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Original Research Article

Geomorphological-based Remote Sensing and GIS analyses to identify vulnerable zones of forest fire in Zambezi Region, North-eastern Namibia

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ABSTRACT

Forest fires are a threat to biodiversity, lives, and livelihoods in many parts of the world. In Namibia, there is growing concern over the increasing frequency and severity of forest fires. The aim of this research was to map out fire-vulnerable zones in Zambezi Region in north-eastern Namibia using remote sensing and geographic information system (GIS) techniques. A forest fire risk zone map was developed from a combination of several forest fire-promoting variables. To assess vegetation condition, Normalised Difference Vegetation Index (NDVI) was calculated from Landsat TM images resulting in six classes. A toposheet map was used to classify land cover and land use into six density categories. Using SRTM imagery elevation data and topographic map, the slope, aspect, drainage density, and other coverages were determined. Geomorphologic and meteorological data were also used in the determination of forest fire risk zones. Forest fire vulnerable zones were defined by assigning subjective weights to each layer's classes based on the perceived sensitivity to fire or ability to cause fire. The final product categorized the Zambezi Region into four fire vulnerable categories: extremely high risk, high risk, moderate risk, and low risk. An area of 137000 ha (9.6%) was at very high risk, 665400 ha (46.5%) was at high risk, and 64600 ha (4.5%) was at low risk. Vegetation structure, geomorphology, land cover, and precipitation were major determinants of fire vulnerability. High elevation and low vegetation moisture status increased fire vulnerability. Lower fire risk (than expected) was recorded at low elevations due to the vegetation type being a limiting factor. Mid-elevated areas were at very high fire risk due to interactive effects of elevation, high temperature, and low humidity. Slope, aspect, and drainage density did not significantly influence fire risk due to low occurrence of pronounced slopes and aspects.

1. Introduction

Forests are very important in the lives and livelihoods of people since they provide a lot of ecosystem services (Tomar, Kanga, & Singh, 2021). However, over the last few decades forests have been increasingly under threat from various factors including overharvesting, unsustainable forest management practices, human settlement encroachment and uncontrolled forest fires. Forest fires have presented a significant danger to various forest ecosystems around the world (Cao, et al.,

2021) . They have a significant impact on the forest ecosystem, resulting in negative impacts on forest biodiversity (Cao,et al., 2021). Some species have gone extinct or are threatened due to a number of factors including impacts of forest fires. Forest fires disrupt the forest functioning by altering the landscape and affecting the wildlife and flora (Enoh, Okeke, & Narinua, 2021). Forest fires do not only destroy forest resources, but they also endanger people's lives, property, and agricultural production.
Due to their vast pace of propagation, forest fires in a given area have the ability to unpredictably change direction from one shape to another (Rios, Pastor, Valero, & Planas, 2016). Forest combustion may spread slowly or quickly depending on the prevailing meteorological conditions (Enoh, Okeke, & Narinua, 2021). Meteorological conditions such as wind, atmospheric temperature, relative humidity and precipitation play a significant role on the extent, affect and spread of forest fires (Cardil, et al., 2021). Coupled with meteorological conditions, land cover, geomorphological features such as slope, aspect, elevation and altitude also play a significant role in the fire regime of an area. Forest fire behavior is characterized by the size of the flame front and the type of spread (Morvan & Frangieh, 2018). Local vegetation structure and attributes are also key determinants of forest fire regimes, and there are feedbacks where each influences the other. Hence, combinations of climatic, geomorphology and vegetation attributes lead to differences in vulnerabilities to fire among zones. Where human activities are within or close to forests, they form the most significant source of ignition. Forest fires are more likely to occur in places that are adjacent to towns, agricultural areas, and road networks (Enoh, Okeke, & Narinua, 2021).

Forest fires are negatively affecting forest biodiversity in many regions of the world, including Namibia's Zambezi Region. Most places in Namibia, particularly the Zambezi and Kavango Regions, experience fires every year (Humphrey, 2018). The Zambezi and Kavango Regions generally receive higher average annual rainfall than other Regions in the country; consequently, they have more woodlands and dry forests, which lead to high risk of fire. Forest fires in Namibia are still mostly caused by human activities, particularly during the dry season when there is a significant water stress (Chuvieco, et al., 2021) and the vegetation is relatively dry while temperatures and wind speeds rise, all of which are conditions, which promote fire occurrence.

Geomorphology, lithology, stratigraphy, climate fluctuation, and landforms are all important variables, which can be used in modelling fire occurrence (Yair, Almog, & Arbel, 2018). The use of remote sensing technology for geomorphological studies has increased its importance for this purpose. Geospatial approaches such as GIS and remote sensing are used to explore the association between geomorphological factors, climate conditions and forest fires. Climate variables such as precipitation, solar radiation, mean temperature, and relative humidity have been examined in the majority of forest fire research cases (Kumari & Pandey, 2020).

Early identification of forest fires is critical for minimizing fire damage, and geospatial approaches are critical for recognizing and mapping forest fires as well as monitoring the frequency with which different vegetation type's burn, leading to the identification of fire vulnerable zones. Forest fire vulnerable zones are areas where a fire is more likely to start before spreading to other parts of the forest. Forest fire risk zones have been mapped using a number of methodologies, the majority of which relied on remote sensing and GIS using topography, vegetation, land use, population, and settlement data (Pradeep, et al., 2022). This study, which is based on geospatial technology, sought to identify vulnerable forest fire in the Zambezi Region in Namibia. Such information would help decision-makers and practitioners to develop appropriate early warning systems and fire management plans or strategies in order to conserve biodiversity as well as saving lives.

1.1. The Objectives the study

This study, which is based on geospatial technology, sought to identify vulnerable forest fire in the Zambezi Region in Namibia. Such information would help decision-makers and practitioners to develop appropriate early warning systems and fire management plans or strategies in order to conserve biodiversity as well as saving lives.

2. Methodology

2.1 Study area

The study was conducted in the Zambezi region north-eastern part of Namibia, at latitude of -17° 29' 59.99" S and Longitude of 24° 15' 60.00" E (Akashambatwa, Zuwarimwe, & Teweldemedhin, 2017) (see Supplementary Fig. S1). The Zambezi Region has a population size of 90 422 and a total area of 22,000 km² (Akashambatwa, Zuwarimwe, & Teweldemedhin, 2017). It has a tropical climate with hot temperatures and substantial rainfall (600–700 mm) during the summer season, which lasts from December to March, making it Namibia's wettest region. Average summer and winter temperatures are 35oC and 28oC in the afternoon respectively. Permanent rivers (Chobe, Kwando, Linyanti and Zambezi) supporting riverine woodlands and floodplains traverse thick deposits of Kalahari sands dominated by savannah woodlands (Gondwe, et al., 2021). The area is covered in dunes, dune valleys, and sandy substrates and has an average elevation of 930 meters above sea level. Swamps, floodplains,

wetlands, and woodlands make up the majority of the topography.

2.2 Data collection and analysis

The study involved data building concerning the geomorphological characteristics or landscape of the Region leading to the identification of forest fire vulnerable places (see Supplementary Fig. S2). The work was done in three phases as described below.

In the first phase, the thematic layer of vegetation was obtained by calculating the Normalised Difference Vegetation Index (NDVI) employing a Landsat TM image (see Supplementary Fig. S6). NDVI is an index that is sensitive to the amount of vegetation above ground that is computed based on the following formula:
NDVI = (Near Infrared- RED) / (Near-infrared + RED);
where NIR is the reflectance measured in the near-infrared channel and red is the reflectance measured in the red channel; the higher the NDVI value, the denser or healthier the green vegetation (Timmer, Reshitnyk, Hessing-Lewis, Juanes, & Costa, 2022) . In general, NDVI values range from -1.0 to 1.0.
Terrain mapping was generated using SRTM image downloaded from www.earthexplorer.usgs.gov. Based on the terrain map, a drainage network and density were generated. With the help of the drainage network, micro-watershed regions and water divide were also generated. Based on the micro-watershed regions, a geomorphological classification of the region was generated and the hydrology map (see Supplementary Fig. S3). This completed the first phase of data procurement and data capture.

2.3 Ranking and weighting factors for different layers

The input information on factors influencing forest fire is in descriptive form and reveals the parameters favouring the fire risk. To achieve effective conclusions through computation and other mathematical operations in the subsequent GIS analysis, the factors that lead to a place being vulnerable to a forest fire in an area were analysed in the following order of importance: Digital Elevation Model, land use/ land cover, NDVI, vegetation structure, drainage density, relief, slope, average annual rainfall and average temperature (see Supplementary Fig. S3 to S15). After determining the influence of each factor on forest fire risk, the different classes of each factor were given suitable ratings. A higher rating indicates that the factor has a high degree of influence on the fire risk in an area. The considered factors were then integrated for calculating the forest fire vulnerability places (see Supplementary Table S1). The factors were rated on a scale of 1 - 10, where the digital elevation model was ranked first meaning that it has a high degree of influence on the fire risk in an area (Sakellariou, Sfoungaris, & Christopoulou, 2022). Based on the digital elevation model geomorphology was derived and classified into five classes (wet valley land, partly wet mid-valley, mid dry land, mid elevated partly and elevated damp land).

The mid-elevation (941- 960 m) area was given the highest weight because in this area rainwater received gets drained to lower regions (Xavier, Leite, Kyle Dexter, & Mato, 2019), thus less moisture makes these areas more vulnerable to forest fire. These areas normally are not evergreen; vegetation dries up in summer because of high temperature and less water percolation. Land use/ land
cover of the area followed DEM during analysis; vegetation was given the highest weight because even though an environment may be favourable to fire, a forest fire cannot occur unless inflammable material is present. The vegetation cover in the mid dryland regions were given a higher weight because dryness makes them more susceptible to forest fire (Thoha & Triani, 2021). Drainage density was awarded a medium rank meaning that it has a moderate degree of influence on the fire risk in an area. The slope was assigned a lower rank because it does not necessarily influence the probability of ignition but has a strong influence on the behaviour of fire (Ciesielski, et al., 2022). Other factors such as temperature and rainfall were given lower ranks because they have a lower degree of influence on the fire risk in an area as they are mostly used in determining the spread of forest. The approach used in rankings and weightings followed standard practice in similar studies as exemplified by (Enoh, Okeke, & Narinua, 2021; Parajuli, et al., 2020) and (Zhao, Zhang, Lin, & Xu, 2021), among others.

In the second phase, depending upon the physiographical region categorised, overlain analyses were done in the ArcGIS platform. Based on the overlain analyses of the final map, the forest area prone to forest fire was identified (Figure 1). With the help of work and final results obtained, the project report was prepared with maps and a table.

3. Discussions and Conclusions

Forest Fire Susceptibility analysis based on Geomorphology

The theme layers generated from satellite images and topographic maps were drainage density, drainage network, aspect, slope, relief, digital elevation model, land use/ land cover, geomorphology, national parks in the Zambezi Region, NDVI and vegetation structure (see Supplementary Fig. S3 to S15). Meteorological data on rainfall and temperature were also among the theme layers generated (see Supplementary Fig. S14 & S15). The Digital Elevation Model was extracted from SRTM data to show the elevation of the study area, ranging from 860 to 1040 m above mean sea level (see Supplementary Fig. S5). The geomorphological classification of the region derived from the Digital Elevation Model resulted in six classes, namely wet valley land, partly wet mid-valley,

mid dry land, mid elevated land, partly dry land and elevated damp land, correlating to the elevation of the region (see Supplementary Fig. S3). The Zambezi Region was classified into different forest regions derived from NDVI, namely sparse vegetation; moderate vegetation and dense green vegetation. The vegetation cover from the topographic map was classified into (very dense bush/forest, dense bush/forest, medium bush/forest, open bush/forest, grassland and marshes with swamps). More of the forests are found in the western part of the Region and less towards the eastern part of the Region because the western part largely falls in protected areas (where there is less human disturbance, no settlements and different geomorphology, while towards the eastern part there are floodplains (see Supplementary Fig. S6 and S8). It is well known that most woody plants cannot tolerate waterlogging (Xavier, Leite, Kyle Dexter, & Mato, 2019), hence the very little woody vegetation in the eastern part of the Region. The level of correlation between forest and the micro-geomorphological region was such that there is more forest in the elevated damp land than in lower wet valley land conforming to a soil catena sequence (García-Gamero, Vanwalleghem, Peña, Román-Sánchez, & Finke, 2022), thus the upper slopes support more woody vegetation where soils are better drained than bottom slopes where the soil is more clayey and gets waterlogged.

Forest fire vulnerable zones of the Zambezi Region

The final output map of zones vulnerable to forest fire in the Zambezi Region was in four classes; very high risk, high risk, moderate risk and low risk (Figure 1).

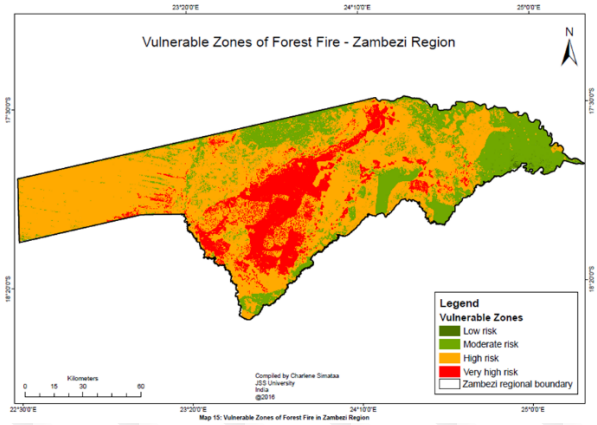

Figure 1: Vulnerable zones of Forest fire in Zambezi region

The Region is dominated by areas of Moderate risk (39.5%) to high risk (46.5%)

Table 1: Area (km^2) and percentage (%) of forest fire vulnerable zones.

Fire vulnerable zones	Area (km^2)	Proportion (%)
Low risk	646	4.5
Moderate risk	5654	39.5
High risk	6654	46.4
Very high	1370	9.6
Total	14324	100

Such a situation may be a cause for concern, especially during the high fire season, which normally runs from August to November each year.

The main factors influencing the level of risk as clearly shown from the maps are vegetation structure, geomorphology, land cover and precipitation while other factors seem to play a less pronounced role. However, it must also be noted that there are complex interactions among these determinants such that the maps may offer a simplification of how the determinants function. It was shown that the mid elevated land regions and the mid dry land of elevations above 940m were at very high risk of forest fire than other areas of high and low elevation. Hence, the high position on the landscape and the low moisture status of the vegetation increases vulnerability to fire. Elevation influences vegetation composition, fuel moisture and air humidity. More than 90% of incidents of forest fire occur above 100m altitude. Low elevation is reported to be associated with high temperatures, low levels of fuel moisture and high wind speeds, all of which tend to increase fire risk (Sivrikaya & Kucuk, 2022). However, results from this study do not present such a clear trend for low elevations, indicating that there are other factors such as the vegetation type (less woody fuel) which were limiting determinants.

Slope also influences fire behaviour, particularly its rate of spread. Fire spreads faster upslope, and as slope increases so does the fire spread rate, the ignition of the canopy fuels and hence the fire risk (Sivrikaya & Kucuk, 2022). Ignition point of the vegetation increases because of pre-heating of the vegetation ahead of the fire, and this effect is higher when burning upslope. Closely related to slope is the aspect. Aspect influences the fire behaviour by affecting the amount of solar radiation received on a site. Generally, northern and western aspects receive more direct heat from the sun, leading to more drying of the soil and vegetation than on southern or eastern aspects. The results show that the influence of slope, aspect and drainage density did not seem to influence fire risk in a significant way. This may be due to the fewer pronounced slopes and aspects; hence, the fire

risks were more influenced by other variables (discussed above) than by slope and aspect. This is expected in such landscapes as shown by Burrows, Stephens, Wills, & Densmore (2021) who reported similar less influence of aspect on fire behaviour near Sydney in Australia, and they interpreted it as a 'surprising' result.

Forest fire risk and behaviour are related to meteorological variables such as precipitation, temperature and humidity. Higher temperatures reduce relative humidity and lead to high vulnerability to fire (Sivrikaya & Kucuk, 2022). The results show that mid elevated areas are at very high fire risk because of dry conditions, which makes them more susceptible to forest fire. There is clear interactive influence between elevation, temperature and humidity on fire risk. Dryland areas provide dry fuel to start a fire and for it to easily spread to other areas. In summer, these areas are likely to dry up because of high temperature and most of moisture drains out to the lower areas as explained by catenal effects (García-Gamero, Vanwalleghem, Peña, Román-Sánchez, & Finke, 2022). These areas support more woody vegetation, which provides more fuel, thus increasing the risk of forest fire in the zone. The area also has some Conservancies where there are human settlements from where fire can be started intentionally or unintentionally, thereby spreading out to other areas. A number of studies (e.g. (Sivrikaya & Kucuk, 2022; Jiménez-Ruano, et al., 2022; Hoang, et al., 2020) have shown the importance of humans as key determinants of fire dynamics, particularly as sources of ignition and promoters of its spread. Lower risk areas of forest fire are mostly in the elevated land and towards the eastern part where it is mostly covered by water (floodplain). Elevated regions have more vegetation than lower wet valley land because high-elevated land receives high rainfall which promotes more woody vegetation. There is also good water percolation due to the more sandy soils compared to the more clay soils in valley bottoms. Out of the 14324 km^2 total area sampled of the Zambezi region, 1370 km^2 was of very high risk of a forest fire with 9.6% with 64.6% area being in the lower risk area (Table 1). Most area vulnerable to forest fire is in high-risk zones with an area of 6645 km^2 (46.5 %) (Table 1).

4. Conclusions

The aim of this study was to identify and map out areas of various vulnerability to forest fires in Zambezi Region in north-eastern Namibia using remote sensing and GIS. More than 50% of the Zambezi Region was classified as being at least high fire risk (9.6% at very high risk, 46.5% at high risk). Vegetation structure, geomorphology, land cover, and precipitation were major determinants of fire vulnerability. High elevation and low vegetation moisture status increased fire vulnerability.

Contrary to widely reported trends, a lower fire risk was recorded at low elevations due to the vegetation type which had lower woody fuel loads, making it a limiting factor. Mid-elevated areas were at very high fire risk due to the interactive effects of the higher elevation, high temperatures, and lower humidity which tend to promote fire. Slope, aspect, and drainage density did not significantly influence fire risk due to the low occurrence of pronounced slopes and aspects in the Region. This study has demonstrated the capabilities of using remote sensing and GIS for the delineation of areas of different fire vulnerability status. It is critical to improve our understanding of the main determinants and spatial distribution of different fire vulnerable zones in order to manage the growing problem of forest fires and their associated threats to biodiversity, human lives, and livelihoods.

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Original Research Article

Predicting work engagement of employees at Dundee Precious Metals Mine in Tsumeb, Namibia

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ABSTRACT

The profit margins of organisations are noticeably influenced by their competitive advantage inclusive of engaged employees. The aim of this study was to investigate the impact of job demands-resources on job satisfaction and work engagement of employees at Dundee Precious Metals Mine in Tsumeb. Job resources play a critical role in the job attitudes employees experience/develop (job satisfaction). Job satisfaction is regarded as the key motivating factor that enhances work engagement of employees. A quantitative, cross-sectional research design was employed, and data was collected through a questionnaire. A sample of n=150 participants was selected using random sampling. Making use of SPSS, correlation and regression analyses were conducted. This study found a positive relationship between job resources (growth opportunities and advancement opportunities), job satisfaction and work engagement. Growth opportunities and advancement opportunities predicted job satisfaction. Job resources (growth and advancement opportunities) and job satisfaction predicted work engagement of employees. This study recommends interventions such as job rotation and internal training to enhance growth opportunities. It is also recommended to involve employees in the decision-making process, establish/implement recognition and rewards policies, educate staff on financial planning and ensure that fair payment and benefits are provided throughout the organisation. The organisation may also consider investing in interpersonal training and conflict resolution skills. The study adds to the knowledge within Industrial Psychology and the Namibian work setting.

1. Background of the study

The business world is becoming increasingly more competitive and challenging. The prosperity of organisations is affected by how resources, including human resources, are managed (Bellet & Ward, 2019). Dundee Precious Metals Tsumeb (Pty) Limited (DPMT), is situated in Tsumeb in the Oshikoto Region of Namibia, and it is 430 km north of the capital city, Windhoek. Working conditions influence the interaction between employer and employees. Demerouti et al. (2001) reported that the features of work conditions can be divided into job demands and job resources. Job demands are the physical, psychological and the social requirements of the working environment (Bakker & Demerouti, 2007). The general well-being of employees can be affected negatively if there are high job demands and low resources. When the job demands correspond with job resources, it leads to improved engagement of workers, increased productivity and job satisfaction (Bakker & Demerouti, 2007). Burnout, fatigue and

lack of resources were linked to disengagement and poor performance from employees (Schaufeli & Taris, 2014). This study specifically focused on growth opportunities and advancement opportunities as part of the job demands-resources model. Collectively, growth opportunities and advancement opportunities will be referred to as job resources.

Spector (1997) defines job satisfaction as the degree to which people like/hate their work. Job satisfaction is a powerful predictor of how employees feel about their careers and working climate (Nielsen et al., 2011). Job satisfaction is regarded as the key motivating factor for employees because it impacts on work culture and customers satisfaction (Garg et al., 2018). Customer satisfaction can be linked to customer loyalty and, ultimately, income for the organisation.

According to Karanika-Murray et al. (2015), employees that are deeply and positively involved in their jobs portray commitment and devotion to their job. Schaufeli et al. (2002) defined work engagement as having a positive and a more fulfilling mindset that is characterised by vigour, dedication and absorption.
This study aims to investigate the relationship between job demands-resources (growth and advancement opportunities), job satisfaction and work engagement of mining employees at Dundee Precious Metals. The study also aims to assess if growth and advancement opportunities and job satisfaction predict work engagement of these employees.

2. Literature review

2.1 Work engagement

Kahn (1990) was the pioneer of work engagement, and he explained that work engagement is employees' physical, cognitive and emotional expression when identifying and investing themselves in their work. Research by Schaufeli and Bakker (2004) goes into depth to explain what characterises work engagement. Firstly, vigour is a positive aspect of feeling and physical liveliness. Secondly, dedication is described as a feeling of importance from one's work, pleased, aroused and tested. Lastly, absorption is described as experiencing joy in one's work and overlooking everything else that is near (Schaufeli & Bakker, 2004).

Similarly, work engagement is defined by Schaufeli and Bakker (2010) as a positive work-related state. Mauno and Ruokolainen (2007) found that job demands and job resources are antecedents of work engagement although job resources is a better indicator of work engagement compared to job demands.

A study conducted by Brunetto et al. (2012) found that job satisfaction is a facet of job engagement. Pieters (2018) found that procedural and interpersonal justice is linked to employee engagement. Intrinsic and extrinsic job satisfaction were found to be major indictors of employee engagement. According to Harter et al. (2002), to enhance businesses success and competitiveness, organisations need to concentrate on individual components such as jobs engagement and employee satisfaction. Zavina (2019) found that mindfulness and work engagement amongst teachers had a positive relationship.

Torp et al. (2012) state that when work engagement is well-promoted in the workplace, it tends to have a positive effect. Work engagement is contagious and is carefully linked to good work performance and motivation.

2.2 Job Demands-Resources

The Job Demands-Resources (JD-R) model developed by Demerouti et al. (2001) categorises job characteristics into job demands and job resources. The model uses these two job characteristics to predict employee well-being/burnout and work engagement (Schaufeli & Bakker, 2004). Job demands are related to health issues and exhaustion, while the job resources are related to work engagement (Demerouti et al., 2001).

Job demands are classified as difficulties such as time pressure, workload and obstacles such as red tape or role conflict. Both categories can be challenging on their own (Hakanen et al., 2006). Schaufeli and Taris (2014) found that job resources are positively viewed, while job demands are negatively viewed.

Schaufeli and Bakker (2004) defined job resources as parts (social, psychological and physical) of the work that elevate growth, accomplishment of goals and decreases job demands. Job demands (negative) and job resources (positive) are predicators of work engagement (Bakker, 2011).

The Conservation of Resources Theory stipulated that individuals seek to obtain, retain, foster and protect those things they centrally value (Hobfoll et al., 2018). The theory is regarded as a motivational theory that helps to describe much of human behaviour that is based on the evolutionary need to gain and preserve resources that are for survival and

are fundamental to human behavioural genetics (Hobfoll et al., 2018). This theory helps to buffer against the negative impacts that stress might have on individuals (Folkman & Moskowitz, 2004). The theory stresses that stress is a result of individual subjective perception and environmental circumstances that can put a strain on a person's resources (Alvaro et al., 2010).

Demerouti et al. (2001) define job demands as aspects of the job (psychological, social and physical) that necessitate sustained psychological/physical effort and are therefore linked to certain psychological/physical output. Demerouti et al. (2001) found that stress is an outcome of job demands. When job demands are too many within an organisation and the resources are limited, the well-being of employees significantly decreases (Narainsamy & Van der Westhuizen, 2013).

2.3 Job satisfaction

Job satisfaction is considered one of the most studied variables (Lu et al., 2012). According to Spector (1997), it is regarded as the degree to which people like their work and are satisfied or hate the parts which deals with dissatisfaction.

In a study by Diedericks and Rothmann (2013), it was discovered that employees who lack resources, do not fit in their work role and have poor relations with supervisors were less engaged and less satisfied at work. Garg et al. (2018) found that intrinsically motivated employees experienced higher levels of job satisfaction than employees being extrinsically motivated. Organisational changes aimed at improving performance positively influence employees' job satisfaction (Judge & Kammeyer-Muller, 2012).

According to Javed et al. (2014), if there is a lack of job satisfaction in a workplace, it may interfere with the efficiency of work.

Flourishing (emotional, psychological and social well-being) has a positive relationship with job satisfaction and job engagement (Diederick & Rothmann, 2013). It was found that work engagement is a vital indicator of flourishment.

Cattell et al. (2016) found that there is correlation between job dissatisfaction, job stress and stress-related illness. Narainsamy and Van der Westhuizen (2013) found that job stress and burnout negatively related to well-being. Job satisfaction had a positive relation with well-being and work engagement.

The Job Characteristic Model was developed by Hackman and Oldham (1976). The model is aimed at studying how certain job characteristics affect the job and the level of employees' job satisfaction. According to Lunenberg (2011), the model is created in such a way that workers get to enjoy their work and at the same time feel valued and attach something meaningful to the work. Hackman and Oldham (1976) created the model such that it consists of five characteristics starting with skill variety; task variety; task significance; autonomy; and feedback. These are concerned with extent to which employees are required to use a variety of their skills (skill variety); do different kinds of jobs (task variety); do work that is important and meaningful (task significance); have a choice in how the work is being executed (autonomy) and receive feedback about performance (feedback) which may influence their motivation and job satisfaction at work.

2.4 Job demands-resources and job satisfaction

When employers assign proper working hours (job demands), productivity increases (Narainsamy & Van der Westhuizen, 2013). Ali et al. (2013) found that good working conditions tend to maximize productivity. The working condition within an organisation is essential for any organisation to function optimally. When employees work under difficult conditions, studies have shown higher levels of absenteeism, lower levels of work engagement, and stress has significantly been higher, which further lowers productivity (Ali et al., 2013). When job demands (workload) is high, employee productivity decreases. Productivity is influenced by job satisfaction (Utami et al., 2020).

2.5 Job demands-resources and work engagement

Schaufeli et al. (2009) found that job resources, job demand and work engagement are dependent on each other. When job demands increase and job resources decrease in the workplace, burnout is likely to occur. When employers increase the social support, promotion and feedback in the workplace, employees' work engagement increases significantly (Schaufeli et al., 2009).

The researchers further found that burnout (positively) and work engagement (negatively) impact the (sick) absence of employees. Employee work engagement promotes job resources, and this further elevates work engagement of employees (Schaufeli et al., 2009). This is in line with the principles of the broaden-and-build theory where positive emotions build further resources that further enhance more positive emotions.

2.6 Job satisfaction and work engagement

S According to Bakker (2011), work engagement differs from job satisfaction in that it links high work pleasure (dedication) with high activation (vigour), while job satisfaction is typically a more passive form of employee well-being. The researchers further found a relationship between job satisfaction and

work engagement (Schaufeli et al., 2009). It was found that work engagement increased significantly amongst employees in management. Pieters (2017) found a significant relationship between job satisfaction and work engagement.

Research by Tims et al. (2013) found that an increase in job crafting, which is when employees adjust the fit of their jobs to their preference, has been shown to increase job satisfaction and work engagement. Tims et al. (2013) reported that an increase in job resources significantly decreases levels of burnout and further elevated job satisfaction.

Based on the literature discussed above, the following hypotheses were developed. *Hypothesis 1*: Growth opportunities and advancement opportunities (job resources) have a positive relationship with job satisfaction. *Hypothesis 2*: Job satisfaction has a positive relationship with work engagement. *Hypothesis 3*: Growth opportunities and advancement opportunities (job resources) have a positive relationship with work engagement. *Hypothesis 4*: Growth opportunities and advancement opportunities predict job satisfaction. *Hypothesis 5*: Job satisfaction and job resources predict work engagement.

3. Methodology

3.1. Research design

The quantitative research approach was used for this study to collect numerical and other statistical data, which makes it easy for generalisations of data findings to the area of research. The researchers used a cross-sectional research design.

3.2 Population and sample

Be The study population are the employees of Dundee Precious Metals Mine in the Oshikoto Region (N=2030). The employees of Dundee Precious Metals Mine who completed the questionnaire in this research constitute the sample of the study.

This research uses a quantitative research method, it consisted of n=150 participants who were randomly selected (availability sampling). The biographical information is presented in Table 1 below.

Table 1:

Descriptive Statistics for Participant Demographics (n=150)

Category:	Item:	Frequency:	Percentage:
SEX:	Male:	77	51.3
	Female:	73	48.7
AGE:	Below 24:	35	23.3
	24-28	38	25.3
	29-31	19	12.7
	32-35	18	12.0
	36-40	19	12.7
	41-45	10	6.7
	46-50	7	4.7
	51 and older	4	2.7
TENURE:	Less than 1 year	23	15.3
	1-2	37	24.7
	3-4	42	28.0
	5-6	17	11.3
	7-8	11	7.3
	9-10	10	6.7
	11-15	6	4.0
	16 and more	4	2.7
QUALIFICATIONS:	Grade 12	44	29.3
	Certificate	15	10.0
	Diploma	19	12.7
	Degree	28	18.7
	Honours Degree	34	22.7
	Master's Degree	10	6.7
NUMBER OF DEPENDENTS (children):	None	55	36.7
	1-2	55	36.7
	3-4	19	12.7
	5-6	16	10.7
	7-9	5	3.3
MARITAL STATUS:	Single	100	66.7
	Married	39	26.0
	Divorced	7	4.7
	Widowed	4	2.7
MANAGEMENT LEVEL	Non-management	83	55.3
	Mid-level management	53	35.3
	Senior-level management	14	9.3
TOTAL:		**150**	**100.0**

3.3 Research instruments

Ac The first part of the questionnaire consisted of the demographic items about participants' sex, age, total years in the mining industry, marital status, number of children, highest qualification obtained and management level. The questionnaires were distributed in person (hard copy) and via good forms

(online link). The questionnaire was divided into three sections. The first section focused on the *Job Demands-Resources Scale* (JD-RS) which was created by Jackson and Rothmann (2005). It was aimed at measuring the job demands and job resources in the workplace or organisations. The job demands-resources scale consisted of 14 items which focused on growth opportunities, "Do you have enough variety in your work" and advancement opportunities "Can you live comfortably on your pay?". The items were rated on a four-point scale ranging from 1 (never), 2 (sometimes), 3 (most of the time) and 4 (always).

The second section was the *Job Satisfaction Scale* (JSS) that was designed by Spector (1997) to assess job satisfaction. The JSS assessed nine categories of job satisfaction which are as follows: pay, promotion, supervision, fringe benefits, contingent rewards, operating conditions, co-workers, nature of work and communications (Spector, 1997). The JSS consisted of 20 comprehensive questions that helped the researchers to assess the five respective components which are promotion, co-workers, pay, supervision and nature of work. The promotion dimension is assessed by asking questions like "There is really too little chance for promotion on my work" and the co-worker dimension is assessed by asking questions like: "I enjoy my co-workers". The third dimension is the pay, and it was assessed by asking questions like: "I feel satisfied with my chances for salary increases". The fourth dimension that was assessed is the supervisor; it was assessed by asking questions such as: "My supervisor is unfair to me". The last dimension that was assessed is nature of work, and this was done by asking questions such as: "There is too much bickering and fighting at work". The Job satisfaction scale uses a six (6) point Likert type scale where the scales are: 1=Disagree very much; 2=Disagree moderately; 3=Disagree slightly; 4=Agree Slightly; 5= Agree moderately and lastly, 6= Agree very much.

The third section of the questionnaire assessed work engagement which was measured using the *Utrecht Work Engagement Scale* (UWES-9) by Schaufeli and Bakker (2004). The scale has three (3) items that measure a participant's level of vigour- "At my work, I feel strong and vigorous".

Three (3) items measure a participant's level of dedication- "My work inspires me", and three (3) items measure a participant's level of absorption at work- "I am immersed in my work". The researchers collected all the responses by making use of a seven-point (7) Likert scale questions/statements ranging from 0-6, where 0 (never), 1 (few times a year or less), 2 (once a month), 3 (a few times a month), 4 (once a week), 5 (a few times a week) and 6 (every day).

3.4 Data analysis

The researchers used Microsoft Excel to record the relevant information that was obtained from the questionnaires. Quantitative data was analysed using SPSS Version 26 for interpretation including descriptive statistics that were used to describe the data and assess the reliability of the instruments (Cronbach alpha). Pearson's correlations were used to determine the relationship between variables. Multiple regression was used to assess which dimensions are significant predictors of job satisfaction and work engagement.

3.5. Research ethics

The researchers obtained ethical clearance from the Head of Department: Human Sciences, Faculty of Humanities and Social Sciences, University of Namibia before conducting the research. No information will be discussed with unauthorised individuals (confidentiality); to protect participant's identity (anonymity), no names will be used, and the right to withdraw from the study at any time was respected without any negative consequences. No participant was forced to participate in the study, and permission were requested from the organisation and consent from the participants. Research data will be kept in a locked safe for safe keeping for a period of five years and destroyed (shredded) afterwards.

4. Results

Table 2 below present the descriptive results related to the mean, standard deviation, Cronbach alpha and correlation. All variables reported a positive relationship with each other.

Table 2:

Descriptive Statistics and Pearson Correlation Coefficient.

	M	SD	A	1.	2.	3.	4.	5.	6.	7.
1. Growth	19.97	4.52	.82	-						
2. Advancement	13.31	3.65	.78	.46*+	-					
3. JD-R_resources	33.28	6.99	.84	.89++	.82++	-				
4. Job satisfaction	68.29	10.19	.71	.40*+	.45*+	.49*+	-			
5. Vigour	15.49	4.35	.73	.48*+	.38*+	.51++	.32*+	-		
6. Absorption	15.82	4.31	.69	.38*+	.36*+	.43*+	.31*+	.67++	-	
7. Work engagement	37.24	8.91	.84	.50++	.43*+	.55++	.38*+	.89++	.92++	-

* Statistically significant: $p \leq 0,05$

\+ Practically significant correlation (medium effect): $0,30 \leq r \leq 0,49$

\++ Practically significant correlation (large effect): $r \geq 0,50$

1. Growth opportunities (JD-R)
2. Advancement opportunities (JD-R)
3. D-R_resources (JD-R resources)
4. Job satisfaction
5. Vigour (Work engagement)
6. Absorption (Work engagement)
7. Work engagement

The mean (19.97) and standard deviation (4.52) for growth opportunities was recorded and for advancement opportunities the mean score is 13.31 and SD of 3.65. JD-R_resources reported a mean score of 33.28 and SD of 6.99. A mean of 68.29 was recorded for job satisfaction (JS), 15.49 for vigour; 15.82 for absorption and 37.24 for work engagement (WE). SD scores were recorded for job satisfaction (10.19), vigour (4.35), absorption (4.31) and work engagement (8.91).

Cronbach's Alpha is 0.82 which reported for the growth opportunities; 0.78 for advancement opportunities and 0.84 for JD-R_resources. Cronbach's Alpha for job satisfaction is 0.71, 0.73 for vigour, 0.69 for absorption and 0.84 for work engagement.

Growth opportunities (JD-R) reported a relationship with advancement opportunities (JD-R) (r = 0.46, p < 0.05; medium effect), with JD-R_resources (r = 0.89, p < 0.05; large effect); with job satisfaction (r = 0.40, p < 0.05; medium effect); with vigour (work engagement) (r = 0.48, p < 0.05; medium effect); with absorption (work engagement) (r = 0.38, p < 0.05; medium effect); and with work engagement (r = 0.50, p < 0.05; large effect).

Advancement opportunities (JD-R) reported a relationship with JD-R_resources (r = 0.82, p < 0.05; large effect); with job satisfaction (r = 0.45, p < 0.05; medium effect); with vigour (work engagement) (r = 0.38, p < 0.05; medium effect); with absorption (work engagement) (r = 0.36, p < 0.05; medium effect); and with work engagement (r = 0.43, p < 0.05; medium effect).

JD-R_resources reported a relationship with job satisfaction (r = 0.49, p < 0.05; medium effect); with vigour (work engagement) (r = 0.51, p < 0.05; large effect); with absorption (work engagement) (r = 0.43, p < 0.05; medium effect); and with work engagement (r = 0.55, p < 0.05; large effect).

Job satisfaction reported a relationship with vigour (work engagement) (r = 0.32, p < 0.05; medium effect); with absorption (work engagement) (r = 0.31, p < 0.05; medium effect); and with work engagement (r = 0.38, p < 0.05; medium effect).

Vigour (work engagement) reported a relationship with absorption (work engagement) (r = 0.67, p < 0.05; large effect); and with work engagement (r = 0.89, p < 0.05; large effect).

Absorption (work engagement) reported a relationship with work engagement (r = 0.50, p < 0.05; large effect).

Multiple regression

Multiple regression was used to identify which dimensions of the JD-R model will best predict the variance in job satisfaction. The first model analysed growth opportunities (JD-R) as the independent variable and job satisfaction as the dependent variable (Model 1). Advancement opportunities (JD-R) was added in Model 2 as an independent variable. The results are reported in Table 3.

Table 3:

Multiple Regression with Job satisfaction being the dependent variable and growth opportunities (JD-R) and advancement opportunities (JD-R) the dependent variables

odel	Unstandardized Coefficients		Standardized Coefficients (β)	T	*P*	F	R^2	ΔR^2
	Beta	SE						
onstant)	50.29	3.47		14.49	0.00**	28.24	.161	.155
ROWTH	0.90	0.17	0.40	5.31	0.00**			
onstant)	44.71	3.56		12.55	0.00**	24.20	.249	.239
ROWTH	0.55	0.18	0.25	3.04	0.00**			
DV	0.94	0.23	0.34	4.13	0.00**			

t, test; *p*, probability value; *F*, overall significance; *R2*, percentage variance explained; Δ*R2*, change in percentage variance explained; B, regression coefficient; SE, standard error.
*p ≤ 0.05; **p ≤ 0.01.

GROWTH = Growth opportunities (JD-R);

ADV = Advancement opportunities (JD-R)

As can be seen from Table 3, entry of growth opportunities at the first step of the regression analysis produced a statistically significant model ($F_{(1,147)}$ = 28.24; p < 0,00) and accounted for 15.5% of the variance in job satisfaction. In Model 2, advancement opportunities (JD-R) was added and produced a statistically significant model ($F_{(2,146)}$ = 24.20; p < 0,00) and accounted for 23.9% of the variance in job satisfaction.

Multiple regression was employed to establish which variable between job satisfaction and job resources (JD-R) would best predict the variance in work engagement. The first model analysed used job satisfaction as the independent variable and work engagement as the dependent variable (Model 1). Job resources (JD-R) was added in Model 2 as the independent variable. The results are reported in Table 4.

Table 4:

Multiple Regression with work engagement being the dependent variable and job satisfaction and job resources (JD-R) the dependent variables

odel	Unstandardized Coefficients		Standardized Coefficients (β)	T	*P*	F	R^2	ΔR^2
	Beta	SE						
onstant)	14.52	4.60		3.16	0.00	24.92	.145	.139
	0.33	0.07	0.38	4.99	0.00**			
onstant)	8.37	4.26		1.97	0.05*	33.53	.315	.305
	0.13	0.07	0.15	1.87	0.06			
R_RES	0.60	0.10	0.48	6.02	0.00**			

t, test; *p*, probability value; *F*, overall significance; *R2*, percentage variance explained; Δ*R2*, change in percentage variance explained; B, regression coefficient; SE, standard error.
*p ≤ 0.05; **p ≤ 0.01.

JS = Job satisfaction;

JDR_RES = Job resources (JD-R);

5. Discussion

The aim of the study was to assess the relationship between growth opportunities, advancement opportunities (job demands-resources), job satisfaction and work engagement of mining employees at Dundee Precious Metals Mine, Tsumeb. This study found a positive relationship between growth opportunities, advancement opportunities (job resources) and job satisfaction. This supports *Hypothesis 1* of this study. The findings of this study are in line with Visser et al. (2012) who found that job resources (money) enhance employees' motivation and job satisfaction. This study further explored whether growth opportunities and advancement opportunities predict job satisfaction. The results support *Hypothesis 4* of this study. Growth opportunities and advancement opportunities predict 23.9% of the variance in job satisfaction for this study.

The result of this study supports *Hypothesis 2*. Job satisfaction and work engagement reported a positive relationship. Studies by Pieters (2017); Schaufeli et al. (2009); Yeh (2015) and Zhang et al. (2020) found supporting evidence for this relationship. When employees are experiencing job satisfaction, they are motivated to work towards the goals and objectives of the organisation- for the organisation that supports their needs.

Hypothesis 3 of this study was aimed at assessing the relationship between growth opportunities, advancement opportunities (job resources) and work engagement. The results from this study support Hypothesis 3. Hakanen et al. (2006); Schaufeli et al. (2009) noted that job resources enhance work engagement. On the other hand, Schaufeli et al. (2009) emphasised that job demands lead to burnout and disengagement of employees.

Hypothesis 5 of this study explored the predictability of job satisfaction and job resources on work engagement. The results support Hypothesis 5. Job satisfaction and job resources predicted 30.5% of work engagement for this study. The positive relationship between job resources, job satisfaction and work engagement is supported by Pieters (2017); Schaufeli et al. (2009) and Tims et al. (2013). Job resources enhance job satisfaction and work engagement, while job satisfaction directly improves work engagement of employees.

6. Limitations

This study is limited because of the methodology (cross-sectional design). The variables can only be measured at one point and not over a long period of time. This study focused on mining employees at Dundee Precious Metals Mine; thus, it cannot be generalised to other employees or the entire mining industry of Namibia.

7. Recommendations

To provide more growth opportunities for employees, the mine could identify employees with potential to act during the absence of senior employees or supervisors. This would allow these employees the opportunity to develop further potential and at the same time, satisfy their need for growth opportunities. Employees can be incentivised and develop their skills and competencies simultaneously.

Employees could also be included in job rotation to expose them to the different aspects of their departments and organisation. Job rotation allows employees to enhance their experience and knowledge related to the different aspects/components of the organisation/processes which could enhance overall effectiveness in their work roles.

The organisation could request experienced senior employees to provide training to less experienced employees. Considering the age and working experience of the sampled employees, the organisation is likely to have challenges when the senior employees retire and/or leave the organisation.

Thus, training workshops could be used to educate and upskill employees through on-the-job training and on-site workshops. If the organisation has the financial capacity, external training may be sourced. Organisations should require employees that attend training, internal or external, to transfer these skills to other employees and share the knowledge gained. This may hold benefits for the employees that provide the training (feeling proud), and it could also enhance the relationship between employees (relatedness).

Employees may also experience growth opportunities when they are consulted about decisions within the organisation, procedures and their views. Allowing employees to become part of the decision-making process enhances their growth opportunities and their levels of perceived importance within the organisation. Through this, autonomy and meaningfulness may enhance job satisfaction and work engagement of employees.

To provide employees with advancement opportunities, the organisation can initiate "employee of the month" recognition. In this way, employees that perform exemplary for a certain

month/time can be recognised and awarded to acknowledge and promote performance. Such awards and recognition could stimulate healthy competition amongst employees and improve overall performance of the department/organisation. This could be extended for annual performance evaluation where employees get performance bonuses or other awards based on employee preferences.

As part of advancement opportunities, employees expect to live off their salaries and benefits but also to advance in terms of their socio-economic status and what the job can provide. To ensure that organisations pay equitable, fair salaries and benefits, it is important to conduct internal and external assessments regularly. This will ensure that employees within the organisation are compensated fairly within the organisation and fairly in comparison to competitors/organisations in the job market.

Organisations may explore promoting employees not only based on tertiary qualifications but by focusing on expertise and years of service. Some employees may not progress academically in terms of further studies but contribute significantly to the organisation. It would be beneficial to have policies in place that promote employees based on these different criteria as well.

Often, employees may be uninformed about the requirements and promotion procedures. This includes vertical and horizontal advancement. When employees know what is expected of them to advance, they may be more focused and directed in how they spend their time at work. Some employees may have worked for the organisation for many years, and a refresher education session could benefit them as well. Education about promotion policy and procedures also enhances the perceived fairness with outcomes of promotion decisions.

Interventions such as being paid fairly and equitably, being promoted for years of service and excellent work may enhance advancement opportunities for mining employees and could also enhance their job satisfaction levels.

Job satisfaction may also be enhanced by healthy relationships between colleagues and with superiors/supervisors. The organisation could ensure that there are different platforms where staff can share their concerns, resolve conflict and address challenges in an open and transparent manner. Making these avenues available and known to staff enhances conflict resolution and stimulates an environment that welcomes the resolution of challenges.

Employees can also be equipped with conflict resolution and interpersonal relationships skills. This can facilitate enhanced conflict resolution and improved healthy relationships at work and in life.

Job rotation does not only enhance growth opportunities, but it makes work more interesting and enjoyable. Organisations and employees can identify ways such as job crafting to enhance motivation, reduce boredom and create opportunities to utilise different skill sets at work. Allowing diverse and distinct ways of thinking and working in the organisation can facilitate creative and innovative ways of executing work tasks.

Future studies could be longitudinal to test behaviour over a longer period. Future studies could also focus on other variables that predict job satisfaction and work engagement of employees considering that work resources and job satisfaction predicted some of the variance. The studies could also be focused on other mining organisations and other industries in Namibia.

8. Conclusion

This study investigated the relationship between job demands-resources (growth and advancement opportunities), job satisfaction and work engagement of Dundee Precious Metals Mine employees. This study found a positive relationship between growth opportunities, advancement opportunities, job satisfaction and work engagement.

Growth opportunities and advancement opportunities predicted job satisfaction. Job resources (growth and advancement opportunities) and job satisfaction predicted employees' work engagement. This study presented practical recommendations for industry practitioners, the management of the mine and future academics/researchers.

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'By Grade 5, learners can read, right?': Examining the reading ability of Namibian learners

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ABSTRACT

By Grade 4, English as a second language (ESL) learners are expected to read fluently and be able to read to learn from their grade-appropriate texts. The purpose of this article was to examine the reading ability of learners in Namibian schools (in the Zambezi Region), with a view to enhance the learners' literacy levels. A quantitative research method was used in which three literacy tests were used in four schools to assess 365 Grade 5 learners' decoding and reading comprehension levels. The analysis of the results showed that the learners had low decoding and reading comprehension skills. Considering the low reading levels of the learners, it seems the schools do not provide effective instructional practices. The results suggest that there is a need to improve learners' reading comprehension levels through teacher empowerment to enhance their instructional practices.

1. Introduction

Comprehending a text is the main reason for reading; it makes sense, therefore, to assess learners' reading levels and teach them how to comprehend what they read. By Grade 4, learners should be able to read fluently and comprehend reading materials at their grade level. However, many learners in Africa, particularly in Namibia, go through Primary Phase (Pre-Primary–Grade 7) with weak reading ability and they perform poorly academically (Liswaniso & Pretorius, 2022; Shigwedha, Nakashole, Auala, Amakutuwa & Ailonga, 2017; The Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) III, 2010; SACMEQ II, 2005; SACMEQ I, 1998). To date Namibia has participated in four SACMEQ assessments that test reading and mathematics skills at Grade 6 level, namely SACMEQ I (1995), SACMEQ II (2004), SACMEQ III (2007), and SACMEQ IV (2013). The first three SACMEQ assessments found that Namibian Grade 6 learners were poor readers and had reading comprehension levels below the SACMEQ reading average of 500 points. Even though the Namibian learners performed a bit above the average in SACMEQ IV in 2013, their performance was still not desirable. These SACMEQ results highlight a serious reading challenge in Namibian schools.

Two broad stages are identified in the reading trajectory; the early 'learning to read' stage and the later 'reading to learn', when reading is used as a learning tool. Learning to read needs to be given special attention in preschool and Grades 1–3 because learning is cumulative in nature (cf. World Bank, 2018; Hernandez, 2011), which means that if the early stage of reading is not properly established, later reading becomes challenging. Pedagogic focus and opportunities for reading to learn, fluent reading, pleasure reading, and reading for meaning should be given priority by Grade 4 for success in

schooling in the upper grades (cf. Liswaniso & Pretorius, 2022; Pretorius, 2014) and for learners to contribute positively in society later in life. Learners who are illiterate can become relatively disadvantaged and if literacy is not achieved for all learners, the inequality gap widens, thus constraining economic growth (Castles, Rastle & Nation, 2018; Graham & Kelly, 2018).

This article reports the quantitative results of a baseline study which was conducted in September and October 2018 to provide information about the learning and teaching context in Namibian schools (see Liswaniso, 2021). The purpose of this article to examine the reading ability and learning context of learners in Namibian schools (in the Zambezi Region) to establish the learners' reading needs, with a view to mitigate reading failure. Although similar studies had been previously conducted on this topic, the current study included the assessment of decoding aspects in addition to reading comprehension assessment.

1.1. The Objectives the study

It is within this broad context that this article examines the reading ability of Namibian learners. The following two research questions were designed to capture salient aspects of the learners' reading levels:

- *What are the decoding and reading comprehension levels of the Grade 5 learners?*
- *What is the relationship between the learners' decoding and their reading comprehension scores?*

Based on the results of the above research questions, conclusions and implications for reading instructional practices are drawn.

2. Understanding reading

The purpose of this section is to situate this study within a literacy theoretical framework. The section will provide a brief discussion of reading, its broader context, its components, and some instructional practices.

2.1 What is reading?

Reading is regarded as "a complex process that requires the automatic integration of multiple cognitive and linguistic abilities" (McWeeny, Choi, Choe, LaTourrette, Roberts, & Norton, 2022). The purpose of reading is to make meaning of a text (Pikulski & Chard, 2005; Day & Bamford, 1998). A question to ponder is: How do readers understand texts, as in the following example:

Belden decided to be adventurous. He ordered a chai latte. He scalded his tongue after taking a sip.

The above example raises further questions about understanding a text. What kind of meaning do readers make (literal or inferential)? What skills are needed to make meaning? The issues raised in these questions will be addressed throughout this literature review section. Scholars have approached reading from different perspectives, such as a cognitive view (Day & Bamford, 1998) and a sociocultural view (RAND Reading Study Group (RRSG), 2002). The term reading is a construct that encompasses both cognitive and sociocultural views. To fully understand what reading involves, the two views of reading should not be set up as oppositional, but as harmonising views/approaches because each one views comprehension with a different lens.

From a cognitive perspective, reading is defined as the ability to construct meaning "from written representations of language" (Wren, 200, p. 13), or it is a complex process of identifying words in a text to construct meaning (Kocaarslan, 2016; Lee & Spratley, 2010; Day & Bamford, 1998). Cognitive reading can also be described as a process in which a reader constructs a "coherent mental representation of a text" (Kendeou, van den Broek, Helder, & Karlsson, 2014, P. 10). The reading process in the cognitive view involves much of what happens in the mind. The sociocultural approach to reading is concerned with how reading is perceived and valued, how it is practised in a cultural setting, and what is considered as 'adequate' reading. Reading is viewed as a sociocultural activity because it is acquired through social interactions, represents how a specific cultural group (or discourse community, e.g. home) "interprets the world and transmits this information" (RAND Reading Study Group (RRSG), 2002, p. 20). Because of space constraints, this article will focus on the cognitive view of reading.

Kendeou et al. (2014, p. 11) refer to two categories in which the cognitive processes of reading can be classified: Firstly, cognitive reading involves lower level processes (e.g. letter identification and decoding process) of translating "written code into meaningful language units". Secondly, it involves higher level processes (e.g. inferential process) of combining language "units into a meaningful and coherent mental representation". The meaning construction process starts with words (word reading may depend on sub-lexical features such as phonemes and letters), and also occurs at sentence level as well at text level. The process involves the use of general knowledge of the world and knowledge of how texts work. The above example shows that reading is a complex process that goes beyond word level.

To understand the text provided earlier, a reader must have resources to identify words and apply context knowledge (cf. Castles et al., 2018). One has to have means to identify unfamiliar words such as adventurous, chai latte, and scalded, and be able to recognise that the pronoun he in the second sentence indicates that Belden is a proper noun for a male. The reader needs to be aware that ordering a chai latte is part of café/restaurant culture. Additionally, the reader should be able to tell that scalding his tongue implies that a chai latte is something hot, and taking a sip implies that this something hot is a liquid drunk from a cup/mug. One can also infer that being adventurous in this context is not about being physically adventurous but being adventurous in a culinary/food sense. All this shows that reading is a complex process involving a number of interrelated components and skills and need to be taught systematically. This suggests that teachers for English as a second language must have strong content knowledge and pedagogical content knowledge about reading to provide effective instructional practices.

Before the term reading comprehension is explained, decoding will be described first because it is the foundation from which reading comprehension is built.

2.2 Decoding

Reading consists of decoding and comprehension. Decoding is the process of transforming print (written code) into spoken language by corresponding letters or graphemes to their sounds to access a text's meaning. Efficient decoding skills are critical in reading because they form the surface level of text representation which represents the "exact wording of a text" (Hwang & Duke, 2020, p. 2). This level of text representation is crucial as it provides surface-level memory of the text. Readers with low decoding skills may not read fluently and it becomes quite difficult to comprehend a text.

The major component of decoding influencing reading comprehension is oral reading fluency (ORF). ORF is the ability to recognise words quickly and accurately; it involves reading in phrases and with appropriate expression (Grabe, 2009). Research shows that automaticity in word recognition helps to free the working memory for a reader to concentrate on comprehension of a text (Pretorius & Murray, 2019). Fluent readers recognise words automatically and reading is less taxing to their working memory. Reading fluency is affected by a range of factors such as age or grade level/reading skill, reading purpose and text difficulty.

Reading fluency is usually measured in oral reading by words correct per minute (WCPM) (Hasbrouck & Tindal, 2006). Skilled readers in English first language (L1) read around 150 WCPM aloud and between 250 and 300 WCPM silently (Grabe, 2010; Nation, 2009). In skilled readers, silent reading is much faster than in poor readers. The shift from oral to silent reading happens around Grade 3. A relationship between fluency and reading comprehension exist in both English L1 and in ESL (Grabe, 2010).

In English home language (HL), oral reading norms have been established based on a large data set involving different grades (Hasbrouck & Tindal, 2006). According to these norms, an average Grade 5 learner at the 50th percentile can increase fluency by 30 WCPM, from 110 WCPM at the beginning of an academic year be able to 139 WCPM by the end of the year. A Grade 5 learner who reads slower than 90 WCPM has a challenge with word recognition (Taylor, 2011). For L1 learners, reading 90 WCPM can be achieved by the end of Grade 3 (the average is 107 WCPM) and by Grade 5 the reading norm is 139 WCPM at the 50th percentile (Hasbrouck & Tindal, 2006).

As the recommended WCPM by Hasbrouck and Tindal (2006) was done in the context of HL readers, the reading speed may not be the same for ESL readers. For this reason, Pretorius and Spaull (2016) argue that Hasbrouck and Tindal's (2006) reading norms are not appropriate for second language (L2) readers in developing countries. In the ESL context, a reading has norm has not yet been established. ESL readers generally read about 20 words per minute slower than their L1 grade peers (Pretorius & Spaull, 2016).

Reading fluency is considered as a 'bridge' between decoding and comprehension (e.g., Wawire, Liang & Piper, 2022). Learners who are not fluent in reading tend to find reading comprehension quite challenging (National Reading Panel, 2000). A study by Pretorius and Lephalala (2011) found a strong relationship between English reading fluency and reading comprehension amongst Grade 6 L2 learners ($r = .80$), while a study by Başaran (2013) found reading fluency to be an indicator of reading comprehension among Grade 4s but the relationship was much weaker ($r = .39$). Although there are relatively fewer studies conducted on the relationship between reading fluency and reading comprehension in ESL, these studies generally show the importance of reading fluency for reading comprehension in the L2 context, and the results seem to agree with English L1 research findings (Grabe, 2010). It must be noted that reading fluency on its own does not guarantee comprehension, but it is a prerequisite for reading comprehension.

2.3 Reading comprehension

Reading comprehension involves the understanding process that occurs when meaning is constructed from a text (Pikulski & Chard, 2005; Pretorius, 2002; Day & Bamford, 1998). This understanding process is mediated through language knowledge, knowledge of a language's written code as well as higher-order reading skills. The RRSG (2002) provides a comprehensive definition of reading comprehension which encompasses both cognitive and sociocultural perspectives. Reading comprehension is defined as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (RRSG, 2002, p. 11). Reading comprehension is affected by many aspects such as ORF, vocabulary knowledge, language knowledge, background knowledge, thinking skills, knowledge of text structure, and reading motivation and interest (Pretorius and Murray, 2019; Aaron, Joshi, Gooden & Bentum, 2008).

2.4 Types of reading comprehension

The Progress in International Reading Literacy Study (PIRLS) framework describes four types of comprehension processes that assess reading comprehension, namely literal comprehension, making straightforward inference, integrating information and ideas, and critical or evaluation comprehension (Mullis, Martin, Kennedy, Trong & Sainsbury, 2009).

Literal comprehension is the lower level of reading comprehension and it requires the extraction of explicitly stated information in a text (Liu, 2010; Howie, Venter, van Staden, Zimmerman, Long, du Toit, Scherman & Archer, 2008). This is the easiest level of comprehension which deals with facts presented explicitly in a text and it includes the Who, What, Where, When, and How form of questions whose answers are explicitly stated in the text (Pretorius & Murray, 2019). A reader reading at a literal level does not only understand explicitly stated information, but also tries to relate that information to the information being sought in the question (Mullis et al., 2009). Although this type of comprehension requires little interpretation (and readers are not required to fill gaps in meaning), it is important for forming a text base representation. However, learners need to be taught to process information in a text beyond the literal level for meaningful reading.

Inferential reading comprehension requires readers to go beyond explicitly stated information to fill in gaps in meaning (Mullis et al., 2009). According to Liu (2010), inferential reading requires readers to draw conclusions, make generalisations, and predict outcomes. Some inferences are easier to make whereas others are more complex. Readers can make inferences between adjacent sentences (local meaning, e.g. determining the referent of a pronoun) and inferences across several sentences or paragraphs (global meaning, e.g. identifying generalisations in a text). This type of comprehension demonstrates reading ability and distinguishes skilled readers from less skilled readers (Pretorius, 2002).

In interpreting and integrating information and ideas, a reader makes inferences or processes the text beyond the sentence level (makes global inferences). The reader integrates text information or meaning with his/her background knowledge and experiences to construct a deeper understanding of the text (Mullis et al., 2009). This shows the importance of prior knowledge and experience in comprehending a text. Examples of this reading level include getting the theme of a text (or overall message), inferring the motive of a character, and determining an alternative to actions of a character.

The last reading comprehension level is critical or evaluation comprehension. When a reader evaluates a text, he/she examines an issue in a text, or the text itself and form an opinion about it (Pretorius & Murray, 2019). Critical or evaluation comprehension gauges a readers' ability to form some kind of judgments about a text. The reader draws ideas from past experiences or from reading other texts, and the text itself to evaluate it.

All Grade 5 learners should at least be able to answer reading comprehension questions at the first two levels (these are literal comprehension and straightforward inferential comprehension). In the PIRLS, this is the Low International Benchmark (400). Internationally, 96% of readers can reach this level (4% cannot) (Mullis, Martin, Foy & Hooper, 2017). In this article, the learners' performance was categorised only into two broad comprehension levels: literal comprehension and inferential comprehension (which included simple and complex inferencing). Learners cope better with simple inferences than with the more complex ones.

2.5 Teaching reading comprehension

Learners who are good readers read fluently and understand what they read. Research shows that explicit reading comprehension instruction (i.e. teaching reading strategies explicitly) is more effective than implicit teaching (i.e. through incidental exposure), especially with learners who are reading below their grade level (Çer & Şahim,

2016; Pretorius, 2014; Klapwijk & van der Walt, 2011; Almasi & Hart, 2011; Taylor, 2011). Explicit instruction refers to direct teaching of reading comprehension strategies by making learners aware of the strategies, and teaching them how to apply them consciously while reading.

The National Reading Panel (2000) has identified the following major topics that are central to learning to read: phonemic awareness, phonics, fluency, vocabulary, and comprehension (National Reading Panel, 2000). These topics are important part of explicit instruction strategies. Older learners at Grade 5 for whom reading is a learning tool, are expected to have some level of reading proficiency and fluency, therefore the instruction at this level should focus on reading comprehension strategies and vocabulary instead of decoding skills (i.e. phonemic awareness, phonics and fluency). However, if the lower reading skills have not developed by Grade 5, it is critical for teachers to teach the skills.

Following Taylor (2011), effective reading instruction in the primary school has four dimensions: Word recognition, fluency, vocabulary, and comprehension development (Taylor, 2011, National Reading Panel, 2000). This is related to the major topics identified by the National Reading Panel (2000). For children who start decoding or recognising words, it is important that they are first taught the letters of the alphabet, and then sound-letter relationships at pre-primary level. Taylor (2011: xviii) describes four components of "grade-specific models" for reading instruction, to be developed from preschool to Grade 5, which are described below.

How reading develops

The pre-primary level is expected to develop learners' oral language, phonemic awareness, and develop emergent literacy. By the end of Grade 1, learners should have developed a sound knowledge of phonemic awareness, letter sounds, and decoding skills. By Grade 2, learners should be able to read graded readers at Grade 2 level. If learners cannot read at Grade 2 level, an intervention should focus on helping the learners read at the appropriate grade level at the beginning of Grade 2 (Taylor, 2011). By the end of Grade 2, the learner should be able to read simple narrative texts. By Grade 3, learners should have developed oral reading fluency, have knowledge of the appropriate vocabulary, and should be able to comprehend narrative and informational texts at their level. Since learners will be required to use textbooks to read to learn in Grade 4, during the course of Grade 3 most readers should be making a transition to silent reading. In Grade 4 and 5, learners should be able to read fluently and comprehend both narrative and informational texts at their age level. Weak readers in Grade 4 and 5 need to be supported to comprehend what they read, through using comprehension strategies (e.g. questioning, making predictions, using prior knowledge, and comprehension monitoring). In the Namibian context, the ESL Senior Primary syllabus states that by the end of Grade 5 learners should be able to read their grade-level materials independently and should be able to comprehend both narrative and informational texts (Ministry of Education, Arts and Culture, 2015).

3. Research Methodology

A descriptive quantitative research design was used to analyse the reading level of Grade 5 learners, with a view to establish whether or not there is a need for a reading intervention. The research method for this study includes the educational context from which data were collected, the participants, and the data collection instruments, as described below.

3.1. School context

Four primary schools (School 1–4) within Katima Mulilo participated in the baseline study. There were only five schools with Grade 5 classes in the town. One of the five schools was randomly selected to participate in the pilot study, which was conducted in March and April 2018, and the remaining four schools all participated in the main study, which included the baseline assessments. Most of the learners were from homes with low socioeconomic status. The classes were overcrowded and some had over 50 learners in a classroom with a capacity of 35 learners.

The resources were a challenge in the participating schools. The resources that were available were not enough and did not seem readily available. All the schools that participated did not have the full complement of chairs and desks for learners. Many of the available chairs were loose or broken. School 2 did not have a library and teachers were constantly complaining about the shortage of books for learners. Although the other three schools had libraries, the libraries seemed dysfunctional as they were not reader-friendly and had limited reading materials.

A total of seven Grade 5 English teachers and four principals in the four schools were assessed. They displayed limited content and pedagogic content knowledge about reading, as reported in Liswaniso and Pretorius (2022). This background information will be used as a frame of reference for engaging the quantitative data.

3.2 Participants and sampling

A total of 365 Grade 5 learners participated in the baseline study. The learners' ages ranged from 10.1 years to 16.1 years, with a mean age of 11.3 years. School 1 had only two Grade 5 classes whereas Schools 2–4 had four Grade 5 classes each; only two classes were selected per school using the Grade 5A – B stream of classes.

A few learners (9.5% of the total) did not participate, either because they were absent during the assessments or their parents did not give consent for them to participate. Most of the learners who participated in this study were from low socioeconomic homes and many of their parents were illiterate.

3.3 The research instruments

In September/October 2018 a baseline study was conducted using three literacy assessment instruments namely, the Burt Word Reading Test (BWRT), the Oral Reading Fluency (ORF) test, and the reading comprehension test. The three research instruments were piloted before being used in the baseline study. For the descriptions of the research instruments, see Liswaniso (2021). The research instruments were administered in the same order as they are listed in this section.

4. Results of the reading assessments

The results for decoding assessments (i.e. word recognition and reading fluency) will be presented first, and then the reading comprehension results. Thereafter, the correlations between the reading components will be examined to establish whether there is some kind of relationship in the reading scores of the literacy assessments.

4.1 Decoding assessment outcomes

Word reading and oral reading fluency measures were used to assess the learners' decoding skills. All in all, 338 learners were tested on the BWRT for the baseline study. The Cronbach alpha reliability coefficient for the BWRT was .97, which is considered high. The Kolmogorov-Smirnov test of normality showed that the data for all the schools were not normally distributed, therefore, non-parametric tests were applied to analyse the data further.

Table 1 shows the learners' means in terms of real age (in years and months), and BWRT raw score out of 110 items, including the BWRT age. The latter means are based on HL English children. There were no learners who scored zero.

Table 1: Grade 5 BWRT results

	BWRT score	**Real age**	**BWRT age**
All (n=338)			
Mean	52	11.3	8.2
SD	19.8		
Minimum-Maximum	1-100	10.1-16.1	5.4-13.3
Percentiles:	37		
25th	49		
50th	68		
75th			

* The BWRT comprises 110 words in total.

Table 1 shows that the learners generally had poor word recognition ability. Even the best performing learners at the 75th percentile had a low recognition word level with a mean of 68. The mean of the BWRT age of these English L2 learners is 3.1 years below the word reading norm of English HL learners of the same age.

Moving from single word reading to passage reading, oral reading fluency performance is described below.

Table 2: Grade 5 ORF test results

	Total words read	**Total errors**	**Words read correctly**
All (n=325)			
Mean	66.3	7.5	58.6
SD			32.2
Minimum-Maximum	6–160	1-28	0-158
Percentiles:			35
25th			57
50th			78
75th			

Table 2 shows that on average the Grade 5 learners were reading very slowly, similar to Grade 2 HL readers (Hasbrouck and Tindal, 2006). One learner could not read at all and was even unable to read the title of the ORF text. Only five learners were reading at rates comparable to HL readers.

4.2 Reading comprehension

A total of 348 learners wrote the reading comprehension test. The Cronbach reliability coefficient for the test was .82. Table 3 shows the scores for the reading comprehension test in percentages, which was analysed in terms of literal, inferential and total score. The percentage of learners with a zero score was very low (0.6%).

Table 3: Reading comprehension scores

	Literal score	T2 Inferential score	Total score
All (n=348)			
Mean	33.5	20.5	24.6
SD	21.1	12.7	14.4
Min.-Max.:	0-83	0-69	0-74
Percentiles:			
25th	17	12	13
50th	25	19	21
75th	50	31	34

Table 3 shows a weak mean total score of 24.6% for the participating learners in the reading comprehension test. Even the best performing cohorts at the 75th percentile performed below 40%. The weakest performance appears in inferential reading (a mean of 20.5%, compared to 33.5% for literal comprehension). Generally, the results indicate that the learners struggle to comprehend texts, even at the literal level.

4.3 Relationship between reading components

Non-parametric Spearman's rho was applied to determine relationships between the two decoding scores (the BWRT and ORF), and the reading comprehension (RC) test scores.

Table 4: Correlation between ORF, BWRT and reading comprehension

	RC total	Literal	Inferential	ORF	BWRT
RC total				.74	.72
Literal			.72	.68	.66
Inferential				.70	.68
ORF					.84

All correlations highly significant at the .001 level (2-tailed)

5. Discussion of the results

The study reported in this article was meant to establish the learning context and reading levels of Grade 5 learners in low socioeconomic schools to determine whether the learners need extra support to enhance their reading skills.

The decoding assessment results in this study showed that the learners had poor word recognition ability and they were reading very slowly (the mean of 58.6). Since ORF is the bridge between decoding and comprehension (Pretorius & Spaull, 2016), learners need to develop sufficient fluency in reading to benefit from reading texts. According to the National Reading Panel (2000), learners with low reading fluency levels can have difficulties in comprehending their reading materials. According to international standards, learners reading less than 40 words WCPM in English are non-readers and can hardly understand what they read (Draper & Spaull, 2015). In this study, 31% of the Grade 5 learners fell in the category of non-readers. Pretorius and Spaull's (2016) findings indicated that ESL learners reading below 70 WCPM struggle to comprehend what they read. Following Pretorius and Spaull's (2016) reading threshold, 69.7% of the learners who participated in this study struggled to comprehend their reading texts.

For the learners in this study whose reading is slow and laborious, understanding aspects of a text at inferential level when reading is even harder. The low reading comprehension in both literal and inferential reading relates to their poor decoding skills. According to McCormick (1995), a score level of 50% or less on a reading comprehension test indicates that the learners are reading at a frustration level. The mean score for the test was 24.6%, suggesting that the learners were reading at frustration level, following McCormick (1995).

The relationship between decoding skills and reading comprehension established in this study supports Gough and Tunmer's (1986) simple view of reading. In this model, reading comprehension relies on decoding skills and linguistic comprehension. The low reading comprehension levels of learners in the baseline study might have been partially caused by their poor decoding skills. These learners need higher decoding skills for their attention resources to focus on meaning construction rather than on word identification (cf. Kuhn & Stahl, 2003).

Good decoding skills can be a pathway for the learners to develop better vocabulary levels and reading comprehension. Reading is too effortful if decoding takes up all one's time and cognitive energy. ESL teachers need this understanding and have adequate pedagogic content knowledge to support their learners to develop reading comprehension skills. Teachers' knowledge about reading relates significantly to their learners' achievement in reading comprehension (Taylor, 2011). It must be noted that with good instructional practices, ESL learners can perform at similar decoding levels to their English HL peers (cf. Lesaux, Rupp, & Siegel, 2007; Chiappe & Siegel, 1999). ESL learners' main challenges lie in vocabulary and reading comprehension. Even some of the learners

who appeared to read relatively fast in the ORF test were not able to answer some comprehension questions on parts of the text that they had read. Altogether, the results suggested a need for a reading comprehension intervention.

Although the Grade 5 learners displayed a positive reading attitude (see the findings of the main study, as reported in Liswaniso, 2021), they seemed to receive little support in terms of reading development for them to transform their reading attitude into the motivational drive to read. Positive reading attitudes usually develop when learners are motivated to read (Applegate & Applegate, 2004) or when they can decode without difficulty (Clark & Poulton, 2011). A positive reading attitude is enhanced through reading instruction and opportunities to read. Furthermore, it should be noted that a positive reading attitude does not necessarily translate into action (Guthrie and Knowles, 2001). The positive reading attitude displayed by the poor readers may be aspirational (i.e. how the learners would like to see themselves) rather than how they actually are. Considering the socioeconomic status of the learners, many of them read only in the classroom. Even when reading materials are available, their poor decoding skills may make reading an arduous activity. Therefore, they need direct instruction in decoding and reading comprehension to become better readers.

6. Conclusion and implications

The results of this study showed that the learners were reading very slowly and struggled to comprehend texts at their grade level, suggesting that they needed assistance in enhancing their decoding as well as their reading comprehension skills. From the poor word recognition skills revealed in the baseline study, one may also infer that the learners have low levels of vocabulary knowledge; therefore there was also a critical need for teachers to systematically develop learners' vocabulary levels. Teaching only reading comprehension strategies to learners with poor decoding skills is less likely to be effective because the learners have not yet mastered the lower level reading skills (Castles et al., 2018). Therefore, reading support needed to include three components, namely fluency, vocabulary, and comprehension.

Despite teaching happening in schools, learning to read seems not to have developed to a level that support learning. These poor readers are excluded from learning from their books and they are unlikely to access the Twenty-First century skills needed for economic development (cf. Taylor, 2019). Empowering teachers with content knowledge and pedagogic content knowledge is of paramount importance so that they could make their instructional practices more effective and so improve learner performance. This could be done through raising awareness of teaching reading, improving their content knowledge, pedagogic knowledge of reading, and providing them with teaching and learning activities. Finally, reading to learn in Namibian schools can be achieved for all learners if in-service teachers receive necessary ongoing support and if teacher training institutions prepare future teachers adequately for teaching reading.

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Original Research Article

The use of soil amendments in crop production: a review

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ABSTRACT

The fertility status of the Namibian soils is very low. In some parts of the country, such as the semi-arid Central Namibia, this phenomenon is much more extreme and, hence, a significant setback for crop growers. The soils are primarily sandy and lack organic matter, further worsened by low precipitation, high temperatures, and high evapotranspiration rates. This paper provides a background on soil amendments, including the two primary ways of categorising them based on the origin and the composition of the material(s) forming the amendments. Secondly, it offers a historical overview of the general agricultural use of soil amendments. Lastly, the paper discusses different soil amendments currently used and their effects on the fertility and productivity of agricultural soils. It is recommended that the effectiveness and the optimal application ratios of locally available soil amendments for crop production be studied.

1. Introduction

As the human population increases, there is a growing pressure to increase food production to meet the increasing demand. In Namibia, the challenge to increase crop for food production is further amplified by different environmental factors, including poor sandy soils, low rainfall and high evapotranspiration rates, as a result of climate change (Ministry of Environment and Tourism [MET], 2019; Watanabe et al., 2019).

Worldwide, the use of different soil amendments (both soil conditioners and fertilisers), such as compost, biochar, horn meal, bone meal, and animal manure, is being promoted to mitigate these environmental challenges faced in crop production (Cataldo et al., 2021; Laghari et al., 2016; Şeker & Manirakiza, 2020). Shinde, Sarkar, and Thombare (2019) defined soil conditioners as materials with limited amounts of nutrients but are beneficial to the soil's physical, biological and chemical nature. On the other hand, fertilisers can be defined as any synthetic or organic materials typically applied to soils to supply nutrient(s) essential for plant growth (Trembley, 1973). The different soil amendments can be classified based on the origin and composition of the materials from which they are made. Amendments can either be synthetic or naturally occurring in origin and can either be organic or inorganic in composition (Shinde et al., 2019). Organic soil amendments such as compost, manure, bone meal, biochar, and crop residues are derived from living things by-products. In contrast, inorganic soil amendment materials are either mined or by-products of manufacturing, which include lime, zeolites, gypsum and hydrogel polymers (Shinde et al., 2019).

Practices involving soil amendments, especially organic ones, can be traced back to 2000 BC and have been commonly attributed to successful sustainable farming in countries like Japan, China, and Korea over the centuries. The materials used at the time, usually composted, included animal

manures, wood ashes, green manures, crop residues, canal mud, tree leaves, aquatic weeds, wild grasses and urban sewage (Parr & Hornick, 1992). In Namibia, field experiments on the effectiveness of soil amendments are minimal. Most of the published work is only recommendations based on general knowledge (Kahler, 2014; Mupambwa, Hausiku, Nciizah, & Dube, 2019; Zimmermann, Matzopoulos, & Kwaambwa, 2017) and based on chemical characteristics study of amendments(Katakula, Gawanab, Itanna, & Mupambwa, 2020). This paper aimed to provide an overview of the use of soil amendments in crop production, including discussing different soil amendments that could be used in Namibia and the benefits derived from their application.

2. Amendments and soil quality

Both soil conditioners and fertilisers generally affect the health/fertility of the soils' physical, biological, and chemical health, broadly impacting soil quality and crop production**;** therefore, a combination of soil conditioners and fertilisers is needed for healthy soil. Soil health is "the capacity of soil to function as a vital living system to sustain biological productivity, promote environmental quality, and maintain plant and animal health" (Urra, Alkorta, & Garbisu, 2019). Sustaining and improving soil health is a significant challenge in soil management (Bonilla, Gutiérrez-Barranquero, De Vicente, & Cazorla, 2012), especially given the reliance on synthetic fertilisers. Applying soil conditioners and organic fertilisers can be of utmost importance in addressing this challenge (Sulok et al., 2021). **Error! Reference source not found.** illustrates different components of soil health.

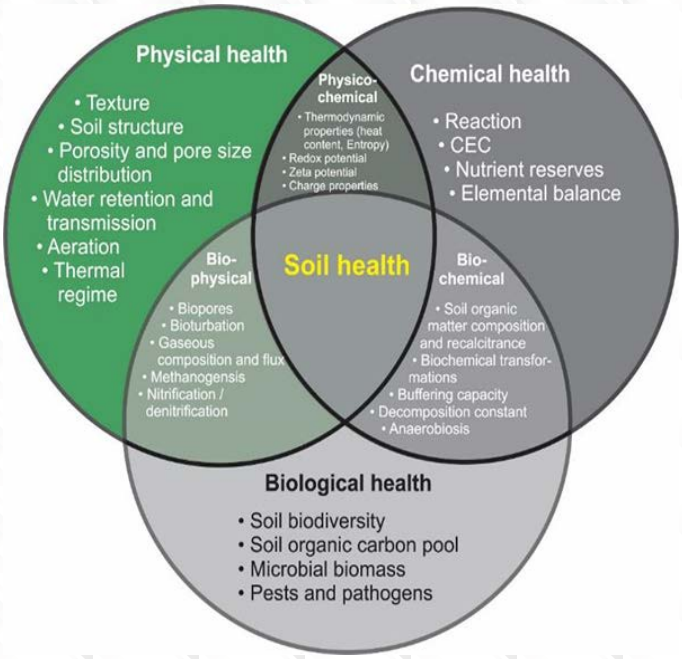

Figure 1 Components of soil health. Adapted from Isaacs (2023).

2.1 Physical soil health

One of the most critical factors to consider in maintaining the appropriate soil structure is aggregate stability, which, with the use of soil amendments, can be controlled by improving pore space necessary for good water retention, gas exchange and microbial activities in the soil (De Roy, Ghosh, Barman, & Dutta, 2016). Soils with good aggregate stability, structure, bulk density, porosity and hydraulic conductivity create a conducive environment for better retention and movement of water and nutrients, resulting in better root growth and, ultimately, higher crop yields (Toková, Igaz, Horák, & Aydin, 2020). In addition, the incorporation of soil amendments with organic matter content (OMC), especially in sandy soils, also improves the soil particle size distribution and surface area,
thereby increasing water holding capacity (Bhadha, Capasso, Khatiwada, Swanson, & LaBorde, 2017; Urra et al., 2019).

2.2 Biological soil health

Biological health is another crucial aspect of crop production, which the addition of soil amendments can influence. Soil amendment application can create a conducive environment for microorganisms, such as bacteria, actinomycetes, fungi, protozoa, nematodes, microalgae (De Roy et al., 2016) and earthworms (Shinde et al., 2019), which are essential for organic matter decomposition and nutrient recycling in the soil. The availability of microorganisms as a result of soil amendment can also indirectly improve soil structure due to microbial activities, which reportedly influence soil aggregate stability (Urra et al., 2019).

2.3 Chemical soil health

In addition to Physical and biological health, the application of soil amendments also influences the soil's chemical health, which primarily relates to soil organic carbon (OC) and cation exchange capacity (CEC) (De Roy et al., 2016). Other chemical soil health indicators include macro and micronutrients, OM and pH (Urra et al., 2019). The chemical health status of the soil interrelates with the soil's biological composition. For instance, higher availability of nutrients and growth substrates may also impact soil microbial diversity and composition by improving microbial activities and the ecological interactions between organisms (Tian et al., 2017, as cited in Urra et al., 2019). Likewise, the microbial composition influences the nutritional status of the soil. In a

natural ecosphere, most nutrients such as N, P and S are not readily available to plants; thus, soil microorganisms, such as bacteria and fungi, play a crucial role in decomposing and mineralising organic molecules into simple forms of N, P and S, that plants can access (Jacoby, Peukert, Succurro, Koprivova, & Kopriva, 2017).

3. Different soil amendments for possible application in Namibia

3.1 Biochar

Biochar can sequester carbon into the soil for sustainable and improved crop production (Abdrabbo, Hashem, Abul-Soud, Abd-Elrahman, 2015; Zhang et al., 2016). Soil carbon plays a vital role in the soil ecosystem by improving soil structure and water retention whilst also reducing atmospheric carbon dioxide (CO_2) (Zhang et al., 2016). Biochar's effectiveness in crop production is widely documented (Alburquerque et al., 2013; Vitkova, Kondrlova, Rodny, Surda, & Horak, 2017). For instance, a study by Abdulrahman, Al-Wazzan, and Al-Jawadi (2020) investigating the effects of biochar on soil moisture content and maize production has found a significant positive effect on maize grain yield and volumetric water content by 1.75 t ha^{-1} and 10.24% respectively, compared to the control. The increase in yield can be attributed to the effect biochar is reported to have on the soil's physical, chemical and biological properties (Hossain et al., 2020; Laghari et al., 2016; Sun & Lu, 2014). On physical properties, biochar application can improve the soil aggregate stability, bulk density, porosity, pH, and cation exchange capacity (CEC) (Laghari et al., 2016). In addition, a study by Saha, Galagedara, Thomas, Nadeem, and Hawboldt (2020) investigating the influence of biochar on the physico-chemical properties of podzolic soil, the application of powder biochar to the topsoil was found to increase porosity by up to 1.6%, compared to the control. In the same experiment, when granular biochar was used, porosity decreased by 3.1% compared to the control. Furthermore, Sun and Lu (2014) reported the application of wastewater-sludge biochar (WSB) to have improved soil aggregate stability by 31%, compared to the control and other two biochar types: woodchip biochar (WCB) and straw biochar (SB). The authors also found SB biochar to have improved soil water retention capacity (up to 18.4% greater, compared to the control), while pore space improvement was 29% for SB, 12% for WCB, and 16% for WSB, respectively. Moreover, according to Widowati, Sutoyo, Karamina, and Fikrinda (2020), biochar constitutes elements that behave as liming agents for acidic soils, such as potassium, magnesium, phosphorus and calcium.

Equally important, biochar also impacts soil microbial community composition (Xu et al., 2014) and microbial biomass carbon (Liu et al., 2016). Xu et al. (2014) report that applying biochar increased the diversity of soil microbes, including those related to carbon and nitrogen cycling in the soil. In addition, in their study on biochar, Liu et al. (2016) found it to have significantly improved the soil microbial biomass carbon (MBC) content by 18%.

3.2 Zeolites

A Swedish mineralist, Alex Fredrik Crönstedt, was the first Scientist to identify a natural mineral zeolite in 1756 after sampling different crystal stones from a copper mine in Sweden. After experimenting with these mineral stones by heating them immediately after soaking them in water, he discovered that they produced vast amounts of water vapour and, as a result, referred to these stones as zeolites, meaning "boiling stones" in Greek, "zeo", boiling and "lithos", stones (Cataldo et al., 2021; Jakkula & Wani, 2018). After numerous explorations by geologists, it became clear that most of the natural zeolites are deposits of volcanic activities and deposits from marine sediments (Cataldo et al., 2021). Zeolites have diverse applications, including industrial gas separation, waste-water and drinking water treatment, agriculture (crop and animal production), aquaculture, and odour control (Jakkula & Wani, 2018). For agricultural purposes, zeolites can be utilised as heavy metal remover, slow-release fertilisers, and soil conditioners to improve water and nutrient use efficiency, soil hydro-physical properties and crop yield (Jakkula & Wani, 2018). More than 50 natural zeolite types have been revealed to date, including Clinoptilolite, mordenite, analcite, phillipsite, erionite, chabazite (Cataldo et al., 2021), heulandite, laumontite, wairakite (Mumpton, n.d.).

Zeolites improve soil hydro-physical properties, including particle density, bulk density, soil porosity, aeration and water-holding capacity (Jakkula & Wani, 2018; Mondal et al., 2021). They can hold water more than half of their weight for prolonged periods due to the high porosity of their crystalline structure and can increase crop available water by up to 50% (Kalita, Bora, & Gogoi, 2020). In addition, zeolites are mainly effective under drought and sandy soil conditions (Hazrati et al., 2017). Jakkula and Wani (2018) reported that zeolites improved spinach (*Spinacia oleracea*) seed germination and yield when applied with synthetic fertilisers. Similarly, Kavoosi (2007) reported that zeolite application significantly increased rice grain yield. The author, however, noted that increasing the zeolite

application without increasing N fertiliser decreased rice grain yield. Moreover, a field study by Hazrati, Khurizadeh, and Sadeghi (2022) studying the effect of zeolite on water and nitrogen use efficiency as well as oil yield and quality of sage (*Salvia officinalis)* under water deficit stress, results indicated that zeolite overwhelmingly improved fresh and dry weight, N use efficiency, N total uptake (kg N ha^{-1}), soil N (nitrogen residue), oil content and yield. The authors also found that the interaction of nitrogen and zeolite considerably impacted water use efficiency. Generally, nitrogen application affects water use efficiency positively (Duan et al., 2014; Hussain & Al-Jaloud, 1995; Rahimi, Sayadi, Dashti, & Tajabadi, 2013).

In Namibia, zeolites have thus far been confirmed to be found in the Kunene region. Besides the Kunene region, they could also be found along the South-Eastern and North-Western parts of the country where the geological requirements of zeolite deposits have been discovered (Kahler, 2014).

3.3 Hydrogels

Hydrogels are cross-linked polymers containing a hydrophilic group capable of absorbing a large amount of water without dissolving in water (Kalhapure, Kumar, Singh, & Pandey, 2016). Hydrogel polymers are also called superabsorbent polymers (SAP) and can be categorised into two major groups based on their origin: natural- and synthetic-based polymers. Polymers from naturally occurring materials are environmentally friendly and harmless to the human body compared to synthetic materials; however, synthetic materials are more effective due to their superior mechanical properties (Oladosu et al., 2022). Generally, SAPs can potentially absorb water up to 500-600 times their weight by forming gels (Narjary et al., 2013).

The use of hydrogels is specifically effective under dry climates and sandy soil as they can improve the structure and hydro-physical properties of the soil, such as permeability, water retention, infiltration rate, and drainage (Grabowska-Polanowska et al., 2021). Other essential aspects of hydrogels are the increased water holding capacity, microbial activity, aeration and water use efficiency, and reducing soil erosion and water stress, enhancing crop production (Narjary, Aggarwal, Kumar, & Meena, 2013). A study by Rajanna, G Manna, Singh, Babu, and Singh (2022) looking at the effects of hydrogels on crop and water productivity of soybean–wheat system in the water-stressed Indo-Gangetic plains of India showed that a pusa hydrogel (P-hydrogel; a semi-synthetic cellulose product) recorded the highest soybean seed and biomass yields (1.22–1.37 Mg ha^{-1} and 4.9–5.4 Mg ha^{-1}, respectively, over two years), compared to the control and a kaoline derivative of a pusa hydrogel (K-hydrogel; also a semi-synthetic cellulose product). The P-hydrogel also improved wheat grain and biomass yield by 3.0–15.0 and 2.0–6.0%, respectively, compared with the control. A significant effect on water productivity (WP) and irrigation water productivity (IWP) by P- hydrogel was only recorded in the second year of the study.

3.4 Compost, bone meal, animal manure, etc. (Organic fertilisers)

Organic fertilisers are some of the most preferred soil amendments, not only due to their natural nutritional content and positive impact on soil health, but they are also more environmentally friendly than synthetic fertilisers. Their application on crop production helps solve waste management problems while increasing food production. The most essential characteristic of organic fertilisers is their organic matter content, which not only improves soil nutrition but also the soil structure and, ultimately, soil water storage (Terleev et al., 2018). Healthy soil typically contains at least 2.5% organic matter (Yasmin, Khan, & Billah, 2018). Table 1 presents the role and effects of organic matter on soil.

Table 1 Role of organic matter in soil (Amlinger et al., 2007)

Property	Remarks	Effects on Soil
Colour	The typical dark colour of soils is often an indication of organic matter.	It may facilitate warming during spring and summer.
Soil biodiversity	The organic composition in soils nurtures a wide variety of organisms. The composition of the organic materials influences the diversity of the organisms in the soil.	Many functions associated with soil organic matter are related to soil flora and fauna activities.
Water Retention	OM can hold up to 20 times its weight in	It helps minimise drying, shrinking and leaching. It may significantly

	water.	improve the moisture-retaining properties of sandy soils. Increasing water supply may not necessarily increase the available water content except in sandy soils.
Combination with clay minerals	Promote soil aggregation.	Allow gas exchange. Improve aggregate stability. Increases permeability.
bulk density of mineral Soils	Naturally, organic materials have a low density because they are lighter; hence, their addition 'dilutes' the mineral soil.	Increases porosity.
Chelation	Forms stable complexes with Cu^{2+}, Mn^{2+} and Zn^{2+} and other polyvalent cations.	It could increase the availability of micronutrients to higher plants.
Solubility in water	Compositions of OM and clay are insoluble. Combinations of divalent and trivalent cations with OM are not soluble. Isolated organic matter is partially water soluble.	Little organic matter is lost through leaching.
Buffer action	OM regulates soil pH in slightly acidic, neutral and alkaline ranges.	It helps to keep uniform reactions in the soil.
Cation exchange	Total acidities of isolated fractions of organic matter range from 300 to 1400 $cmol_c$ Kg^{-1}	This may increase the CEC of the soil. In many soils, 20 to 70% of the CEC is related to organic matter.
Mineralisation	Mineralisation of OM yields CO_2, NH^{4-}, NO_3^-, PO_3^{4-} and SO_2^{4-}.	It is a source of macro and micro-nutrients for plant use.
Stabilisation of contaminants	Stabilisation of organic materials in humic substances, including volatile organic compounds.	Stability is influenced by the consistency of the soil humus and the amount of carbon within the soil.

Several studies on the use of organic materials indicate that organic fertilisers positively impact soil health and crop yield (Nogalska, 2021; Watanabe et al., 2019). For instance, Watanabe et al. (2019) reported an increased soil organic content (SOC), total soil N, available P, and exchangeable K by 1.7, 1.5, 1.3, and 2.1 times when 62 Mg ha^{-1} of cattle manure was applied in their experiment on the use of cattle manure and intercropping. However, in the same study, cowpea's grain and biomass yields were higher under 31 Mg ha^{-1} than 62 Mg ha^{-1} of cattle manure. These results imply that the over-application of organic fertilisers can have a negative impact on crop yield.

In a different study using bone meal (BM), Nogalska (2021) observed that the application of BM improved maise, wheat and rape yield. Generally, BM contains 8 % N, 5 % P, 1% K and 10% Ca (Asare, 2019; Yasmin et al., 2018). Naturally, BM has a narrow N:P ratio, meaning an insufficient

amount of BM results in an N deficit. In contrast, a high amount leads to excessive accumulation of P in the soil (Nogalska, 2021). This is probably so because BM application reduces soil pH (Nogalska, 2021), leading to more available P in the soil. Composted BM is reported to be more effective than powder BM (Yasmin et al., 2018).

Moreover, composts usually contain a range of macro and micro-nutrients and impact the soil's physical, biological and chemical properties such as pH, CEC, porosity and water holding capacity (Abbott et al., 2018). Şeker and Manirakiza's (2020) study showed that compost positively impacted SOM, soil density, particle density, soil total porosity, water retention and soil aggregate stability when added to sandy clay loam soil.

Despite the benefits offered by using organic fertilisers, there are areas of concern as well. For example, Urra et al. (2019) stress some serious adverse effects that applying organic materials can pose, such as harbouring human pathogens, heavy metals, organic pollutants, and some emerging contaminants (including micro-plastics). In addition, Aytenew and Bore (2020) also note that the overapplication of organic fertilisers may also result in eutrophication (an excess of nutrients in the soil), which results in water contamination. Therefore, there is a need to follow the guidelines on using organic fertilisers, such as those discussed by the (Namibian Organic Association [NOA], 2020), to avoid environmental and soil ecosystem degradation.

4. Conclusion

Many research activities have been done around the globe on applying soil amendments (soil conditioners and organic fertilisers) in crop production. However, these efforts are lacking in Namibia, making it challenging to acquire crucial information to improve crop productivity locally. Therefore, research studies are needed in Namibia to scientifically determine the effectiveness and optimal application ratios of locally available soil amendments for crop production. Global research indicates that the use of soil amendments positively impacts soil health (physical, chemical and biological health). Soil conditioners, such as biochar, zeolites and hydrogel polymers, primarily can improve the soils' structures, water and nutrient dynamics and microbial activities. However, they must be supplemented with synthetic or organic fertilisers due to limited macro elements. The knowledge of the classification of soil amendments is also valuable for crop growers, especially those venturing into organic farming where only applying organic soil amendments (conditioners and fertilisers) is acceptable. Organic soil amendments are those derived explicitly from living organisms (e.g. compost, bone meal, manure). Materials from mining activities and manufacturing by-products are inorganic (e.g. zeolite, lime, gypsum). Organic soil amendments are abundant in nutritional content and positively impact the soils' structure, water dynamics and microbial activities; however, over-application can harm humans and the environment, including eutrophication. Therefore, there is a need to follow the guidelines for using organic fertilisers, as with synthetic fertilisers, to avoid environmental and soil ecosystem degradation.

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Heritage Tourism Development and Marketing Model: a community-based intervention to address barriers hampering the heritage sector in Namibia

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ABSTRACT

Heritage tourism is a form of tourism that attracts people to visit heritage sites to appreciate the natural and cultural heritage of any given place. Heritage tourism marketing and development in Namibia have been experiencing numerous impediments. This study, therefore, examines the barriers hindering the heritage sector and presents a conceptual model for heritage tourism development and marketing at the grassroots level. This qualitative study adopted an interpretive phenomenology design to generate data. The population of this study consisted of 58 heritage practitioners from the Oshikoto region of Namibia. A purposive sampling technique was employed to select a sample size of 20 participants. Data were collected through an in-depth interview, a focus group discussion and document analysis. The data collected were analyzed using thematic data analysis. The study revealed that the development, promotion and preservation of Namibia's heritage resources as tourism products pose many challenges, including inadequate funding, lack of basic infrastructure, weak documentation and poor marketing of heritage products. The study concluded and recommended that to address barriers hampering the heritage sector in Namibia, there is a need to intensify heritage funding as well as collaboration among a range of heritage stakeholders to strengthen partnerships and sharing of available resources including heritage spaces and facilities. The study also proposed the Heritage Tourism Development and Marketing Model as an alternative strategy to address the identified challenges. The proposed model includes a road map with detailed activities to develop heritage tourism in a way that engages the local and all heritage stakeholders by adopting a participatory approach to valorization and marketing of local heritage resources as tourism products.

1. Introduction

Heritage tourism is a form of tourism that attracts people to visit heritage sites and appreciate the natural heritage and experience or learn about the cultural heritage (abahneh, 2015; Ezengu, 2020). It includes cultural tours, trips to festivals, visits to monuments and ruins, art viewing, and experiencing traditions and their vibrant expression in the target community. Hence, heritage resources have the potential to be a driving force for heritage tourism and local development in both rural and urban areas if well-developed and marketed (Hausmann & Weuster, 2018). Heritage resources can be the backbone of heritage tourism if thoroughly developed and marketed. Heritage tourism is currently recognized as an economic sector with the potential for community empowerment and sustainable community development at the grassroots level (Ministry of Education, Arts and Culture, 2021). In this regard, the heritage sector

has proven to be an economic stimulus that creates jobs and direct economic benefits to the local communities, contributes to infrastructure development, and is a platform for profitable business opportunities (Doganer & Dupont, 2015). Other social benefits derived from heritage tourism include environmental protection, cultural exchange, revitalization of local culture and traditions, means of psychosocial support, and educational and spiritual values (Ezenagu, 2020).

Namibia is a country with rich heritage resources which can be the basis for heritage tourism development. However, their potential has not yet been fully realized and has hardly developed. Similarly, the heritage sector faces several challenges that hamper the development and marketing of heritage resources for heritage tourism. As a result, the country's heritage tourism industry is developing inefficiently. At the same time, current marketing strategies do not include approaches to encourage and attract visitors to the rich country's heritage resources and thus do not classify Namibia as a heritage tourism destination. Rather, the marketing strategies focus on ecotourism and wildlife (Ministry of Education, Art and Culture and Ministry of Environment and Tourism, 2021). Marketing heritage resources as heritage tourism products is a complex process. It encompasses the entire process of promoting the heritage tourism sector and selling heritage products, experiences and services. Consequently, there is a need for an effective heritage tourism development model that allows the involvement of the local community and key stakeholders (McCamley & Gilmore, 2018). Local communities can become peripheral hubs that stimulate new socio-economic activities through the valorization and commercialization of heritage resources and the diversification of community-based heritage tourism. Thus, this study aims to explore the perspectives of local heritage practitioners on the challenges associated with the development and marketing of heritage resources for tourism consumption. In addition, the study aimed to raise public heritage awareness and present a conceptual model for heritage tourism development and marketing at the grassroots level.

2. Literature review

To explore the barriers faced with the development and marketing of heritage resources as heritage tourism in Namibia, definitions of the following key concepts are essential.

2.1. Heritage

Heritage is a broad concept and includes both natural and cultural features. It is the legacy from the past, what we live with today and what we pass on to our future generations, including tangible as well as intangible resources with significance or values (International Council of Monuments and Sites, 1999). Heritage can be regarded as the present manifestation of the human past. For Bitusikova (2021), heritage is part of the past, selected in the present for contemporary purposes, be the economic, cultural, political or social usage. On this note, heritage is seen as an important market tool and a major tourist attraction, thus bridging the gap between culture and economic value in societies (Ezenagu, 2020). Heritage values refer to the qualities attributed to heritage resources (Mensah, 2022) and are associated with the preservation, management, and development of heritage resources (Diaz-Andreu, 2017). These values reside in the benefits derived from their direct and indirect use and include economic, social, aesthetic, scientific, symbolic, spiritual and historical values. Namibia has a rich natural and cultural heritage, which are of great importance for cultural preservation and revitalization, environmental protection and the economic life of the community.

2.2. Heritage tourism

Tourism activity based on the utilization of heritage resources is referred to as heritage tourism. Eladway et al. (2020) described heritage tourism as the experience of travelling to places and activities that represent the authenticity of people's stories, the past and present, which includes history, culture and natural resources. It is a phenomenon where the cultural, historical and ethnic components of a society or place are used as resources to attract tourists (Ezenagu, 2020). Heritage tourism includes not only visits to monuments and archaeological sites but also experiences of the traditions and vibrant expressions of the local communities visited (Ababneh, 2015)). According to Bitusikova (2021), the significance of historical tourism includes its political purpose of stimulating pride in national or local history, being a source of rising local revenue and being a catalyst for social change. Heritage tourism promotes local and regional development, contributes to community empowerment, opens up profitable business opportunities and is a source of capacity building for local people. Therefore, heritage tourism's perspective is committed to the development, promotion and preservation of heritage resources, community empowerment and economic development.

2.3. Community participation and heritage tourism

Heritage development can only be successful with full community participation. The notion of community participation in heritage tourism development may include the identification, nomination, preservation and safeguarding of heritage resources to generate benefits for local communities through heritage tourism. It is consistent with bottom-up approaches that include heritage resources sustainability, sustainable community livelihood, equity and empowerment. According to Salazar (2012), community refers not only to a locality but also to a network of relationships and shared interests. In the development and marketing of heritage tourism, the community can be a group of individual practitioners or custodians of heritage resources and practices. Hence, local communities must play an important role in the development of heritage tourism (Eladway et al., 2020). Local people should be encouraged to get involved in identifying untapped natural and cultural heritage resources in the region and determining their importance for the development of heritage tourism. Community participation in heritage tourism development enhances partnership and capacity building, decision-making, knowledge sharing, and collaboration with diverse stakeholders (Li & Hunter, 2014).

2.5. Heritage Tourism marketing

Marketing is an important aspect of heritage tourism development. Heritage tourism marketing includes the identification, selection and development of heritage products, the setting of prices for products as well as the setting of entrance fees to heritage sites. Marketing is also extended to the accessing of heritage services and places and the development and implementation of appropriate promotional strategies. Hence, heritage tourism marketing is a complex process and differs from traditional and mainstream tourism marketing practices (McCamley & Gilmore, 2018). Hasan and Jobaid (2014) described heritage tourism marketing as a process of convincing and communicating with actual and potential heritage tourists as they pay a visit to a heritage destination. This process is responsible for creating communicating, delivering and exchanging the element of heritage value for tourism development and is concerned with how heritage resources from different cultures are marketed as tourist attraction products. Donohoe (2012) expressed that heritage tourism marketing lies in strategies designed to communicate with target markets to generate profits. It can therefore be used to boost the number of domestic and foreign tourists visiting heritage tourism destinations. Furthermore, heritage marketing can also be used to raise public awareness of the significance of heritage resources and to reduce negative impact. For sustainable heritage tourism, there is a need to use Information and Communication Technologies (ICTs) platforms. Hausmann and Weuster (2018) describe ICTs as an umbrella encompassing various digital communication tools, devices, and technologies as well as the various services and their applications. The ICTs platforms can be used for content creation to provide access to heritage information in the global market, thereby accelerating the development of heritage tourism. Additionally, the use of ICTs infrastructure helps communities to be more strategic and entrepreneurial in managing their heritage (Katiyar & Priyanka, 2015). It can be key to transforming the production, interpretation, marketing and consumption of heritage services, as well as interactively communicating with heritage tourists while managing their experiences (Hausmann & Weuster, 2018).

3. Methodology

A qualitative research approach with an interpretive phenomenological design was adopted to explore the perspectives of heritage practitioners on the barriers related to the development and marketing of heritage resources as products for tourism in the region. The target population of the study consisted of 58 heritage practitioners representing a wide range of professions related to the preservation and development of heritage in the Oshikoto region. The professions represented include curators, heritage site officers, culture officers, arts extension officers, conservancies officers, craftsmen and culture conveners. Using purposive sampling, 20 key informants were selected, 12 of whom were interviewed in depth and 8 took part in a focus group discussion. In addition, secondary data from records and reports for the heritage institutions in the region were collected using document analysis. The multiple data collection methods were used for triangulation purposes. The collected data were analyzed using a thematic data analysis approach, following the analytical procedure proposed by Miles and Huberman (2014). The researchers analyzed the data concurrently with the data collection. The researchers used the dataset as organized per theme to write the findings of this study. The data were analyzed concurrently with data gathering. Data were presented in narrative forms.

4. Results and discussion

Barriers hampering the development, preservation and marketing of heritage resources as heritage tourism products in the Oshikoto region, Namibia.

4.1. Poor funding for the heritage sector

The study revealed that Namibia has been facing the challenge of a short supply of public and private funding for the heritage sector. Consequently, it hinders the preservation, promotion and development of heritage resources as heritage tourism products. Besides, the heritage sector is placed in the Ministry of Education, Art and Culture, whereby education (teaching and learning) is considered a ministerial priority in comparison to culture and heritage development and promotion. This is reflected in the allocation of the ministerial budget and its distribution among different directorates and divisions within the ministry. For instance, the following participants (AEO1, C2 and AEO2) stated:

The Divisions of National Heritage and Culture Programmes in the Region were not allocated a budget for the previous financial two years (2017/2018 and 2018/2019) by Head Office. We have not been able to do much in the region due to the lack of the operational budget and many of our activities planned were cancelled. I don't know why arts and culture are not considered important in Namibia when they have great potential for economic development (Participant AEO1).

This museum is managed by the town council and when allocating funds to the departments and institutions within, the museum receives a small budget that is not even enough to carry out planned activities (Participant C2).

We are faced with the problem of lack of funding related to carrying out our activities and advertising our cultural products (Participant AEO2).

In literature, the same was noted by Sam (2019) reported that the heritage sector in Namibia has been facing funding challenges that hamper the development of the sector. Similarly, the results confirmed those of Huibin, Marzuki and Razak (2012) which shows that the challenge related to the preservation, promotion and management of heritage in developing countries is a prevalent lack of public funds. These results are supported by records obtained during the document analysis. The researchers found that a minimal operational budget was allocated to the Sub-division of National Heritage and Culture Programmes and Sub-division of Arts Education and Training in the Directorate of Education, Arts and Culture in the region. Due to the budget cut planned activities aimed at the promotion and preservation of heritage in the region were cancelled. It should also be noted that the above-mentioned sub-divisions are mandated by the Government to develop and promote arts and heritage for economic growth.

4.2. Lack of basic infrastructure

The study found that the Oshikoto region faces the challenge of a lack of supporting facilities and infrastructure. These are infrastructures where heritage practitioners can host heritage promotion activities such as arts festivals, talent shows, and cultural festivals and exhibit the artefacts present in the region. The following quotes from respondents support this claim:

There is no single studio or performance centre in the region. I have no place to teach music to learners and I don't have musical instruments to use. The government needs to bail us out (Participant AC5).

We are facing the challenge of lack of funding. Funding to carry out our activities, funds to promote culture and arts in the region, funds to support the community in initiating activities to promote arts and culture, and funds to develop and build infrastructure such as workshops, culture and craft centres where craft people can go and exhibit their products (Participant AEO2).

Participant CGL1 pointed out: *"There are no centres such as culture villages where we can lively exhibit the people's culture in the region"*.

These results mirror those reported by Yang et al. (2018) found that one of the barriers for heritage practitioners such as artisans is the lack of availability of basic infrastructures such as power supply and commercial markets. The results also support the study by Viljoen and Henama (2017) who claim that the heritage sector in most rural areas of Africa is characterized by underdevelopment or a total lack of basic infrastructure. Heritage tourism infrastructure is an integral part of heritage tourism development. According to Ebbe (2009), infrastructure can serve as the single important key to tourism growth and successful performance and can provide an entry point for effective interventions in heritage conservation and development. Henceforth, to successfully preserve, promote and develop heritage resources requires basic facilities and public infrastructure. Public infrastructures are one of the pillars for social and economic growth in the heritage tourism industry as they have the potential to attract multiple tourists. Therefore, it is of great importance to develop heritage facilities and infrastructures in the region. Infrastructures to be developed for the heritage tourism sector can include roads, craft shops,

museums, cultural villages, heritage sites, theatres, art galleries, conservancies and landscapes. Some of these infrastructures become heritage assets themselves.

4.3. Lack of interest and participation by the locals in heritage matters

The study revealed that heritage practitioners and institutions in the Oshikoto region are challenged by the lack of interest from local people in heritage activities aimed at preserving, promoting and developing heritage resources for economic purposes. The respondents mentioned the following:

As a curator, I keep a record of visitors coming to our museum and only a few Namibians visit the museum. Many community members have no interest or willingness to participate in heritage activities related to activities in the region (Participant CO1).

I observed poor participation by local inhabitants, schools and institutions in activities such as Namibia Heritage Week, culture festivals and heritage-related social gatherings that are meant for heritage development and promotion (Participant HSO2).

Young people have no interest in cultural heritage-related matters and consider most cultural heritage activities time-consuming and old-fashioned (Participant AC4).

In addition, the document analyzed such as visitor records for museums, cultural villages, conservancies, and heritage sites show that compared to foreign tourists, few locals visit heritage sites and institutions. The results showed that local people are not interested in engaging with heritage matters. Lack of interest can be attributed to many factors such as poor marketing, lack of heritage education, Christianity, Westernization and acculturation. The results are consistent with the previous study by AbdelNaby (2017) which showed that there is a lack of interest in the active participation of the local people in heritage promotion and preservation. In addition, the results support Yang, et al. (2018) who observed that there is a growing trend among the younger generation that they are reluctant to enrol in heritage-related studies or choose heritage-related careers, instead, preferring to work in other sectors. The thriving promotion and development of heritage depend on the interests of the local communities as they are the custodians of heritage resources in their locality. Importantly, the local community's involvement in the conversion of heritage resources into tourism products and their marketing efforts give greater importance to these heritage resources.

4.4. Poor documentation of heritage significance and potential

Poor documentation and limited research on heritage resources hinder the preservation, promotion and development of heritage tourism in the region. Local people and relevant stakeholders should assist with the identification of such resources and assess their cultural values and significance. The National Strategy on Sustainable Heritage Tourism Development and Employment Creation Opportunities at Community Level (2021) reported that no systematic research is being conducted on the importance of heritage tourism in Namibia. Similarly, the following respondents supported the claim:

Cultural heritage practices, indigenous knowledge and events such as rituals, new harvest ceremonies, children's naming ceremonies and more are disappearing and gradually dying due to a lack of documentation (Participant CGL5).

Due to the lack of documentation of cultural heritage such as cultural arts and crafts skills, which are intangible cultural heritage, the elders are ageing and forgetting traditional artistic skills and techniques resulting in no skills left to be transferred to the young generations (Participant AC6).

Indigenous knowledge systems related to traditional healing and agricultural techniques are disappearing because they are weakly documented, thus, there is nothing left to retain and build on (Participant C01).

These results support the study of AbdelNaby (2017) who explained that poor documentation of heritage resources is one of the major challenges of the heritage sector. The results continue to agree with Gwenzi et al. (2015) who warn that indigenous knowledge systems are at risk of disappearing due to the lack of systematic documentation and coordinated research of fragile intangible cultural heritage. Similarly, Underberg-Goode (2014) called on institutions responsible for heritage to research and document all the heritage resources threatened by extinction.

4.5 Poor marketing of heritage resources as heritage tourism products

The study revealed that current marketing strategies for heritage resources in the Oshikoto region are not effective. If expanded, the community will benefit from heritage resources available in the region through heritage tourism.

Poor marketing of heritage products and sites was identified as one of the challenges facing the heritage tourism sector in Namibia. The poor marketing is attributed to poor funding and a lack of interest from both the public and private sectors. In addition, the Ministry of Education, Arts and Culture and the Ministry of Environment and Tourism (2021) in the National Strategy on Sustainable Heritage Tourism Development and Employment Creation Opportunities at Community Level reported that mainstream tourism does not market Namibia as a heritage destination. Heritage resources such as handicrafts, museums and cultural villages have the potential to attract heritage tourists to the region and therefore need to be marketed. Marketing is a tool to make products known to customers. The Oshikoto region faces the challenge of poor marketing and a lack of markets for heritage products. This was what respondents had to say on the subject:

Our museum needs to start using digital platforms and media to market and showcase the objects that we are exhibiting to attract more tourists. Our exhibition is very special because it can only be found in our museum but the problem is that the museum is not well known and we are not well trained when it comes to marketing and promotion (Participant C2).

There is no marketing system for heritage products in the region, therefore all heritage stakeholders need to come together to design a marketing approach that includes the integration of ICT because it is not an individual responsibility. Nowadays everything is digitized and we need to do the same (Participant CO1).

There are no places where artists and craftsmen can go and sell their products, therefore, we established small craft and curio shops at their museum but cannot cater for all of them in the region (Participant C1).

The results show that the current marketing strategy for heritage resources as a tourism product is ineffective. Therefore, it needs to be intensified, to allow the community to benefit from the heritage resources available in the region through heritage tourism. The poor marketing is attributed to poor funding and a lack of interest from both the public and private sectors. In addition, it noted that Namibia is not marketed as a heritage tourist. These results are consistent with those of Rotich (2012) who noted that the global lack of a marketplace for heritage products, makes the effective marketing and promotion of these products challenging due to the lack of widespread marketing skills. Heritage marketing is a collaborative effort to make heritage consumers aware of the heritage resources available and to help increase its popularity and appeal. Therefore, various media such as television, digital photo radios, newspapers, Facebook, WhatsApp, billboards at airports, and video and short films at the national airline should be used to market the national heritage resources and attract heritage tourists.

5. Heritage Tourism Development and Marketing Model

The Heritage Tourism Development and Marketing Model is a strategic approach developed based on the analysis of related literature and the findings of this study on the challenges faced by the heritage sector in Namibia. This model aimed to develop, commercialize and valorize local heritage resources as tourism products and make heritage tourism an integral part of the country's development agenda. A model is a bottom-up approach that ensures community participation in the identification, preservation and development of heritage resources at the grassroots level. It encourages collaboration among the heritage actors' identification, development, promotion and preservation of both cultural and natural heritage resources in the region. Namibia has a wealth of natural and cultural heritage resources with the potential to attract tourists from around the world. These heritage resources embodied several significant values that can be valorized by local communities for functional use. Therefore, this model promotes the identification and valorization of untapped heritage resources in the local areas. In addition, the model aimed to empower local heritage tourism practitioners, ensure ownership and promote the sustainable use of heritage resources for community development and community livelihood improvement. The model is presented in seven

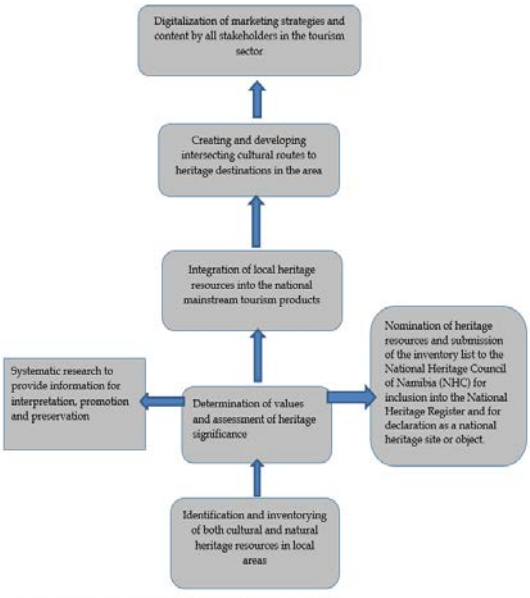

Figure 1: **Heritage Tourism Development and Marketing Model**
Sources: The Authors

processes as detailed in Figure 1.

5.1. Identification and inventorying of both cultural and natural heritage resources in local areas

This process advocates the recognition, inventory and mapping of heritage resources existing in the region with the potential to support heritage tourism. The identification and inventory of heritage resources should be an ongoing approach leading to the generation of information necessary for the preservation, development and conservation of both tangible and intangible resources. Importantly, the information collected can be presented to the general public to promote further awareness and appreciation of heritage resources. In addition, the model calls on local communities, traditional authorities, local councils, regional councils, groups and all stakeholders to get involved in identifying and profiling heritage resources, including lesser-known and well-known resources in the areas, developing management plans and forming a local management committee. Community involvement is vital as some are the custodians of heritage resources, especially cultural heritage as they are the ones who create and practice to keep it alive. The successful identification and inventory of heritage resources serve as an invaluable tool for the preservation, conservation and safeguarding of tangible and intangible heritage resources in the region. The Heritage Tourism Development and Marketing Model is further strengthening the development and management of heritage resources by governmental institutions and local communities through participation in decision-making. This involvement of the local community leads to community empowerment. Also, this model encouraged stakeholders to use innovative technology such as geographical information systems (GIS) for better mapping and the creation of a heritage resources database.

5.2. Systematic research to provide information for interpretation, promotion and preservation

Documentation and gathering background information are critical in heritage resources promotion, preservation and marketing as tourism products. The Heritage Tourism Development and Marketing Model encouraged systematic research and documentation for the identified resources to provide information for interpretation, marketing and preservation purposes. According to Fitri (2017), the documentation of heritage resources enhances the acquisition of knowledge to advance a better understanding of heritage value, history and utility and revive community interest in its preservation through the dissemination of gathered information. Therefore, local heritage practitioners and all key players in the area such as local communities, historians, private property owners, anthropologists, tourism development officers, environmentalists, business analysts, cultural officers, researchers, arts and heritage sites officers, conservation officers, archaeologists, traditional authorities and regional councils should work in a participatory manner to collect and provide information. Participation in the research activities will build trust among each other and cultivate a sense of ownership of the heritage resources. Information can be gathered through observation of heritage assets, interviews, surveys and study of archival materials such as photographs, records, maps, and unpolished written materials. Heritage practitioners and stakeholders would use the information gathered to write a narrative description that includes the heritage facilities, the cultural values, the historical and cultural connotations, the physical location and distance between them, and the activities and services available. Heritage practitioners and stakeholders should also use the information to identify and establish intersecting routes to tourist destinations in the areas.

5.3. Determination of values and assessment of heritage significance

Heritage values help to understand the context and sociocultural aspects of heritage resources while significance helps to give a clear and concise understanding of why such heritage resources are important (Chandani et al. 2018). Mensah (2021) defined heritage values as the qualities attributed to tangible and intangible heritage resources and differ from society to society and at levels within society. They may include the historical, social, spiritual, educational, economic and aesthetic values of the past, present or future generations embodied in heritage resources. Community participation plays an important role in defining heritage values and the functionality of heritage resources in the local community. Heritage resources are associated with the number of qualities, meanings, and values that society has attributed to them. Within this process, the model inspires local communities and all stakeholders to work together in determining values and evaluating the importance of local heritage. This is because heritage plays different roles for individuals, families, communities, regions, nations and the world. It is, therefore, crucial that all concerned members participate. Therefore, the Heritage Tourism Development and Marketing Model invites local communities and all stakeholders to participate in the accurate identification of heritage resources and clear

articulation of heritage values.

5.4. Nomination of and submission of the inventory list to the National Heritage Council of Namibia (NHC) for inclusion into the Namibia Heritage Register and declaration as a national heritage site/ object.

The Heritage Tourism Development and Marketing Model encourages heritage actors to submit the heritage inventory list to the National Heritage Council of Namibia for inclusion in the Namibian Heritage Register. The Heritage Tourism Development and Marking Model further calls for heritage actors to collaborate in the nomination of such heritage resources to be considered and declared a national heritage site or object. The inclusion of heritage resources into the national heritage register allows the provision of legal guidance through a heritage site management plan.

5.5. Integration of local heritage resources into the national mainstream tourism products

Namibia's tourism sector is primarily focused on ecotourism and wildlife, with less emphasis on heritage tourism. The current national tourism marketing strategies inadequately represent heritage resources as tourism products. To foster sustainable development in heritage tourism, this proposed Heritage Tourism Development and Marketing Model recommends the integration of heritage resources into mainstream national tourism products. This integration aims to enrich visitors' experiences, provide economic opportunities for local communities, and facilitate the responsible management of these delicate resources.

5.6. Creating and developing intersecting cultural routes to heritage destinations in the area

The Heritage Tourism Development and Marketing Model aims to promote tourism destinations by creating new cultural routes and expanding tourism offerings, including wildlife and ecotourism. According to Pattanoro and Pistocchi (2016), a cultural route should combine three elements: the geographical area where attractions and places of interest are located, the theme that links the different components of the route, and the products and services provided to visitors in the destinations along the route. These cultural routes should showcase the cultural and natural products of the region and connect lesser-known heritage sites to well-known tourist attractions, making it the most attractive tourist destination. Tourism stakeholders, including local communities, should collaborate to define the main goal of the cultural route and select an appealing theme. They should also create narrative descriptions that encompass heritage amenities, cultural values, historical and cultural significance, physical location and distances between sites, available activities and services, and consider the accessibility of the destinations. Accessibility here refers to easy access to information, services, and transportation to heritage destinations along the route. It is also important to develop a map of the intersecting tourism routes, along with a common log and website providing detailed descriptions of the different tourism destinations in the area. This comprehensive approach will help increase the quantity of heritage tourism attractions and attract and retain visitors in the area.

5.7. Digitalization of marketing strategies and content by all stakeholders in the tourism sector

To attract tourists and visitors, it is crucial to adopt a comprehensive marketing approach that accentuates all the heritage resources in the region. It is advisable to market heritage products as a cohesive cluster rather than individual entities. Collaboration among local creative artists, ICT experts, and heritage actors is essential for the development of digital marketing content and materials that cater to both local and foreign tourists, providing them with detailed information about the available heritage products and landscapes in the region. In addition, it is recommended that tourism stakeholders enhance existing heritage strategies and establish regional heritage tourism forums to underscore the significance of heritage assets as viable tourism products.

The Heritage Tourism Development and Marketing Model promotes the utilization of digital platforms to showcase all heritage products, activities, and services, to attract both local visitors and international tourists. Furthermore, it is imperative for heritage practitioners to collectively conduct target market research to identify potential risks associated with the established cultural route and devise necessary actions to mitigate business failure and enhance the sustainability of operations. These endeavours will engender a sense of ownership, promote social cohesion, and encourage networking, collaboration, cooperation, and community participation among stakeholders, all of which are pivotal for the advancement of the cultural heritage industry.

6. Conclusions and recommendations

This study explores the perspectives of heritage practitioners to uncover the challenges associated with the development and marketing of heritage

resources for heritage tourism in the Oshikoto region. After in-depth interviews and a focus group discussion with the heritage practitioners as well as analyzing various documents such as reports, plans, policies and laws, this study concluded that the heritage sector in the Oshikoto region has been facing numerous challenges ranging from developing, promoting and preservation of heritage sources as tourism products. Amongst, the sector experiences inadequate funding from both central and local governments. Other challenges from the study's findings are a lack of basic infrastructure, a lack of local interest in heritage activities, and poor documentation and research. Similarly, the lack of integrated marketing strategies and a marketplace for heritage products was also pointed out as a challenge for the sector.

Given the economic and social significance of heritage resources, further development of this sector is essential. This study proposes active participation, coordination, and collaboration among heritage stakeholders are crucial to strengthening partnerships and sharing available resources, including heritage spaces and facilities. On the same note, the study recommends the establishment of a Regional Heritage Joint-Management Committee with full representation of grassroots community members and a diverse range of stakeholders. The Committee should address issues related to heritage tourism development, marketing, funding, infrastructure development, and the promotion of heritage offerings. Furthermore, the study suggests seeking funds from traditional entrepreneurs, public-private partnerships, supporting affiliates, and other sources. It also recommends the efficient utilization of available resources and an increase in state funding.

To address the marketing challenge, this study proposes the development of cultural routes that connect well-known and lesser-known heritage resources to attract more tourists. It also suggests promoting destinations, establishing a strong network among heritage practitioners, and ensuring access to heritage sites. Additionally, the study recommends leveraging social media, packaging heritage offerings as a unified tourist product, and enhancing existing heritage tourism products and services.

The study proposes an increase in heritage education and awareness to enrich local understanding and appreciation of heritage resources, thereby unlocking their potential benefits and fostering greater interest and participation. It's believed that locals' interest in heritage-related matters can be cultivated through a deeper understanding of the heritage and its significance. Henceforth, the study advocates for institutions responsible for heritage promotion and higher learning institutions offering programs in heritage-related areas to prioritize community capacity building through training and encouraging enrollment in tertiary programs focused on heritage conservation and tourism development. Moreover, it is essential to integrate heritage into the basic education curriculum to foster a deeper understanding of heritage among school-going children and youths. Furthermore, the study encourages community heritage awareness through a range of initiatives including community outreaches, forums, media campaigns, and school visits. This strategic approach aims to equip Namibians, particularly the young ones and youths, with the necessary knowledge to appreciate protect and preserve heritage for sustainable development.

In addition, it is imperative to prioritize the advancement of heritage documentation and research agendas to generate data for training heritage stakeholders in awareness raising, heritage conservation, and capacity building. Active involvement of community members in the documentation of heritage is essential, given their role as custodians.

Finally, this study has made a significant contribution to the development of a Heritage Tourism Development and Marketing Model based on its findings. This model aims to strengthen and promote the heritage sector, ensuring its primary role in tourism activities in Namibia and its central position in the country's development agenda. Additionally, the model advocates for the active involvement of the local community in identifying, preserving, developing, and commercializing heritage resources at the local level. To ensure the successful implementation of this Heritage Tourism Development and Marketing Model, a study must be conducted on the relevance of digital platforms in promoting and preserving heritage in Namibia, as digital technologies (ICTs) need to be effectively utilized.

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Original Research Article

An assessment of the challenges of gender disparity in the City of Windhoek's management structures

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ABSTRACT

The purpose of the study was to assess the challenges relating to gender disparity in the City of Windhoek's management structures. The results of the study should help the City of Windhoek's management in developing leadership and management positions and in addressing gender parity. The study suggests possible ways of how to eliminate gender barriers and create opportunities in higher leadership and management positions. This study adopted a qualitative approach and case study research design. The researcher purposively selected 15 participants from all departments. Primary data for this study was collected using interview guides. Thematic analysis was used to analyse interview responses. The first key conclusion was that, gender disparity is prevalent at the City of Windhoek. The study revealed eight factors that lead to gender disparity in the city of Windhoek. These include lack of implementation of strategic policy, stereotyping leading to discrimination of women in recruitment and selection policies, lack of gender-sensitive budgeting practices, inconsistent gender mainstreaming practices, inadequate gender analysis of information and poor implementation of gender responsive key result areas in performance management plans.

1. Introduction

According to Hall (2021) gender imbalance is a disparity between males and females in a population. As stated above, males usually exceed females at birth, but subsequently experience different mortality rates due to many possible causes such as differential natural death rates, war casualties and deliberate gender control. The overall participation of women over the world in public administration is 46 percent. Despite this, just 32% of countries have achieved gender equality. In 39 percent of countries, women are underrepresented in public administration, whereas in 28 percent, women outweigh males significantly.
Gender parity among public officials is most prevalent in Latin America and the Caribbean, and least prevalent in Central and Southern Asia (Hall, 2021). Women in the civil service are more prevalent in nations with higher levels of economic development, whereas fragile and conflict-affected countries have less women in the same sector.

Though progress is uneven, the world is moving closer to gender balance among civil officials. According to the most recent data available, the global average of women's engagement in public administration is 46 percent in 139 nations. When compared to the global GEPA report from 2014, where women made up 37 percent of public administrators in 33 nations; from 2006 to 2012, there
has been significant progress towards gender parity around the world (Hall, 2021). Using all available statistics from each year, the upward

trend continues as evidenced by women's average proportion of all public administrators rising from 44% in 2010 to 49% in 2020 (UN, 2021).

Even if only the countries featured in both the 2014 global GEPA study and this report are considered, over time, women's engagement in public administration has increased from 38% to 42%. Despite recent progress in some nations, there is still significant global diversity in women's engagement in government. At 6% and 7%, respectively, Pakistan and the Democratic Republic of Congo have the lowest percentage of women in public administration in the world. Lithuania, with 77 percent women in public administration, and the Russian Federation, with 73 percent of women in public administration, are the two countries with most women in public administration (United Nations, 2020).

In the public sector, there is still a gender gap in the workforce. In general, only around a third of countries (32%) have gender parity in public administration. Underrepresentation of women is more widespread in 39 percent of countries around the world. Women are generally underrepresented, if not completely excluded in public administration in 17 percent of countries (Hall, 2021). Women's underrepresentation in government means that it is not utilising the full potential, capacity, and inventiveness of its citizens. Given that government is the single largest employer in many countries, women's underrepresentation in the civil service jeopardises their economic stability and empowerment, both of which are important drivers of long-term development and economic success.

As depicted in the next statistics, women's engagement in public administration varies by location and country. Europe and North America (53 percent women), Eastern and South-eastern Asia and Oceania (51 percent women), and Latin America and the Caribbean (51 percent women) are the three regions with the highest gender parity (49 percent women). Women in public administration are underrepresented in the remaining three regions, with 38 percent in Sub-Saharan Africa, 37 percent in Northern Africa and Western Asia, and 32 percent in Central and Southern Asia (Hall, 2021).

In view of the above, income and gender disparities are very common all over the world. However, the gap is more prominent among women in developing countries. Some of the factors that influence these gender imbalances in work places are deeply rooted in the socio-cultural structures that are deeply embedded in society. They are as a result of factors such as difference in education between man and women, preferred job and industry, work experience and labour market. According to Younas & Sandler (2017) research proved that there has been steady progress in improving women's representation in Sub-Saharan Africa over the past decade. However, their research revealed that most of the women are still the most underrepresented group of all in the workplace, especially in politics. Their study revealed that the gender imbalance that women experience on political and top management leadership positions in many organisations is due to lack of education or attrition rates. Women are not generally attracted to careers in politics as compared to men (United Nations, 2020).

Gender imbalance in the work-place is a global phenomenon. Wide disparities exist in the employment of men and women in different fields of work, particularly, in health, education, economics and politics as well as in promotions and wages. In the business world, women leaders are still a minority. Globally, efforts are continuing to redress these challenges. Whereas gender imbalance and the resultant disparity in politics are prevalent in most African countries, this is less so in Rwanda, Namibia, South Africa, Seychelles, Senegal, Burundi, and Botswana. The stereotypes that contribute to gender imbalances are anchored in religion, education, culture, social orientation, politics and public policy considerations. These continue to contribute to the chasm that exists in the presence of women in Namibian elective offices (Tavis, 2018).

Despite the legal and social frameworks institutionalised by the Namibian government, that say all people are and should be treated as equal in all areas of life, there is clearly evidence of gender-related inequalities at workplaces. Stereotypes persist that portray women as less capable leaders than men. According to Afro barometer of Namibia, there are greater levels of support for men in political leadership and management. The Afro barometer also shows that women are less interested in public affairs than their male counterparts are (Shejavali, 2020). Women also discuss politics less frequently than men do. It is therefore against this background that this study sought to evaluate gender imbalances in the City of Windhoek and how women progress in their careers. It also sought to identify the causes and effects of the gender gap at the City of Windhoek in particular. This study analysed the impact of gender-imbalances and how it affects service delivery and the performance of the City of Windhoek.

1.1. **The Objectives the study**

The main objective of research paper was to assess the challenges brought about by gender disparity in

the City of Windhoek's Management structure.

- To examine whether the City of Windhoek is rendering efficient and effective municipal services to the people.
- To evaluate gender imbalances in the City of Windhoek
- To evaluate women's progression in their careers.
- To identify the causes and effects of the gender gap at the City of Windhoek.
- To analyse the impact of gender-imbalances and how this affects service delivery and the performance of the City of Windhoek.

2. Literature Review

2.1 Human Capital Theories

Gender imbalance in organisations is a complex phenomenon to explain and its manifestations vary in the organisational structures, processes and practices especially for women in developing countries like Namibia. To explain the issue of gender imbalance in Namibia, the researchers used human capital theories. Human capital theories argue that men and women receive different pay-offs from employment because they invest differently in their careers. Men seek higher education, skills training, and overtime at work because they are family breadwinners whose major responsibility is to support their wives and dependent children (Mahendra Dev, 2018). Meanwhile, women invest less in the human capital by workplace because their primary commitment is to their families. This theory assumes the heterosexual nuclear family, which is no longer the typical family form (Perrotta & Perrotta, 2018).This rational choice perspective also fails to explain recent trends in women's educational attainment and labour force participation rates, now estimated to be equal to, if not greater than men's (Ginting, 2020).

2.2 The Social Context of Gender-Disparity in Namibia

Along with many other countries, Namibia was represented in the Beijing Platform for Action in the Fourth United Nations World Conference on Women in 1995. Namibia established its National Gender Policy in 1997 in response to the proposed steps, laying the groundwork for gender equality and women empowerment programs in the country (MGECW, 2010). The Ministry of Gender Equality and Child Welfare is in charge of the National Gender Policy, and it has the mission of establishing gender equality and equitable socio-economic development for women and men.

In August 2018, Namibia signed and ratified the amended SADC Gender Protocol (Kampilipili, 2018). All Namibian line ministries and state bodies are required to execute the country's National Gender Policy without delay. All stakeholders are responsible for putting the National Gender Policy (NGP) into action. All policy partners are responsible for the NGP's implementation and will be held accountable for gender equality outcomes (Republic of Namibia, 2008).

According to many researchers, since independence, gender mainstreaming in Namibia has taken several different paths. The Namibian Constitution was the starting point for gender equality (Namibian National Strategic Plan, 2022–2027). As soon as the country gained independence, women activists fought for significant declarations on women's rights in the new Namibian Constitution. This was both individually and through religious and political party organisations. In contrast to many other African countries' constitutions, which include different citizenship rules for men and women, Namibia's citizenship regulations are totally gender-neutral. According to Gertze (2018), Namibia is entirely devoted to the advancement of women as well as achieving gender equality and equity. Despite the fact that the Namibian Constitution incorporates these ideals in national laws, policies, and institutions; more still has to be done. There is still work to be done on developing the requisite political will for the incorporation of such ideals in the legal structure. To complete the mainstreaming of these gender sensitive policies, there must be buy-in. For this purpose, Namibia's ruling party has proved its political determination by implementing the 50/50 rule (Gertze, 2018).

The Affirmative Action (Employment) Act 29 of 1998, on the other hand, aims to boost the participation of blacks, women and people with disabilities in the formal sector. According to the Employment Equity Commission's most recent reports, women account for approximately 15% of executive directors and slightly over a quarter of senior managers (Hubbard, 2018). In middle management and specialist supervisory jobs, however, they are approaching parity with men. Affirmative action measures apply to a variety of statutory bodies and boards, with seats reserved for women in bodies ranging from line ministries to municipalities.

2.3 Namibian Gender Policy

One of Namibia's strategies for achieving gender equality is Gender mainstreaming. This is represented in the National Gender Policy as a strategy to achieve gender equality and to fulfil this goal (MGECW, 2010). Namibia reviewed its 1997 Gender Policy in 2010. This review was in order to realign it with the rest of the world and resulted in

The National Gender Policy (2010-2020). This new Gender Policy (2010-2020) and its gender plans of action are targeted at closing the gender gaps that exist in Namibian society as a result of socio-economic, political, and cultural disparities (MGECW, 2010). The Policy Document establishes a framework for implementing programs aimed at achieving the expectations of Namibians, particularly women. All this, in order to achieve fundamental freedoms and to be treated equally with their male counterparts in all developmental projects (MGECW, 2010).

2.4 Gender Imbalances in Windhoek City Police Service

According to Rajalingam (2021) the literature review forms the nucleus of all research. For a scientific investigation to succeed in coming up with new conclusions and establish facts, each research builds on existing data. Unless one needs to reinvent the wheel, precise awareness of the extent of knowledge on a topic is important. This paper presents the literature review focusing on the leadership-management positions in City of Windhoek, its effects on salary structure, recruitment and promotion, decision-making and it also looks at The Namibia National Gender Policy.

It is a well-known fact that women are under-represented in governance and leadership positions in public and private sectors, all over the world (Kazembe, 2020). At times, the equal representation does not necessarily mean equal power in decision-making but women are put in such a position to further the men or the patriarchal agenda. Society is driven by a struggle for dominance among social groups and culture, men as the dominant group and women as the subordinate group and social problems are created when dominant groups exploit or oppress subordinate groups.

Gender-disparity in the public sector affects salary scales. The gender pay gap expresses the average difference between male and female earnings as a percentage of average male earnings and is usually based on gross hourly earnings among employed individuals (Publications Office of the European Union, 2014). If the gender pay gap is positive, it indicates that women's salaries are on average lower than men's salaries, with the opposite holding true if the gender pay gap is negative. The effect of the gender pay gap means that women earn less over their lifetimes. This results in lower pensions and a risk of poverty in old age.

The empowering and mentoring of women in leadership is a great opportunity, especially within the City of Windhoek as it helps women interact with other women from all spheres of life. According to the Affirmative action report (2013/14), the achievement of equality in terms of promotions and occupation of higher leadership and management positions in terms of gender, is showing a slow progress. Achieving equality in promotion between women and men at workplaces is a prerequisite for global prosperity and an advancement in society. According to Transparency International (2010) the integration of women into service-based workforces, can help reduce gender-specific forms of corruption and provide positive role models for young women in society. The mainstreaming of gender in anti-corruption work ensures that women are well represented at all stages of service delivery. Also, the likelihood of opportunities to promote women's participation and strengthen their voice in the planning, managing and oversight of decision making becomes apparent.

Inequality in institutions remains a key area of gender-based discrimination and to date, one of the most neglected topics in Namibia. Equality in the organisations is fundamental to gender balances overall, and this affects every Namibian woman in multiple ways. According to Samuel (2015) gender inequalities at the workplace and in the family context can undermine women's financial independence and personal autonomy, thus affecting their ability to exercise rights in other spheres.

3. Methodology

3.1. Research design

This study adopted a qualitative approach and case study research design. This refers to an interpretive research approach, relying on multiple types of subjective data and investigation of people in particular situations in their natural environment (Christensen, Johnson & Turner, 2015). The researchers understood the gathered data from participants' subjective perspectives. The key was to understand the insider's views and objective outsider's view to interpret this subjective information, based on the research purpose. The aim of this qualitative research was to analyse the impact of gender imbalance in the City of Windhoek.

A questionnaire was adopted as the research instrument and the data was collected by means of a survey. In order to attain the research objectives, this research used quantitative methods to address the relationships between all the variables in the study. Initially, descriptive statistics were used to illustrate the profile of the respondents. This was in order to have a balanced assessment of the results. Detailed analysis then followed, which involved inferential statistics based on correlation and regression analyses. The inferential process included making deductive claims that could be generalised to the population. A quantitative research approach is based on examining theories by testing the link between variables (Khalid, 2017). The study used regression

analysis to study the relationship between the measured variables. In order to attain the research objectives, this research used qualitative data collection for all the variables in the study.

3.2 Research Population

Bertram and Christiansen (2014) views population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications. The targeted population in this study were 100 employees from the City of Windhoek employees. The population for this study included all strategic executives within the City of Windhoek in all departments and the political leadership comprising of 2020-2022 councillors. The target population of this study was top management and the political leadership. It comprised of 9 departmental managers, their deputies and 15 Political Councillors who led different committees of the municipality of every department in the City of Windhoek.

3.3 Sample size

According to Strydom (2014), sampling involves the examination of a carefully selected proportion of the units of a phenomenon in order to help extend knowledge gained from the study of that part to the whole, from which the part was selected. This study used a purposive non-probability sampling. The study targeted 30 respondents who were purposefully selected from various departments such as: Marketing, Corporate Communications, Office of the CEO, Human Resources, City Police Department, Human Resources and Political leadership Councillors. Similarly, six political councillors were drawn to be part of the study sample, giving a total of 15 participants. The chosen individuals/departments were believed to be knowledgeable, and informative on the phenomenon of interest in this study.

3.4 Data collection procedure

Both primary and secondary data were used in the study. The researchers collected primary data by means of a structured questionnaire and interview guide. Interviews were used to obtain views and opinions from the staff members of the City of Windhoek. Responses from face-to-face interviews were recorded on a tape recorder and then transcribed. Secondary data, such as documentary analysis and books were explored. Questionnaires were distributed to the respondents to fill in, in the presence of the researcher so that assistance could be availed if required.

3.5. Credibility

The design of the interview schedule was guided by the principles of the Human Capital Theory. The instrument was piloted, and corrections were made. Consistency was measured by asking the participants the same question in different ways. Reliability was achieved by asking questions based on the principles of Human Capital Theory.

3.6 Data Analysis

ATLAS.ti was used for data analysis. The research data was coded and thematically analysed. A further analysis was done through reviewing transcripts and field notes and that were then matched with the coded data.

4. Results of the study

Table 4.1 below presents a summary of key findings which were extracted from the results gathered through face-to-face interviews with 15 participants.

Table 4.1: Main findings from the interviews

Findings from Interviews	Responses
1. Gender Imbalances in Windhoek City Police Service	• The Namibia Constitution Article 10: Equality and Freedom from Discrimination (1) All persons shall be equal before the law. (2) No persons may be discriminated against on the grounds of sex, race, colour, ethnic origin, religion, creed or social or economic status. Gender stereotyping leads to discrimination of women, affect recruitment and selection policies.
2. Namibian policy on gender.	Literature revealed that the national policy on gender and employment is to promote equal economic rights between men and women as well as the economic independence of women.
3. The factors that lead to gender disparity in	• Lack of Gender-Focal Representatives • Lack of gender-sensitive budgeting

the city of Windhoek	practices • Inconsistent gender mainstreaming practices • Inadequate gender analysis of information. • No implementation of gender responsive key result areas in performance management plans • No preparation of gender responsive performance indicators in plans of action • HR Policy is not explicit on incorporating gender balance in strategic human resource management plans and gender equality quotas.
The challenges women face in decision-making concerning gender roles	• Women receive equal salaries with men • Women receive equal internal training opportunities only • Women receive less study leave opportunities • Women are accorded adequate maternity leave • Women have unequal representation in all leadership positions
The effect of gender-disparity on municipality's performance	Gender imbalance negatively affects the municipality's performance due to: • limited monitoring and evaluative processes of the outcomes and impacts of gender mainstreaming, • lack of disaggregated data, • failure to provide effective capacity building for both men and women at all levels • Mainstreaming attempts are depicted as voluntary which results in little explicit effort to initiate change. • Limitation in resources and low organisational commitments to put gender policies into practice. • unfair identification and mentoring of high potential employees, both men and women • Leadership does not regularly review and develop talent management initiatives and succession *management* towards obtaining gender balance in all leadership positions. • lack of promotion of gender balanced participation in management development programs • no mentoring and coaching programs for women in the leadership pipeline.

The factors that lead to gender disparity in the city of Windhoek

The participants identified eight key factors that lead to gender disparity in the City of Windhoek. These are: lack of implementation of strategic policy, lack of gender focal representatives, stereotyping leads to discrimination of women and affects recruitment and selection policies, lack of gender-sensitive budgeting practices and inconsistent gender mainstreaming practices. The other three are: inadequate gender analysis of information, poor implementation of gender responsive key result areas in performance management plans and lack of clarity on the roles of departments in gender-responsive budgeting in the workplace.

The challenges women face in decision-making concerning gender roles

The participants reported seven significant challenges women face concerning gender roles in decision-making in the City of Windhoek. First, unlike their male counter-parts, women do not receive equal opportunities for training outside the country. However, the same women indicated that they receive equal internal training opportunities. The second challenge is that, women also receive less study leave opportunities at local universities and beyond. Furthermore, men tend to have study leave opportunities and scholarships to continue with their studies, both locally and through foreign institutions. Thirdly, women have unequal representation in all leadership positions in the City of Windhoek. The participants indicated that women only make one quarter of top and middle leadership positions while they outnumber men at line level of management. The other four challenges are inefficient oversight mechanisms to ensure effective management of gender-related complaints/grievances, senior leadership lacks sound understanding on how to best integrate gender mainstreaming. Senior leadership does not also wholly support the gender issues with most senior leadership resisting the implementation of gender mainstreaming, giving high priority to other key result areas. Lastly, performance agreements of the majority of officers have not yet integrated gender mainstreaming as a key indicator of excellent performance.

The effect of gender-disparity on municipality's performance

The direct effects of gender-disparity on the municipality are that: there is limited monitoring and evaluative processes of the outcomes and impacts of gender mainstreaming, inadequate and lack of disaggregated data, failure to provide effective capacity building for both men and women at all levels and most mainstreaming attempts are depicted as voluntary, which results in little explicit effort to initiate change. There is also limitation in resources and low organisational commitment to putting gender policies into practice.

The indirect effects are that, the organisation engages in unfair identification and mentoring of high potential employees, both men and women. This discourages consistent internal promotions from occurring. In addition, leadership does not regularly review and develop talent management initiatives and succession management towards obtaining gender balance in all leadership positions. There is also lack of promotion of gender balanced participation in management development programs and no mentoring and coaching programs for women in the leadership pipeline.

5. Discussions and Conclusions

Instigation of gender sensitive program-based budgeting

The City of Windhoek should incorporate GRB into departmental missions and objectives; develop gender sensitive indicators for each budget phase and apply the principles of gender sensitive program-based budgeting. This would create gender equality and equity awareness among all employees.

Leadership and coordination mechanisms for gender budgeting

The City of Windhoek should have clear coordination and leadership mechanisms for gender budgeting processes, provide guidance to departments through budget circulars and training to ensure sufficient capacity for delivery of gender budgeting goals.

All City of Windhoek Departments should engage in gathering gender-disaggregated data for supporting gender assessments and developing effective evidence based and gender sensitive policies, engaging with key stakeholders on gender budgeting issues to allow participative, inclusive and responsive gender budgeting practices.

The departments should assign distinct functional classifications to performance indicators to help highlight and monitor how the budget contributes towards attainment of gender equality and mainstreaming in the whole Municipality.

The Senior Managers should create mechanism for appeals on gender equality complaints with no repercussions of being victimised and they should acknowledge receipt of complaints timeously and communicate on follow-up processes and timelines.

The Senior Managers should facilitate proactive training of officers on gender equality policies and legislation for effective gender equality implementation; capture and report all gender related appeals and recourses, render protection to employees who report violations of gender equality legislation and policies in the workplace. They must do much to establish impartial and effective appeal and recourse mechanisms on gender issues and develop advocacy and awareness campaigns on gender laws and policies.

The HR Policy should be explicit on incorporating gender balance among key objectives in strategic human resources management plans and gender equality quotas in senior leaders and middle managers' performance agreements for recruitment and selection. This would ensure all managers consider gender equality practices as one of their key result areas for performance review and assessment.

The Top Managers should ensure that all departments in the organisation make their internal gender policies explicit and ensure that all subordinates understand them so that they can value them and eventually feel committed to implementing them effectively;

The Top Managers should build the capacity for high potential women, such as through fast-track schemes, also, ensure women are well represented in both foreign and domestic workshops through making such training as accessible as possible for them;

The Top Managers should build the capacity of gender focal points and gender champions in order to nurture a culture of gender equality and institutionalize gender equality commitments;

The employees at the City of Windhoek should develop the political will and openness to innovation, commitment and willingness to allocate resources towards gender sensitive budgeting which is aimed at benefitting both men and women in a fair and sound manner.

The study concluded that there is gender disparity in the City of Windhoek. Women do not receive equal opportunities for training outside the country like their male counterparts, women also have unequal representation in all leadership positions. Furthermore, there are inefficient oversight mechanisms to ensure effective management of gender related complaints/grievances, senior leadership lacks sound understanding on integrating gender mainstreaming. Also, most senior leadership resists the implementation of gender mainstreaming and performance agreements of the majority of officers do not integrate gender mainstreaming as a key indicator of excellent performance. Thus, disgruntled women and incompetent men appointed based on gender stereotypes become sources of incompetency in the City of Windhoek.

6. Areas for future studies

1. Future studies can explore the established linkages of interpersonal and socio-cultural gender disparity.

2. This study provides an opportunity for future research on exploring how changing norms have been altering the position of women.

3. The current study also provides an opportunity for designing intervention projects aimed at providing justice and quality to women.

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