

## **RURAL-URBAN MIGRATION CHALLENGES IN SOUTH AFRICA: CASE OF KWAZULU-NATAL (SA)**

**B. Nkabinde**

*Durban University of Technology*

**L.M Lekhanya**

*Durban University of Technology*

**N. Dorasamy**

*Durban University of Technology*

### **ABSTRACT**

*Urban areas in developing economies are facing challenges related urbanization and rural-urban migration patterns and urban planning, there is overcrowding in cities and a rise in informal settlements in cities coupled with poor structural planning and no proper planning in cities. urban areas in KwaZulu-Natal are facing same challenges with the rise on service delivery demand, while on the other hand there have been economic contributions from rural entrepreneurs who establish small to medium size business in cities which end up creating employment opportunities for them and others. This stands to show that the rural to urban migration patterns can either make or break the local economic development in African cities. hence, there is a need to harness the benefits for sustainable development and economic growth The study adopts a quantitative approach with the sample comprising 350 respondents, purposively selected through non-probability sampling, and required to complete a 5-point Likert scale questionnaire. The researcher assisted in terms of questionnaire administration. The completed questionnaire provided the quantitative data for statistical analysis, using SPSS version 28.0. Study findings indicate that, among other factors, a strong significance exists regarding increased crime levels in urban areas because of rural-urban migration patterns, with suggestions that include more money needs to be prioritized from government for policing and crime in cities such as eThekweni Municipality. Since there are more informal settlements because of rural-urban migration, it is also shown as necessary to create network infrastructure in rural areas to improve communication for those working from home. need for improved urban planning to enhance service delivery, the study investigated the challenges in migration patterns and their influence on service delivery, as well as examining the extent to which rural-urban migration can be used to deal with the current state of service delivery. In addition, the study determined the role of rural-urban migration in the overpopulation of urban areas.*

**Keywords:** Service Delivery, Rural-Urban Migration Challenges, Patterns, Government, Municipalities.

### **1. INTRODUCTION**

There were approximately 281 million international migrants in 2020 – 3.6 percent of the global population, according to the World Migration Report (WMR) (2022), with migrants living in countries not their place of origin adding to existing rural-urban migration, leading to the increase of the urban populace (Mubangizi 2021). Putting matters into perspective, the urban population in the world comprised 34 percent of the total in the 1960s and was steadily accumulating, according to studies by the United Nations Department of Economic and Social Affairs (UNDESA) (2015). In 2014, this growth was predicted to increase from 54 to 66 percent by the year 2020 (Niva, Taka & Varis 2019).

Rural-urban migration means the movement from rural-urban areas, where urbanization processes enable these individuals to become permanently situated in the urban areas (Berry, Bowen, & Kjellstrom 2010). In this process, the number of migrants living in cities increases beyond the population in the rural areas, leading to growth in urban areas, coupled with natural population growth, which worsens the problem (Liu & Dang 2019). An economy is considered urbanised when more than half of the population lives in the urban areas; with the ability to harness the power of rural-urban migration for economic growth and service in municipalities such as the eThekweni municipality, in the province of KwaZulu-Natal (KZN) (Munishi & Jewitt 2019).

The rapid increases in rural-urban migration are linked to economic transformation and urbanisation, for example, people mostly migrate for economic reasons, such as education and better jobs; however, should migration be ignored, it can only exacerbate poor service delivery (Eduful & Hooper 2019). Moreover, when there is no proper planning, the growth then leads to disadvantages in urban areas that relate to housing allocation and infrastructure, which result in increased informal settlements (Ginsburg et al. 2016). Nonetheless, there is an existing problem of government being unproductive, while the outputs of services and goods seem to not meet the demands and needs of the community, which lead to poor service delivery performance (Jacobs, Rivett & Chemisto 2019).

#### ***Problem statement***

As per a latest study into municipal urban growth, the eThekweni Municipality 2016/17 Spatial Development Framework reported 276 988 in-migrants in 2001 and 2011, showing marked growth (Govender 2017). According to the municipality, this figure grew to 3 414 197 for 2011, yet was expected to rise 3 818 499 for 2021, amid estimates reaching 4,47 million by the year 2030, which indicates an unsettling trend (Musvoto, Lincoln & Hansmann 2016). Urbanisation usually impacts resource allocation and the management of public amenities (Hellberg 2014). Hence, the research aims to demonstrate a link across rural-urban migration trends and service delivery (Fleischmann & Phaet 2018).

## **2. LITERATURE REVIEW**

The literature review gathered in this section focuses on pertinent issues influencing rural-urban migration patterns to enhance service delivery eThekweni Municipality KwaZulu natal.

#### ***Theoretical framework on rural-urban migration***

People engage in internal migration (in-country) or external migration (inter-country) (Ahouga 2021; Gardiner & Hajek 2020), because of harsh climate conditions, political conflicts, limited access to social amenities and in search of better economic opportunities, among other reasons (Bimrose & McNair 2011; Usman et al. 2020). In the context of SA, people practice rural-urban migration mainly due to underdeveloped rural areas imposed by the apartheid regime that favoured urban development at the expense of rural development (Gelb & Krishnan 2018; Boulding & Wampler 2010). As a result, rural-urban migration leads to overpopulation in urban areas, which chokes service delivery. It also results in poor economic development in rural areas, as the economic and politically active population migrate to urban areas (Nkabinde et al. 2018; Dago & Barussaud 2021) which, evolves around numerous theories.

It is, therefore, important to examine the theories developed by scholars of internal migration in the 1900s. These include the theories of: Lee (1966) - theory of migration; Mabogunje (1970) - migration systems theory; Zelinsky (1971) - mobility transition theory; and the 1990s work of Skeldon on migration transitions, as well as Harris and Todaro (1970) - neo-classical migration theory; Piore (1979) - dual labour-market theory, Stark (1978, 1991) - new economics of labour migration; and, lastly, Massey (1990) - cumulative causation

theory in the 90s. It is important to investigate all the theories in full context, to wholly understand the phenomenon of rural-urban migration and its role in population growth and service delivery (Nkabinde et al. 2018).

Though urbanisation is viewed as an integral part of economic development in developing economies such as SA (Posel & Casale 2011), it has created overcrowding in eThekweni city, as it accommodates local rural-urban migrants, refugees, asylum seekers and regional economic migrants (Bonallack 2018). This has resulted in the eThekweni Municipality struggling to provide social services efficiently and effectively to its residents. In socio-political spaces, this has created 'social classes' dubbed "us (locals) and them (foreigners)", which is born from rising insecurities that affect the way migrants are perceived in general (McKinsey 2016).

Urbanisation is, furthermore, deemed an integral part of economic development in developing economies such as SA (Posel & Casale 2011). Globally, there have been calls for support mechanisms on migration by civil society, particularly rural-urban, with rising concerns crippling the cities. As such, SA needs a legal policy framework that regulates rural-urban migration (Machinya 2020). Rural-urban migration results in imbalances in both source and destination communities. For example, it may lead to health personnel leaving rural areas and small cities, negatively impacting rural area hospital capacity (Labonté et al. 2015). It follows this reduces resources, for example, health personnel; subsequent capability problems in rural areas, small towns and cities need to be determined to find solutions that negate the impact (Missinne & Bracke 2012; Mohamed & Abdul-Talib 2020).

#### ***The state of rural-urban migration and its impact on service delivery in SA***

The increase of rural-urban migration brings challenges to the government, with most municipalities lacking clean water and electricity, which causes delays in service delivery to the community in SA (Weiberg et al. 2019). There is a need to develop rural areas to help municipalities build and create job opportunities in rural areas to provide the municipality responsible in that area an opportunity to render services and curb rural-urban migration (Weimann & Oni 2019).

Rural-urban migration is responsible for the increase in informal settlements in urban areas, with these settlements having long been an issue requiring government attention to ensure the safety of the community (Prior & Eriksen 2013). While there has been improvement in settling informal settlements, the problem is that numbers increase day-by-day due to rural-urban migration (Mayer & Rouleau 2013: 1-9). An immediate need exists for local government to expand land projects in urban areas because of the never-ending population hike (Nielsen-Pincus, Ribe & Johnson 2015).

The issue of land remains a challenge, because part of the land is owned by Chiefs, and other stakeholders, apart from what the government owns (Petrzelka & Armstrong 2015). The government is working to ensure 100 percent ownership of the land, to facilitate equal distribution to deserving communities (Ghebru & Okumo 2017). LED is necessary, as urbanisation is closely linked to it (Cox et al. 2018; Mamokhere 2019). Rural-urban migration is also driven by the demand and supply of labour where economic development and growth are concerned, to the extent that temporal and permanent migration is gradually affecting coastal provinces (Qi 2019; Wise, Perić, & Đurkin 2019).

#### ***Economic contribution of rural-urban migration in KZN***

The economic impact of rural-urban migration is a phenomenon that needs to be explored in its entirety due to its significance in productivity and growth in the entire economic spectrum in KZN (Tanrikulu 2021; Day, Cornell & Malherbe 2021). This includes positive aspects in terms of entrepreneurial migrants from rural areas who bring business to urban areas that contributes to LED and creates jobs within eThekweni Municipality (Henderson & Kriticos 2018; Lekhanya 2018).

The need for structural transformation is obvious in urban areas because rural-urban migration provides the necessary labour in all sectors including agriculture (Henderson, Nigmatulina & Kriticos 2019; Ngcamu 2019). Within eThekweni municipality, educated migrants are prominent in creating job competition and other urban migrants are entrepreneurs (Henderson & Kriticos 2018; Breakfast, Nomarwayi, & Bradshaw 2020). The rural municipalities are short-changed in the process because they find it difficult to sustain development in rural areas with limited labour (Henderson & Turner 2020; Masuku & Jili 2019).

Evidence of increases in urban employment has been attributed to increases in rural migrants (Strobl & Valfort 2013), because there are higher earnings in urban than in rural areas (Piyapromdee 2021). Unlike in developing countries, salaries in developed countries are balanced for both rural and urban employees, thereby reducing the need for migration (Duranton & Puga 2020; Cetin 2019; El Badaoui, Strobl & Walsh 2017). Other studies report little to no impact on hourly wages of workers in urban areas of eThekweni municipality (Kleemans & Magruder 2018).

The rural areas become deficient of human capital to reach its potential (Monras 2019). This points to the need to balance the flow of migrants in both rural-urban and urban-rural migration to ensure balance in salaries and the distribution of jobs created in rural KZN (Lyu & Chen 2019). Comprehending the importance of migrants' contributions to the economy is equally important, particularly where educated migrants are concerned (Dustmann & Glitz 2011; Njwambe, Cocks & Vetter 2019).

#### ***Rural-urban migration global patterns and their impact on service delivery in urban areas***

Evidence exists that people migrate with economic intentions in mind, such as the pursuit of a job opportunity or entrepreneurial opportunities available in urban spaces (Carson, Carson & Eimermann 2018). Hence, the costs associated with migrating place a monetary value on the process of relocating (Huang, Dijst & Van Weesep 2017). Government ought to focus all development efforts on rural economies to strike a balance between rural-urban and service delivery demands (Bryan & Morten 2019; Rhoads 2018). Most governments focus on developing urban economies, turning them into economic hubs but research shows this slows down economic growth (Morten and Oliveira 2016; Yang & Dunford 2018). Development of rural areas reduces overcrowding of urban areas (Fafchamps & Shilpi 2013).

Migration is also common when people migrate to areas where there are people who share both their language and ethnic background (Tabellini 2020; Bryan & Morten 2019). This is due to migrants integrating better where there are ethnic groups similar to theirs (Armann, Inostroza & Fan 2019). Studying of networks in migration is important, particularly the implications of rural-urban migration in urban areas (Tjaden et al. 2019; Détang-Dessendre, Partridge & Piguet 2016: 89-103). This can assist in understanding migration with respect to destinations, as well as migration outcomes, development, and improving service delivery (Azose & Raftery 2019). When people migrate from rural areas, labour in rural areas becomes scarce (Helbling & Leblang 2019). High wages in urban areas are a pull factor attracting migrants to urban areas, increasing the rural-urban migration (Hankaew et al. 2019).

SA is home to an extensive population, as it is one of the most urbanised parts of Africa (Zimmer et al. 2020; Makinde 2014). Existing governance issues also need to be considered, since it is necessary to put rural-urban migration on the government agenda (Phago 2020; Liu, Zuo & Dong 2021). New policy reforms in the southern African region have taken migration into consideration, however, there is less focus on urban planning (Wellmann et al. 2020). In this regard, the way forward is to provide grounds for these changes and how these changes are going to affect urban spaces in SA (Ronchi et al. 2020; Lagakos 2020).

### **3. OBJECTIVES**

This research aims at studying rural-urban migration patterns to enhance service delivery in the eThekweni Municipality, in the KZN province to identify and explain migration patterns to enhance service

delivery in eThekweni Municipality. To investigate the pull and push factors in the patterns of migration and its influence on service delivery. To examine to what extent rural-urban migration can be used to deal with the current service delivery state. To determine the role of rural-urban migration on the overpopulation of urban areas in eThekweni Municipality. To suggest and recommend strategies that should be employed to improve the current state of service delivery in the municipality's local government, related to service delivery.

#### 4. RESEARCH METHODOLOGY

The application of the interpretivist and positivist paradigms, as well as the use of qualitative and quantitative evidence will be discussed (Weinreb, Stecklov & Arslan 2020). These approaches rely on data gathering to analyses and find correlations in data that may be generalized to the entire population (Jumriani, Hadi & Mutiani 2023). Assumptions will be established and evaluated to draw conclusions based on factual reality, rather than illusions (Saunders, Lewis & Thornhill 2012).

Interpretivism incorporates components of explanation into research by fully integrating objectives, which investigators presume they can use to gain accessibility to truth, using social contrasts such as language, knowledge, tools, and shared meaning (Jumriani et al. 2023). The study will aim to integrate the two, relying on philosophical assumptions to be realistic by acknowledging there are several ways to perceive things (Saunders et al. 2012). Following substantial research, the researcher adopted a quantitative approach, while an extensive literature review assisted in examining rural-urban migration, in respect of service delivery within the eThekweni Municipality. These variables were measured using a questionnaire and analyzed statistically to determine whether rural-urban migration can be employed to enhance service delivery in Silver City informal settlement. eThekweni City, KZN. This approach was also deemed appropriate for exploring the large sample size of 350 rural migrants in KZN, considered necessary for establishing valid findings, and which would have been impractical should qualitative methods have been employed.

#### 5. DATA ANALYSIS, INTERPRETATION AND DISCUSSION

The following section provides the interpretations and discussions of the empirical findings of this study.

##### *Kaiser-Meyer-Olkin Measure and Bartlett's Test*

Table 1 reflects the level of adequacy and significance of the sample of this study.

**Table 1. Kaiser-Meyer-Olkin (KMO) Measure and Bartlett's Test**

		KMO Measure of Sampling Adequacy	Bartlett's Test of Sphericity		
			Approx. Chi-Square	df	Sig.
8A	The effects of rural-urban migration on roads and Transportation infrastructure.	0.853	3559.371	15	0.000
9A	The impact of rural-urban migration on schooling facilities capacity.	0.733	1768.192	3	0.000
10A	The effects of rural-urban migration on health facilities in urban areas.	0.805	1544.206	6	0.000
11A	The effects of rural-urban migration on Policing and crime.	0.833	3021.757	10	0.000
12A	The effects of rural-urban migration on the electricity supply	0.753	1191.572	3	<0.001

13A	The effects of rural-urban migration on water and sanitation.	0.791	2053.820	6	0.000
14A	The effects rural-urban migration on social development.	0.797	1900.984	6	0.000
15A	The effects of rural-urban migration on Technology and communication	0.796	1941.734	6	0.000
16A	The effects of rural-urban migration on employment and job creation.	0.830	2567.941	6	0.000
8A-16A	Rural-urban migration patterns to enhance urban service delivery	0.951	41133.832	666	0.000

*Source: Developed by the authors*

Based on table 1 above, all conditions are satisfied for factor analysis, where the KMO value should be  $> 0.500$  and Bartlett's significance value should be  $< 0.05$ . These results clearly indicate that sampling, with all variables under the categorised themes shown as adequate and statistically significant in measuring the same thing. Furthermore, the tests show a 0.951 KMO measure of sampling adequacy, indicating the effects of rural-urban migration as ( $<0.001$ ), which is highly significant on the electricity supply.

## 6. RELIABILITY STATISTICS

Table 2 reflects the reliability statistics tested at 0.70 using Cronbach's Alpha.

**Table 2. Reliability test scores**

		N of Items	Cronbach's Alpha
8A	The effects of rural-urban migration on roads and Transportation infrastructure	6	0.962
9A	The impact of rural-urban migration on schooling facilities capacity.	3	0.963
10A	The effects of rural-urban migration on health facilities in urban areas.	3	0.880
11A	The effects of rural-urban migration on policing and crime.	5	0.974
12A	The effects of rural-urban migration on the electricity supply.	3	0.953
13A	The effects of rural-urban migration on water and sanitation.	4	0.964
14A	The effects rural-urban migration on social development.	4	0.958
15A	The effects of rural-urban migration on Technology and communication.	4	0.936
16A	The effects of rural-urban migration on employment and job creation.	4	0.975

*Source: Developed by the authors*

The reliability test was performed on all statements in the questionnaire. The questionnaire was designed and divided into research themes based on the research aims. Table 2 above indicates the reliability scores for all sections exceeded the recommended Cronbach's alpha value for a newly constructed construct.

This indicates a degree of acceptable, consistent scoring for all these sections of the research. The following table will cover component test for all research questions.

## 7. FACTORS INFLUENCING RURAL-URBAN MIGRATION PATTERNS TO ENHANCE SERVICE DELIVERY

The table below reflects the component matrix on rural to urban migration patterns to enhance service delivery.

**Table 3. Component Matrix<sup>a</sup>: The effects of rural-urban migration on roads and transportation infrastructure**

	Component 1
There is no proper transport system in the rural areas which makes it difficult to travel to work.	0.807
I migrated from rural areas to urban areas in order to work in transport.	0.771
The infrastructure development of rural areas can minimise rural-to-urban migration trends.	0.788
There is no Roads and bridges in my area of origin	0.711
I migrated from rural areas to urban areas to gain access to better roads and bridges.	0.895
Rural-to-urban migration is good for the transport	0.812

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether there is no appropriate transport system in the rural areas were at (0.807) while more people are migrating for transport needs (0.771). Infrastructural development (0.788) is connected to both the direct and indirect impact of migration patterns affecting rural areas no proper roads and bridges (0.711), which shows poor service delivery in rural area. Furthermore, access to better roads and bridges (0.895) has both direct impact as it affects rural areas, since this better infrastructure seems to act as a pull factor attracting migrants from rural areas to urban areas, which then shows poor service delivery in rural areas and better provision of roads and bridges in urban areas. Rural migrants support the urban economy through transport (0.812), which in turn, affects the transport economy in rural areas results showed major significance as rural-urban migration challenges.

**Table 4. Component matrix: the impact of rural-urban migration on schooling facilities capacity**

	Component 1
There is an increase in the student population due to rural-urban migration patterns.	0.690
There is overcrowding in classes due to rural-urban migration patterns	0.830
The learners' overload in classrooms is increasing the work load for teachers.	0.677

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether There is an increase in the student population due to rural-urban migration patterns. (0.690) while overcrowding in classes (0.830) affects urban areas as a result of rapid rural-urban migration patterns that have an impact on service delivery The learners' overload in classrooms is increasing the work load for teachers (0.677). results showed major significant as rural-urban migration challenges.

**Table 5. Component matrix: the effects of rural-urban migration patterns on Health Facilities in urban areas**

	Component 1
The rural-urban migration patterns cause delays in urban hospitals	0.741
The rural-urban migration patterns increase diseases in urban areas	0.873
The ever-increasing numbers of patients in urban areas because of rural-urban migration leads to shortages in medical staff	0.855
The rural-urban migration patterns lead to shortages in hospital admission facilities.	0.680

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether Delays in urban hospitals (0.741) is connected directly to service delivery, because hospitals are mostly in cities as opposed to rural areas, and patients normally travel to the urban hospital (in this case, the Emshiyeni Memorial hospital). Thus, increasing diseases in urban areas (0.873) is critical to both the rural and urban impact of rural-urban migration pattern and highlights the need for government to be proactive with regard to disease management. The ever-increasing numbers of patients in urban areas because of rural-urban migration leads to shortages in medical staff (0.855) The rural-urban migration patterns leads to shortages in hospital admission facilities. 0.680 results showed major significant as rural-urban migration challenges.

**Table 6. Component matrix: the effects of rural-urban migration patterns on policing and crime**

	Component 1
The rural-urban migration patterns lead to an increase in crime in urban areas.	0.902
The rural-urban migration patterns create more demand for police officers.	0.745
We need more police stations to the high demand created by rural-urban migration patterns	0.832
More police officers need to be hired to deal with the demand created by rural-to-urban migration.	0.745
More money from the Government needs to be prioritised for policing and crime	0.900

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether the rural-urban migration patterns lead to an increase in crime in urban areas (0.902). The demand for more police officers (0.745) is connected to the urban direct impact of migration patterns and service delivery, which reflects the need for the government to hire more police officers in order to deal with crime rates in eThekweni municipality. We need more police stations to the high demand created by rural-urban migration patterns (0.832). The demand for more police officers (0.745) is connected to the urban direct impact of migration patterns and service delivery, which reflects the need for the government to hire more police officers in order to deal with crime rates in eThekweni municipality. The table further depicts a strong significant connection between more money for urban policing (0.900), public service delivery, reflecting the need for



government to prioritise policing in all government spheres. results showed major significance as rural-urban migration challenges.

**Table 7. Component matrix: the effects of rural-urban migration patterns on the Electricity supply**

	Component 1
The rural-urban migration patterns lead to more migrants demanding more electricity which results in load shedding	0.685
More power stations are needed in urban areas to curb the demand created by rural-urban migration patterns.	0.890
More options need to be created for electricity for example, solar and wind energy since there is more demand for electricity due to rural-urban migration patterns.	0.880

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether electricity demands are critical to both rural and urban (0.685), which signifies a strong connection to the impact of rural-urban migration patterns, with both indirect and direct effects that subsequently affect service delivery in cities and in rural areas. More power stations (0.890) show a connection and significance in relation to rural migration patterns, critical patterns; which means the need for power stations has effects on both rural and urban areas in terms of service delivery. more options for electricity (0.880) indicates a strong connection and significance in relation to rural impact of migration patterns and service delivery lack power option effects both rural and urban areas. results showed major significance as rural-urban migration challenges.

**Table 8. Component matrix - the effects of rural-urban migration patterns on water and sanitation**

	Component 1
There is more demand for water in urban areas because of rural-urban migration patterns.	0.721
There are pit latrines in urban areas due to rural-urban migration patterns.	0.854
More illegal water connections are in the urban areas due to rural-urban migration patterns.	0.691
Air pollution because of rural-urban migration patterns leads to climate change	0.857

*Source: Developed by the author*

Component test was conducted in relation to the subthemes and the study main objective and results on whether demand for water in urban areas (0.721) has a connection to urban impact of migration patterns and service delivery, meaning there is more demand for water in eThekweni municipality due to rural-urban migration patterns Moreover, the increasing number of patients (0.854) signifies a strong connection to the urban migration patterns and service delivery. Illegal water connections are in the urban areas (0.691) is connected to urban impact of migration patterns and service delivery Further to this, air pollution (0.857) illustrates a connection to housing provision, the urban impact of migration patterns and service delivery, with informal settlements contributing much to urban pollution. results showed major significance as rural-urban migration challenges.

**Table 9. Component matrix: the effects of rural to urban rural-urban migration patterns on social development**

	Component 1
There are more informal settlements because of rural-urban migration patterns.	0.894
There is more demand for social grants in urban areas because of rural-urban migration.	0.774
It is hard to eliminate informal settlements in urban areas because of rural-urban migration patterns.	0.894

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on the need for network infrastructure (0.894), in addition, indicates a strong connection and significance with the patterns influencing rural push factors, impact of rural migration patterns on service delivery. Demand for social grants (0.774) is, furthermore, critical factors influencing rural-urban migration to both the rural and impact of rural-urban migration patterns, which affects service delivery to people in rural areas, who have less access to points of collection, while there are more access points in cities, as well as more people receiving social grants in cities due to unemployment. The need for network infrastructure (0.894), in addition, indicates a strong connection and significance with the patterns influencing rural push factors, impact of rural migration patterns on service delivery. results showed major significance as rural-urban migration challenges.

**Table 10. Component matrix: the effects of rural-urban migration patterns on technology and communication**

	Component 1
There is poor network connection in urban areas due to demand created by the flow of rural-urban migration.	0.687
E-public service delivery is needed to meet the demands created by rural-urban migration patterns.	0.858
There is a need to create network infrastructure in rural areas to improve communication.	0.894
There is theft of network infrastructure in urban areas as a result of rural-urban migration patterns.	0.739

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether network connectivity in urban areas (0.687) is connected to the impact of migration patterns, meaning it can affect service delivery directly and indirectly, at the same time. E-public service delivery is needed to meet the demands created by rural-urban migration patterns 0.858 The need for network infrastructure (0.894), in addition, indicates a strong connection and significance with the patterns influencing rural push factors, impact of rural migration patterns on service delivery. theft of network infrastructure in urban areas (0.739) is connected to both the indirect and direct urban impact of migration patterns and service delivery, which means rapid rural-urban migration patterns lead to crime, including network infrastructure theft in urban areas. results showed major significance as rural-urban migration challenges.

**Table 11. Component matrix: the effects of rural-urban migration patterns on employment and job creation**

	Component 1
The influx of rural-urban migrants creates more competition in the job market in urban areas.	0.881

There are more migrants unemployed in the urban areas because of rural-urban migration patterns.	0.723
Unemployment caused by the influx of rural-urban migration patterns leads to high crime rates in urban areas.	0.872
There are entrepreneurs that come from rural areas to urban areas to start businesses and create jobs.	0.823

*Source: Developed by the authors*

Component test was conducted in relation to the subthemes and the study main objective and results on whether Jobs competition (0.881) similarly reflects a strong connection and significance to the urban impact of migration patterns and service delivery. Unemployed in the city (0.723) is connected to critical patterns, meaning it affects both rural and urban areas and the urban direct impact of migration patterns, as well as service delivery. Rural-urban migration patterns are contributing to the unemployment in eThekweni municipality. Unemployment in the city (0.872), furthermore, shows a strong significance and connection to critical patterns, urban migration patterns, the urban direct impact of migration patterns and service delivery. Tested at 0.823 Rural entrepreneurs affect rural areas, since rural migrants end up helping the urban economy grow, while rural municipalities suffer in terms of LED, which then affects service delivery. results showed major significance as rural-urban migration challenges.

## 8. CONCLUSION

### *Conclusions as to research objectives*

The following section provides an overview of the variables tested and conclusion are reached and they are based on the analysis of empirical findings test were conducted on different variables. Questionnaires were very useful in reaching conclusions using different variables.

### ***Key findings of Objective 1: To identify and explain migration patterns to enhance service delivery in eThekweni Municipality***

The findings suggest a need for urban planning to harness the good aspects of rural-urban migration, providing key pointers for sustainable growth in local government, as well as to address the high urban crime rate, unemployment, delays in hospitals, and the importance of creating a conducive environment for rural entrepreneurs to start businesses in cities, thus contributing to economic growth. A further need identified is for more power stations, in terms of energy generation, and the adoption of other energy options such as solar, wind and hydro power.

While there is high demand for housing in urban areas as a result of rural-urban migration patterns, there is also more demand for social grants, in addition to overcrowding in classes in urban areas as a result of rural-urban migration. Consequently, rural areas suffer directly and indirectly as a result of rural-urban migration. The suggested theoretical framework (figure 6.1) shows the importance of understanding all the patterns in order to enhance both urban and rural service delivery.

### ***Key findings on Objective 2: To investigate the pull and push factors of rural-urban migration and their influence on service delivery***

The findings reflected there is a need for the government to understand the pull and push factors in rural-urban migration to enhance service delivery, since migrants are attracted to urban areas by better services and economic opportunities, such as jobs and education, while they are pushed from rural to urban areas by poor service delivery and lack of economic opportunities such as education and employment; this

also increases the unemployment rate in cities. Hence, there is a need to maintain local economic growth and development, while ensuring service delivery performance is at an optimum level.

***Key findings on Objective 3: To examine to what extent rural-urban migration can be used to deal with the current state of service delivery***

The study suggests a strong relationship exists between rural-urban migration patterns and urban service delivery. Hence, there are demands for services in cities, since migrants end up living in and occupying cities, which lead to overcrowding. The study further concludes government needs to put money aside for urban policing in order to eradicate crime in eThekweni municipality. In addition, the study found there is fierce competition for jobs in urban areas, as well as illegal water connections, more patients in urban hospitals, air pollution and pit latrines, which are major factors in urban pollution, indicating poor service delivery, network infrastructure theft, and more water demand in eThekweni municipality as a result of rural-urban migration patterns.

***Key findings on Objective 4: To determine the role of rural-urban migration on the overpopulation of urban areas in eThekweni Municipality***

Rural-urban migration patterns show migrants are motivated by economic opportunities such as jobs and education, which only lead to more electricity and water demand, overcrowding in schools and hospitals, and creates fierce competition in the job markets in cities, which leads to joblessness. However, development needs to also focus on rural areas, which can alleviate the flow of rural migrants into cities.

***Key findings on Objective 5: To suggest and recommend strategies that should be employed to improve the current state of service delivery in the municipality's local government, related to service delivery***

There is a major need for integrated urban expansion and town plans that will harness the power of migration to enhance service delivery. Hence, there is a suggested conceptual framework (figure 6.1), developed after testing different variables with the review of literature. The study suggests a review of the critical patterns, indirect and direct impact of rural-urban migration patterns in urban service delivery, as a strategy to improve service delivery.

## **9. RECOMMENDATIONS**

The section below provides key recommendations in accordance with the empirical findings and study conclusions.

The study recommends urban planning to harness the good aspects of rural-urban migration, providing key pointers for sustainable growth in local government, as well as curbing the high urban crime rate, unemployment, delays in hospitals, and the importance of creating a conducive environment for rural entrepreneurs to start businesses in cities for economic growth. There is also a need for more power stations in terms of energy generation and the adoption of other energy options such as solar, wind and hydro power. A high demand exists for housing in urban areas as a result of rural-urban migration patterns, as well as more demand for social grants, while overcrowding in classes happens in urban areas as a result of rural-urban migration, with rural areas suffering directly and indirectly as a result of rural-urban migration. There is thus a need for the development of policies and control mechanisms to manage rural-migration patterns.

The study recommends, in order to enhance service delivery, there is a need for the government to understand the pull and push factors in rural-urban migration. Migrants are attracted to urban areas by better service and economic opportunities such as jobs and education, while they are pushed from rural to urban areas by poor service delivery and lack of economic opportunities, such as education and employment, which also increases the unemployment rate in cities. Hence, there is a need to maintain local economic growth and development, while ensuring service delivery performance is at an optimum level.

The study recommends the need for a strong relationship between rural-urban migration patterns and urban service delivery. Hence, there is service demand in cities since migrants end up living and occupying cities, which only leads to overcrowding. The study further concludes the government needs to put money aside for urban policing in order to eradicate crime in eThekweni municipality. The study also concludes there is fierce competition for jobs in urban areas, as well as illegal water connections, and more patients in urban hospitals, while air pollution and pit latrines are major factors in urban pollution indicating poor service delivery. Other factors include network infrastructure theft and more water demand in eThekweni municipality as a result of rural-urban migration patterns.

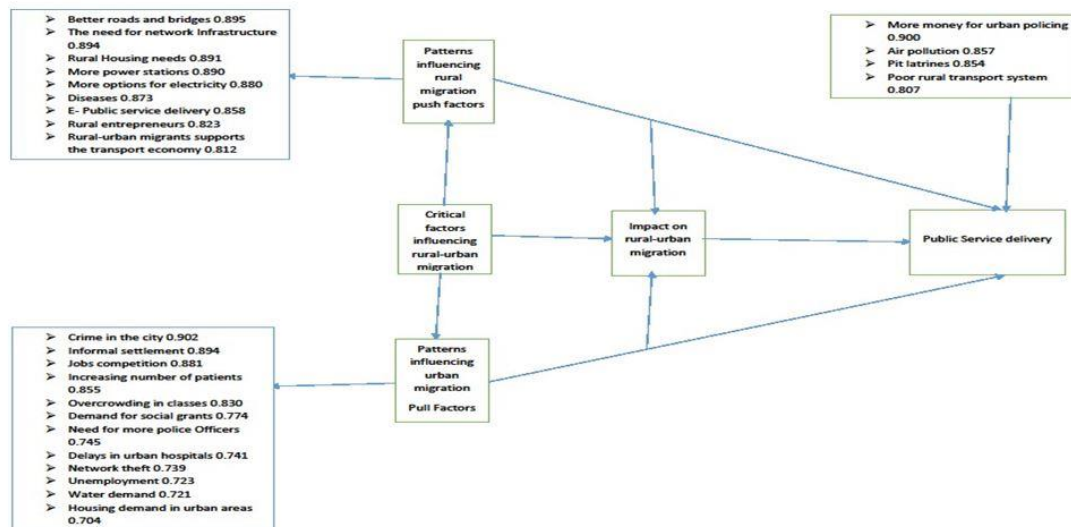
The study recommends proactively dealing with rural-urban migration patterns to enhance service delivery, since migrants are motivated by economic opportunities such as jobs and education, which only lead to more electricity and water demand, overcrowding in schools, hospitals and creates fierce competition in the job market in cities, which leads to joblessness. However, development needs to also be focused on rural areas, which can alleviate the flow of rural migrants into cities. There is a major need for integrated urban expansion and town plans that will harness the power of migration to enhance service delivery. Therefore, a conceptual framework is suggested, developed after testing different variables with the review of literature. The study suggests the review of critical patterns, indirect and direct impact of rural-urban migration patterns in urban service delivery, as a strategy to improve service delivery.

## 10. PROPOSED INTEGRATED MODEL

### *Conceptual framework formulated through variables identified from the questionnaire*

As indicated in the previous chapters, the formulation of the objectives, hypotheses and data collection instrument was achieved through a rigorous literature search. The literature review served as a fundamental source for identifying and selecting variables that supported the development of this research study.

Based on the questionnaire, it can be concluded rural-urban migration leads to overcrowding, crime, and poor service delivery in terms of health, education, housing and job creation, as per the identified themes. Different variables were used in the formulation of questionnaire and they were test scientifically; as a result, the integrated Conceptual framework has been developed and is presented below Figure 1.



## FIGURE 1 CONCEPTUAL FRAMEWORK

### 11. ACKNOWLEDGEMENT

Gratitude to Durban University of Technology (DUT) for their financial support during the course of this research.

### 12. COMPETING INTERESTS

Authors have declared that no competing interests exist.

### REFERENCES

1. Ahouga, Y. (2021). *Transforming the international organisation for migration: An analysis of the IOM strategic vision* (No. 2, p. 21). Working Paper.
2. Artmann, M., Inostroza, L., & Fan, P. (2019). Urban sprawl, compact urban development and green cities. How much do we know, how much do we agree?. *Ecological indicators*, 96, 3-9.
3. Azose, J. J., & Raftery, A. E. (2019). Estimation of emigration, return migration, and transit migration between all pairs of countries. *Proceedings of the National Academy of Sciences*, 116(1), 116-122.
4. Berry, H. L., Bowen, K., & Kjellstrom, T. (2010). Climate change and mental health: a causal pathways framework. *International journal of public health*, 55, 123-132.
5. Bimrose, J., & McNair, S. (2011). Career support for migrants: Transformation or adaptation?. *Journal of Vocational Behavior*, 78(3), 325-333.
6. Combeaud Bonallack, P. (2018). Amnesty international language resource centre: Overview of current context and vision for the future. *Translation Spaces*, 7(1), 92-105.
7. Boulding, C., & Wampler, B. (2010). Voice, votes, and resources: Evaluating the effect of participatory democracy on well-being. *World development*, 38(1), 125-135.
8. Brannen, J. (1992). Mixed methods: qualitative and quantitative research. *England: Avebury*.
9. Breakfast, N. B., Nomarwayi, T., & Bradshaw, G. (2020). Electoral violence and municipal demarcation in South Africa, 1994-2019: a violent service delivery protests perspective. *Gender and behaviour*, 18(1), 14857-14871.
10. Bryan, G., & Morten, M. (2019). The aggregate productivity effects of internal migration: Evidence from Indonesia. *Journal of Political Economy*, 127(5), 2229-2268.
11. Cetin, M. (2019). The effect of urban planning on urban formations determining bioclimatic comfort area's effect using satellitia imagines on air quality: a case study of Bursa city. *Air Quality, Atmosphere & Health*, 12(10), 1237-1249.
12. Cox, D. T., Shanahan, D. F., Hudson, H. L., Fuller, R. A., & Gaston, K. J. (2018). The impact of urbanisation on nature dose and the implications for human health. *Landscape and urban planning*, 179, 72-80.
13. Carson, D. A., Carson, D. B., & Eimmermann, M. (2018). International winter tourism entrepreneurs in northern Sweden: understanding migration, lifestyle, and business motivations. *Scandinavian Journal of Hospitality and Tourism*, 18(2), 183-198.
14. Dago, F., & Barussaud, S. (2021). Push/Pull Factors, Networks and Student Migration from Côte d'Ivoire to France and Switzerland. *Social Inclusion*, 9(1), 308-316.
15. Day, S., Cornell, J., & Malherbe, N. (2021). Discourses of 'service delivery protests' in South Africa: an analysis of talk radio. *Critical Discourse Studies*, 18(2), 245-262.
16. Détang-Dessendre, C., Partridge, M. D., & Piguet, V. (2016). Local labor market flexibility in a perceived low migration country: The case of French labor markets. *Regional science and urban economics*, 58, 89-103.
17. Duranton, G., & Puga, D. (2020). The economics of urban density. *Journal of economic perspectives*, 34(3), 3-26.
18. Dustmann, C., & Glitz, A. (2011). Migration and education. In *Handbook of the Economics of Education* (Vol. 4, pp. 327-439). Elsevier.
19. Eduful, A. K., & Hooper, M. (2019). Urban migration and housing during resource booms: The case of Sekondi-Takoradi, Ghana. *Habitat International*, 93, 102029.
20. El Badaoui, E., Strobl, E., & Walsh, F. (2017). Impact of internal migration on labor market outcomes of native males in Thailand. *Economic Development and Cultural Change*, 66(1), 147-177.
21. Fafchamps, M., & Shilpi, F. (2013). Determinants of the choice of migration destination. *Oxford Bulletin of Economics and Statistics*, 75(3), 388-409.

22. Fleischmann, F., & Phalet, K. (2018). Religion and national identification in Europe: comparing Muslim youth in Belgium, England, Germany, the Netherlands, and Sweden. *Journal of Cross-Cultural Psychology*, 49(1), 44-61.
23. Gardiner, R., & Hajek, P. (2020). Municipal waste generation, R&D intensity, and economic growth nexus—A case of EU regions. *Waste management*, 114, 124-135.
24. Gelb, S., & Krishnan, A. (2022). *Technology, migration and the 2030 Agenda for Sustainable Development*. ODI.
25. Ghebru, H., & Okumo, A. (2017). *Land administration service delivery and its challenges in Nigeria: A case study of eight states* (Vol. 39). Intl Food Policy Res Inst.
26. Ginsburg, C., Bocquier, P., Béguy, D., Afolabi, S., Augusto, O., Derra, K., ... & Collinson, M. A. (2016). Healthy or unhealthy migrants? Identifying internal migration effects on mortality in Africa using health and demographic surveillance systems of the INDEPTH network. *Social Science & Medicine*, 164, 59-73.
27. Govender, R. (2017). *Evaluation of the approach of eThekweni Municipality in delivering low income housing in the context of urbanisation* (Doctoral dissertation).
28. Harris, J. R., & Todaro, M. P. (1970). Migration, unemployment and development: a two-sector analysis. *The American economic review*, 60(1), 126-142.
29. Hankaew, S., Phithakkitnukoon, S., Demissie, M. G., Kattan, L., Smoreda, Z., & Ratti, C. (2019). Inferring and modeling migration flows using mobile phone network data. *IEEE Access*, 7, 164746-164758.
30. Hellberg, S. (2014). Water, life and politics: Exploring the contested case of eThekweni municipality through a governmentality lens. *Geoforum*, 56, 226-236.
31. Henderson, J. V., & Kriticos, S. (2018). The development of the African system of cities. *Annual Review of Economics*, 10(1), 287-314.
32. Henderson, J. V., & Turner, M. A. (2020). Urbanization in the developing world: too early or too slow?. *Journal of Economic Perspectives*, 34(3), 150-173.
33. Henderson, J. V., Nigmatulina, D., & Kriticos, S. (2021). Measuring urban economic density. *Journal of Urban Economics*, 125, 103188.
34. Helbling, M., & Leblang, D. (2019). Controlling immigration? How regulations affect migration flows. *European Journal of Political Research*, 58(1), 248-269.
35. Huang, X., Dijst, M., & Van Weesep, J. (2017). Social networks of rural–urban migrants after residential relocation: evidence from Yangzhou, a medium-sized Chinese city. *Housing Studies*, 32(6), 816-840.
36. Jacobs, C., Rivett, U., & Chemisto, M. (2019). Developing capacity through co-design: The case of two municipalities in rural South Africa. *Information Technology for Development*, 25(2), 204-226.
37. Jumriani, B. S., Hadi, S., & Mutiani, M. R. I. (2023). 1. Education of Social Regulation Through Social Institution Materials in Social Studies. *Kajian-Kajian Lokal Kalimantan Selatan*, 6(1).
38. Kleemans, M., & Magruder, J. (2018). Labour market responses to immigration: Evidence from internal migration driven by weather shocks. *The Economic Journal*, 128(613), 2032-2065.
39. Labonté, R., Sanders, D., Mathole, T., Crush, J., Chikanda, A., Dambisya, Y., ... & Bourgeault, I. L. (2015). Health worker migration from South Africa: causes, consequences and policy responses. *Human resources for health*, 13, 1-16.
40. Lekhanya, L. M. (2018). The digitalisation of rural entrepreneurship. In *Entrepreneurship-Trends and Challenges*. IntechOpen.
41. Liu, Y., Zuo, R., & Dong, Y. (2021). Analysis of temporal and spatial characteristics of urban expansion in Xiaonan District from 1990 to 2020 using time series Landsat imagery. *Remote Sensing*, 13(21), 4299.
42. Lyu, L., & Chen, Y. (2019). Parental migration and young migrants' wages in urban China: An exploratory analysis. *Urban Studies*, 56(10), 1968-1987.
43. Makinde, O. O. (2014). Housing delivery system, need and demand. *Environment, development and sustainability*, 16, 49-69.
44. Machinya, J. (2020). Migration control, temporal irregularity and waiting: Undocumented Zimbabwean migrants' experiences of deportability in South Africa. In *Waiting and the temporalities of irregular migration* (pp. 96-112). Routledge.
45. Mamokhere, J. (2019). An exploration of reasons behind service delivery protests in South Africa: A case of Bolobedu South at the Greater Tzaneen Municipality. International Conference on Public Administration and Development Alternatives (IPADA).
46. Masuku, M. M., & Jili, N. N. (2019). Public service delivery in South Africa: The political influence at local government level. *Journal of Public Affairs*, 19(4), e1935.

47. Mayer, A. L., & Rouleau, M. D. (2013). ForestSim model of impacts of smallholder dynamics: Forested landscapes of the Upper Peninsula of Michigan. *International Journal of Forestry Research*, 2013(1), 520207.
48. McKinsey, E. (2016). Faculty mentoring undergraduates: The nature, development, and benefits of mentoring relationships. *Teaching and Learning Inquiry*, 4(1), 25-39.
49. Missinne, S., & Bracke, P. (2012). Depressive symptoms among immigrants and ethnic minorities: a population based study in 23 European countries. *Social psychiatry and psychiatric epidemiology*, 47, 97-109.
50. Mohamed, M. A., & Abdul-Talib, A. N. (2020). Push–pull factors influencing international return migration intentions: a systematic literature review. *Journal of Enterprising Communities: People and Places in the Global Economy*, 14(2), 231-246.
51. Monras, J. (2019). Minimum wages and spatial equilibrium: Theory and evidence. *Journal of Labor Economics*, 37(3), 853-904.
52. Morten, M., & Oliveira, J. (2024). The effects of roads on trade and migration: Evidence from a planned capital city. *American Economic Journal: Applied Economics*, 16(2), 389-421.
53. Mubangizi, B. C. (2021). Rural-urban migration and smart cities: Implications for service delivery in South Africa. *African Renaissance*, 18(1), 181.
54. Munishi, S., & Jewitt, G. (2019). Degradation of Kilombero valley Ramsar wetlands in Tanzania. *Physics and Chemistry of the Earth, Parts a/b/c*, 112, 216-227.
55. Musvoto, G., Lincoln, G., & Hansmann, R. (2016, June). The role of spatial development frameworks in transformation of the eThekweni municipality, KwaZulu-Natal, South Africa: reflecting on 20 years of planning. In *Urban Forum* (Vol. 27, pp. 187-210). Springer Netherlands.
56. Nielsen-Pincus, M., Ribe, R. G., & Johnson, B. R. (2015). Spatially and socially segmenting private landowner motivations, properties, and management: A typology for the wildland urban interface. *Landscape and Urban Planning*, 137, 1-12.
57. Niva, V., Taka, M., & Varis, O. (2019). Rural-urban migration and the growth of informal settlements: A socio-ecological system conceptualization with insights through a “water lens”. *Sustainability*, 11(12), 3487.
58. Njwambe, A., Cocks, M., & Vetter, S. (2019). Ekhayeni: Rural–urban migration, belonging and landscapes of home in South Africa. *Journal of Southern African Studies*, 45(2), 413-431.
59. Nkabinde, B., Lekhanya, L. M., & Dorasamy, N. (2018). The rural immigration effects on urban service delivery in South Africa (SA). *Journal of Economics and Behavioral Studies*, 10(6 (J)), 11-24.
60. Petrzalka, P., & Armstrong, A. (2015). Absentee landowners of agricultural land: Influences upon land management decision making and information usage. *Journal of Soil and Water Conservation*, 70(5), 303-312.
61. Piyapromdee, S. (2021). The impact of immigration on wages, internal migration, and welfare. *The Review of Economic Studies*, 88(1), 406-453.
62. Prior, T., & Eriksen, C. (2013). Wildfire preparedness, community cohesion and social–ecological systems. *Global environmental change*, 23(6), 1575-1586.
63. Munzhedzi, P. H., & Phago, K. (2020). Necessitating a Germane developmental local government agenda in South Africa: A post COVID-19 contemplation. *African Journal of Governance and Development*, 9(1.1), 181-199.
64. Qi, Z. (2019). An overview of rural to urban migration in China and social challenges. *Migration Letters*, 16(2), 273-282.
65. Ronchi, S., Salata, S., & Arcidiacono, A. (2020). Which urban design parameters provide climate-proof cities? An application of the Urban Cooling InVEST Model in the city of Milan comparing historical planning morphologies. *Sustainable Cities and Society*, 63, 102459.
66. Rhoads, E. (2018). Forced evictions as urban planning? Traces of colonial land control practices in Yangon, Myanmar. *State Crime Journal*, 7(2), 278-305.
67. Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.
68. Strobl, E., & Valfort, M. A. (2015). The effect of weather-induced internal migration on local labor markets. Evidence from Uganda. *The World Bank Economic Review*, 29(2), 385-412.
69. Tanrikulu, F. (2021). The political economy of migration and integration: Effects of immigrants on the economy in Turkey. *Journal of Immigrant & Refugee Studies*, 19(4), 364-377.
70. Tabellini, M. (2020). Gifts of the immigrants, woes of the natives: Lessons from the age of mass migration. *The Review of Economic Studies*, 87(1), 454-486.
71. Tombe, T., & Zhu, X. (2019). Trade, migration, and productivity: A quantitative analysis of china. *American Economic Review*, 109(5), 1843-1872.



72. Tjaden, J., Auer, D., & Laczko, F. (2019). Linking migration intentions with flows: Evidence and potential use. *International Migration*, 57(1), 36-57.
73. United Nations (UN). 2011. Population, distribution, urbanization, internal migration, and development: international perspective. UN.
74. United nations department of economic & social affairs (UNDESA). (2015). *International migration report 2015*.
75. Usman, O., Olanipekun, I. O., Iorember, P. T., & Abu-Goodman, M. (2020). Modelling environmental degradation in South Africa: the effects of energy consumption, democracy, and globalization using innovation accounting tests. *Environmental Science and Pollution Research*, 27, 8334-8349.
76. Weiberg, E., Hughes, R. E., Finné, M., Bonnier, A., & Kaplan, J. O. (2019). Mediterranean land use systems from prehistory to antiquity: a case study from Peloponnese (Greece). *Journal of Land Use Science*, 14(1), 1-20.
77. Weimann, A., & Oni, T. (2019). A systematised review of the health impact of urban informal settlements and implications for upgrading interventions in South Africa, a rapidly urbanising middle-income country. *International journal of environmental research and public health*, 16(19), 3608.
78. Wellmann, T., Lausch, A., Andersson, E., Knapp, S., Cortinovis, C., Jache, J., ... & Haase, D. (2020). Remote sensing in urban planning: Contributions towards ecologically sound policies?. *Landscape and urban planning*, 204, 103921.
79. Weinreb, A., Stecklov, G., & Arslan, A. (2020). Effects of changes in rainfall and temperature on age-and sex-specific patterns of rural-urban migration in sub-Saharan Africa. *Population and Environment*, 42, 219-254.
80. Wise, N., Perić, M., & Đurkin, J. (2019). Benchmarking service delivery for sports tourism and events: Lessons for Gorski Kotar, Croatia from Pokljuka, Slovenia. *European Journal of Tourism Research*, 22, 107-128.
81. WORLD MIGRATION REPORT (WMR). 2022. *Interactive World Migration Report*.
82. Yang, Z., & Dunford, M. (2018). City shrinkage in China: Scalar processes of urban and hukou population losses. *Regional Studies*, 52(8), 1111-1121.
83. Yilmaz, K. (2013). Comparison of quantitative and qualitative research traditions: Epistemological, theoretical, and methodological differences. *European journal of education*, 48(2), 311-325.
84. Zimmer, A., Guido, Z., Tuholske, C., Pakalniskis, A., Lopus, S., Caylor, K., & Evans, T. (2020). Dynamics of population growth in secondary cities across southern Africa. *Landscape Ecology*, 35, 2501-2516.