture A

Picture B

Figure 1: Pictures of an unsecured asbestos roof support against the wind

4.2.2 Theme 2: Sealing and Painting the Roof Inside

The second strategic theme discussed is sealing holes inside the roof to avoid stepping on the asbestos cement roof, which breaks easily and paints to enhance its appearance, minimise dust and temporarily make sealant stick on the roof. Eight participants stated they tried to seal holes from the inside. While most use this strategy, it is temporary and sometimes used as a minimisation strategy instead of prevention. It is a minimisation strategy because it may not completely prevent water from coming in, as the hole would still be visible from the outside. Still, it would decrease the amount of water drips into the house compared to when it is left unsealed. This strategy was seen in Figure 2, picture D, where the participants used sealants such as silver waterproof tape and multipurpose glue. This indicates its fragility, and the only condition people are willing to seal it. Some participants indicated they painted their roofs inside. They, however, had different reasons for painting them. An example is in Figure 2, picture C, where the participant painted it to make it look better.

P4: *"We paint it to get rid of the water stains".*

P11: *"After patching it, I paint it to try and keep it glued to the roof".*

Picture C: Dusty roof painted over

Picture D: Dusty roof painted over

Figure 2: Pictures of a painted asbestos roof to improve its aesthetics.

For instance, P5 indicated that it is difficult to wash the roof; thus, they painted it to improve the colour, which subsequently peeled off. Additionally, P11 stated that it becomes a bit better when you apply water paint. One participant, P7, said he had painted it a while back and would only be repainting it. His rationale for this is based on the idea that the roofs may be removed any day, and he is worried he would have wasted his money if he painted it today and it gets removed soon after.

P5: *"You see also with the paint; over time it gets removed".*

P7: "*I painted it a while back and did not after as they had said they would remove them. So, I will paint it today and tomorrow they come and remove it while I spent my money to buy the paint".*

4.2.3 Theme 3: Other Coping Strategies

Participants indicated other strategies they use besides those discussed in the previous sections. These were to place buckets where roofs leak and add binding wires on the walls to support the poles and roof during windy days. Six participants stated they place buckets inside their houses when rainwater drips to prevent their furniture from getting wet and the house from getting messy. While no images were acquired indicating the buckets being used, some participants pointed out places where water drips typically when it rains. For example, P6 pointed out the holes and suggested that they place buckets in those areas during rainfall.

P6: *"Here we have holes; we just put a bucket in most cases"*

Figure 3, picture E, illustrates some of the areas where buckets are used to collect the water from the roof during rain, as pointed out by the participants.

Picture E Picture F

Figure 3: Pictures of a leaking asbestos roof where buckets collect the water during rainfall, and binding wires are installed to the external walls to hold the roof structure.

The other strategy for the participants' houses was to install binding wires around the external walls attached to the roofing poles. Four participants stated this strategy, and the researcher observed this during the site visits. For instance, P1, in explaining why they had installed these, noted that the father installed the binding wires.

P1: *"My dad before he passed added binding wires to hold the poles down - this has been an issue for ages now".*

Figure 3, picture F, illustrate different participants' houses where this strategy was observed.

5. DISCUSSION

The inhabitants of asbestos-cement roofed houses used six coping strategies in Phomolong; none of these were cited in academic literature. The identified coping strategies were used to minimise the challenges related to dust, wind, rain, and physical damage to roof sheets. This study did not identify the coping strategies that Obminski (2022) posited, such as having good ventilation for air exchange and decreasing the concentration of asbestos dust inside a building. The physical conditions and limited finances may have limited this strategy's use. For example, changing the standard windows to add bigger ones would require the participants to have money to buy the

windows and get them fitted. Additionally, observed cracks on the structural walls could be another limiting factor in why this strategy is not used there. Gibson et al. (2021) state that communities have and will continue to live with asbestos cement roofs for decades. The findings of this study support and provide evidence for this notion. It was observed that most participants (64%) have lived in these houses for over thirty years and recall these houses being older than that. Additionally, considering the challenges identified, inhabitants of asbestos-cement roofed houses in Phomolong have been forced to adopt coping strategies. Kottek and Yuen (2021) state that although asbestos removal is ongoing, inhabitants devise several means of dealing with the current challenges. These coping strategies are used to minimise the challenges related to dust, wind, rain, and physical damage to roof sheets. Bonifazi et al. (2018) suggest that, because of the status of many asbestos roof houses, serious intentions must be made by the authorities to address the inhabitants' challenges. Gil et al. (2024) identified that many asbestos roof covering conditions were hazardous to the inhabitants; they used several means to contain the dilapidated state. This, they indicate, was a great concern for the community. Likewise, Martínez et al. (2024) identified that several people's strategies for controlling their asbestos roofs were insufficient; they proposed that authorities identify the state of the various roofs and develop prioritised intervention strategies to mitigate the problem. In support of this, Saba et al. (2024) posit that roofing materials also play a significant role, with thermoacoustic roofs reducing emissions compared to asbestos cement roofs. These concerns confirm the findings of this study, where people need an urgent intervention from the government to address their concerns about the asbestos roof. Authorities must ensure that replacing asbestos cement roofs with the urgency it deserves to address inefficient practices adopted by the inhabitants, which more often pose a health risk to them.

6. IMPLICATION OF THE FINDINGS

The findings show that the government policy on removing asbestos cement roof houses in legacy townships, like the case study town in South Africa, has failed to achieve its goal. Thus, posing a health-related risk to the inhabitants of these houses and the communities at large. The study also identified during the site visit that many community members are still using asbestos to construct informal houses and fences around their houses, oblivious of the danger it poses to their health. This calls for the government to intensify the public health education within these communities and address the elimination of asbestos roof policy with more urgency.

7. CONCLUSION AND RECOMMENDATION

Over a decade ago, the South African government embarked on a programme to remove asbestos roofing from all the legacy township houses. However, this attempt has not been materialised, with many houses in rural areas having dilapidated asbestos roofs posing danger and maintenance challenges to the inhabitants. Considering the environmental risk to society and communities, this asbestos roof removal must be done. As such, these inhabitants cannot remove them unless the government agency responsible for this task executes the removal in compliance with the environmental regulations. The study, therefore, sought to explore the lived experiences of the inhabitants of asbestos-roofed houses to bring their ordeal to policymakers so that they could revisit perhaps the asbestos removal programme abandoned over the years. The study identified many challenges the

inhabitants face, including health, poor living conditions, and maintenance issues. To overcome these challenges, they apply several strategies, including placing material on the roof, sealing and painting the roof inside and other strategies. This situation poses health risks to the inhabitants, especially during the winter and rainy seasons. The study, therefore, recommends urgent government interventions to remove these roofing materials to ensure healthy living conditions for the inhabitants. The government can also engage with private organisations to promptly facilitate the removal of roofing. The government can also engage non-governmental organisations to assist these inhabitants in removing the asbestos roof and replacing it with the appropriate roofing materials. The community councillors must agitate and draw the urgency of this asbestos roof phenomenon to the government and other municipal leaders to ensure the problem is resolved. The limitation of the study is that a case study approach for a specific setting, thus the findings may not be generalised. Future studies must examine the challenges of the government in executing the asbestos roof removal programme since its inception, which has led to several communities still having these roofs on their houses.

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