



## Impact of land restitution benefits on Water, Energy and Food (WEF) misgovernance and social injustice

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### ABSTRACT

Land restitution has been used to achieve redistributive justice. However, such social justice has been compromised by the misgovernance of water, energy, and food (WEF) which has resulted in distributive injustices and compromised welfare outcomes. The objective of the study was to ascertain the land restitution benefactor impacts on WEF misgovernance in lieu of offsetting social injustice. The study was carried out in Matatiele, Magareng and Greater Taung Local Municipalities in South Africa. A purposively selected sample of 1184 households was obtained through a cross-sectional survey using a semi-structured questionnaire. Vulnerability indices, independent sample t-tests and Propensity Score Matching were used to analyze the data. The results showed that land restitution beneficiaries were vulnerable to WEF misgovernance relative to social injustice. In addition, becoming a land restitution benefactor had a significant impact and increased the level of vulnerability to WEF misgovernance. This was mainly through increased exposure and sensitivity to WEF misgovernance. Benefiting from land restitution did not have an impact on vulnerability to WEF social injustice, even though exposure and adaptive capacity to social injustice were increased. The study concludes that benefiting from land restitution increased vulnerability to WEF misgovernance while having no impact on social injustice. The study recommends improving access and fixing dilapidated WEF infrastructure in land-restituted areas. Furthermore, there is a need to implement livelihood-improving programs in addition to social protection support to enhance access to WEF resources. Water, energy, and food (WEF) decision-making should be decentralized to improve participation, governance, and procedural justice.

### 1. Introduction

Land restitution is a social justice-based initiative with the objective of restoring the land to previously dispossessed owners (Tshishonga et al., 2020). This is in lieu of land being essential in achieving sustainable development, especially through the provision of shelter, a food production base, a base for energy production and transmission as well as accessing clean water leading to reduced poverty (Ngarava, 2023). Equitable rights and access to land as envisioned in Sustainable Development Goal (SDG) 1.4 have provided impetus to pursue and sustain land reform in many countries such as Brazil, Ghana, Kenya, Vietnam, Zimbabwe and South Africa, to achieve social justice in accessing and utilizing land (Ngarava, 2020, 2023; Narh et al., 2016; Wolford and Wolford, 2010). This has resulted in a variety of programs which are context specific. For instance, Zimbabwe's land reform redistributed land through land resettlement, various land-size based schemes (such as A<sub>1</sub> (less than 10 ha) and A<sub>2</sub> (more than 10 ha), mainly focusing on the productive capacity of the land (Ngarava, 2020). In Brazil, the National

Institute for Colonization and Agrarian Reform (INCRA), National Plan for Agrarian Reform (PNRA), and the Landless Rural Workers Movement (MST) focused on land expropriation. In addition, Market Assisted Land Reform (MALR) models such as Land Credit (subsidized loans to purchase land) were later adopted focusing on market-based approaches (Fitz, 2018). South Africa embarked on a land reform program characterized by land redistribution, land restitution and tenure reform. Despite the obvious equitable objective of South Africa's land reform program, various issues have arisen pertaining to land use changes that affect the demand and supply of water, energy and food (WEF) (Ngarava, 2023). However, what has also been neglected is how the governance of such resources has also been implicitly affected, and at times led to misgovernance and social injustices.

Land restitution in South Africa was a reversal of the Natives Land Act of 1913, and the Native Trust Land Act of 1936 (Bradstock, 2006). The Natives Land Act of 1913 regulated the institutionalized acquisition of Black-owned land providing a basis for apartheid and segregation while the Native Trust Land Act of 1936 set aside land that would be

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occupied by the displaced native black communities (Masuku et al., 2023). Under the Restitution of Land Rights Act 22 of 1994, a Land Claims Court and Commission were established to adjudicate the land claims cases, focusing on black households that were forcibly removed from their native residences post-19 June 1913 (Bradstock, 2006; Maloka et al., 2021; Yingi et al., 2021). The restituted households had the option to either receive cash for their compensation or be awarded their ancestral land back (Ngarava, 2023; Akinola et al., 2021). The Constitutional Court invalidated the Restitution Act after an amendment was made in 2014 (Cousins, 2021). This was after 160 000 land restitution claims were filed (which had doubled from 64 000–80 000 in 1998), R 5 billion (USD 596 million) cash payout had been made and 2.76 million hectares of land transferred. The process was marred by inadequate funding and incapacitation in handling claims. In addition, there was a requirement to form a communal property association (CPA) in the instance that the beneficiaries chose restitution through the land. However, these were also marred by inefficiencies, group dynamics and competing interests resulting in some being dysfunctional, chiefly through mismanagement and misgovernance (Ngarava, 2023; Xaba, 2022; Daramola et al., 2021).

Governance is the political, economic, administrative and social management of resources, with land, water, energy and food being some of them (Barati et al., 2019). It leads to sustainable utilization of resources, conflict resolution, efficient resource utilization and equity. The theory of misgovernance concerns the rectification of these aspects of governance, with the theory of government failure being informed by regulations, subsidy and provision while the theory of government supply failure focuses on the inability to meet the demand and supply of public goods (V Banerjee, 1997; Le Grand, 1991; Vining and Weimer, 1990). In the context of land restitution and the current study, all three theories can be expressed when there is unsustainable utilization, conflict resolution, inefficiency, and inequity of land-based resources such as WEF. This is further expressed when there are inadequate regulations and support resulting in an inability to meet the demand and supply of WEF resources. However, what this spells for land restituted areas is still unravelling as the process presented a new set of governance and intertwined social justice issues.

Governance can provide a platform to achieve social justice through procedural justice when the vulnerable are presented in decision-making positions. Social justice refers to the “fair distribution of opportunities, rewards and responsibilities in societies” (Barak, 2015:392) with procedural justice referring to fairness in the determining process (Almgren, 2018). However, this has been less apparent in land restitution programs. Land restitution presents two apparent forms of social justice, (i) redistributive/compensatory justice and to some extent (ii) distributive justice. Redistributive justice is the compensation or punishment of wrongdoing while distributive justice operationalizes social justice through economic (distribution of income and economic resources) and political (distribution of political rights) (Almgren, 2018; Moroni, 2020). Transferring ancestral land back to the Indigenous people who were forcibly removed was a form of redistributive justice. This is due to compensation for the wrongdoing that was inflicted on the local natives. The cash compensation option was a form of distributive justice although it could also be argued that it was redistributive justice. In both cases, there is a redistribution of accumulated wealth and distribution amongst the native communities that were displaced. Cash compensation was distributive in reallocating state financial resources to land restitution claimants.

There have been limited studies that have taken a perspective of governance and social justice in land restitution programs, especially in South Africa. Various studies have focused on the welfare outcomes of land restitution. In Colombia, Nilsson and Taylor (2017) found that land restitution has no facilitative role in development. This was due to (or resulted in) lack of essential resources such as water, housing, energy, and other amenities. This has been compounded by land accumulation and unsustainable land uses affecting welfare (Del Río Duque et al.,

2022). In Myanmar, land restitution brought about a negative change in the developmental outcomes through land use changes which affected income levels and welfare (Mark and Belton, 2020). Hedin (2005) found that in Estonia, land restitution also brought about a shift in land use, with some land remaining abandoned. A more recent and broader study was done by Chitonge (2022) who evaluated the developmental outcomes of land restitution beneficiaries across three programs in South Africa, namely Cata, Dwesa-Cwebe and Keiskamahoe. The study highlighted that land restitution was a failure in South Africa, mainly due to concentrating on procedural processes rather than meaningful redress for the benefactors. The failure was attributed to a lack of post-settlement support, with responsible authorities negating such responsibilities to other developmental government departments. Chitonge (2022) outlines that even though in one of the most dubbed successful land restitution programs in Cata, success was driven by non-state actors such as local NGOs, resulting in developmental outcomes relating to infrastructural development. This was also augmented by community resources which were mobilized. The program did however increase the number of households that had access to electricity and food security.

The most researched land restitution program in South Africa is Dwesa-Cwebe, which was deemed highly unsuccessful. This was due to inadequate infrastructure including water and electricity. Furthermore, rights to natural resources have also not been realized, resulting in low welfare outcomes. The Keiskamahoe land restitution program in Eastern Cape, South Africa, failed to take off the ground because of limited resources availed by the District Municipality to initiate projects. Thus a governance failure has negatively affected the land restitution program (Chitonge, 2022). Another South African land restitution success story has been the Bela-Bela land restitution program in Limpopo which restituted 250 households on 6000 ha of land (BRICS and BRICS and Africa, 2023). The program has been instrumental in providing integrated food production improving beneficiary welfare. Ngarava (2023) found that the land restitution program in Majeng, Northern Cape Province resulted in decreased water and energy security even though food security was improved through social transfers and not livelihood activities. Akinboade (2008) found that land restitution benefactors in Capricorn District, Limpopo Province were food insecure and were reliant on food transfers. In Kgalagadi, South Africa, Dikgang and Muchapondwa (2016) found that even though land restitution improved access to natural resources, it had no effect on poverty reduction. This was also echoed by Okumbor et al. (2018) in Manavhela, Limpopo Province and de Koning and De Beer (2014) in Mpumalanga Province. Despite this plethora of studies reflecting on livelihood and welfare outcomes of land restitution, little has focused on governance and social justice.

The purpose of the study was to determine the impact of benefiting from land restitution on WEF governance in lieu of offsetting social injustice. This was guided by the following fundamental problems and justifications:

- (a) Lack of afterthought in the land restitution program. According to Chitonge (2022), land restitution in South Africa focused on settling land claims. It concentrated on procedural outcomes instead of the welfare implications (Chitonge, 2022). However, what happens after that was not paid attention to. This has dire consequences not only for the program itself, but also on the welfare outcomes of the benefactors. It throws governance of the after process out the window, and rather than reduce social injustice through redistributive justice, it exacerbates it through allocative injustice, especially in accessing WEF resources. Chitonge (2022) confirms that non-material developmental outcomes should be considered in land restitution, such as social justice, beyond the physical developmental outcomes concerning access to resources such as land.

- (b) There was limited consideration of power dynamics in South Africa's land restitution program. Broad-based land restitution should consider power dynamics which may lead to misgovernance and social injustice (Chitonge, 2022). Even though Community Property Associations (CPAs) have much oversight in land restitution programs, access to WEF resources is governed by other governmental and non-governmental organizations, rendering their WEF decision-making ceremonial at best, if any. However, there is still a need to ascertain the WEF governance and how it accentuates social injustice.
- (c) There is a dearth of empirical studies that focus on the impact of misgovernance and social injustice in land restitution. There are various studies that have focused on the welfare implications of land restitution in South Africa (Ngarava, 2023; Okumbor et al., 2018; Xaba, 2020). However, there are limited studies that have added the elements of misgovernance and social injustice effects of land restitution. Land restitution without accompanying good governance will not achieve the desired social justice effects. Hence it is prudent to evaluate how governance and social justice are enhanced or limited for land restitution beneficiaries.
- (d) Micro-level WEF security in South Africa is still elusive, especially in the rural areas. The country has been deemed water scarce, exhibits power shortages and has high micro-level food shortages. This is despite 88.7% of the households having access to water, 89.3% with electricity as a source of energy and 79.1% with adequate access to food (Ngarava, 2022, 2023; Stats, 2021). The study highlights the WEF security status of households especially those that have benefited from land restitution. This will aid in informing WEF policy in land restituted areas, especially in governance, not only in the land restituted area but also for WEF resources.

## 2. Methodology

### 2.1. Study site

Matatiele, Magareng and Greater Taung Local Municipalities were the study sites that were used (Fig. 1). The beneficiaries of land restitution were obtained from Ward 5 in Magareng Local Municipality. Magareng Local Municipality is a Category B municipality located in the Northern Cape Province with 6970 households which have 24 060 people, 4.5% who have no access to electricity and 93.9% who have access to piped water in their yards (Wazimap and Magareng Local Municipality, 2022; Magareng Local Municipality, 2014). A Category B municipality is "a metropolitan municipality [that] has exclusive and legislative authority in its area", even if it is from another municipality (GoSA and Local Government, 1998). Ward 5 in Magareng has 1075

households with a population of 3139 (Wazimap and Magareng Ward 5, 2022). The ward has 60% of its population between the ages of 18 and 64, with 49.0% being female and 45% and 44% of the people being Setswana and Afrikaans speaking, respectively. About 37.2% of the population has gone beyond secondary education contributing to 51% of the unemployment rate (Wazimap and Magareng Ward 5, 2022). The Majeng land restitution project in Ward 5 of Magareng Local Municipality sought to reconstitute 800 households on 10 220 ha of land that had been disposed of between 1962 and 1975 (Magareng Local Municipality, 2012; Nortje et al., 2022). During apartheid, the community had been relocated 60 km away to places such as Kgomoitso and Vaalboschoek, but had lodged a formal land claim in 2002 after illegally resettling back in the area in 1996 (DoENC, 2014). The settlement was envisaged to be off-grid in terms of electricity as well as having an off-grid biolix sanitation system. Sustainable solar power energy and revitalization of the irrigation systems were envisaged to provide energy and water for the human settlement as well as meet subsistence food production (Magareng Local Municipality, 2012). However, there has been limited evaluation of the welfare implications of the land restitution program in South Africa, let alone in Majeng and Magareng Local Municipality. This has also been the hallmark of WEF misgovernance and social injustice studies for land restitution beneficiaries, which have been scanty if none.

Matatiele and Greater Taung, which are both Category B and located in the Eastern Cape and North West Provinces, provided the counterfactuals of non-beneficiaries of land restitution that were used in the impact assessment of the study. The two local municipalities have areas between 4 353 km<sup>2</sup> and 5 647 km<sup>2</sup>, households between 58 868 and 46 168 as well as populations between 219 448 and 167 827, respectively (Wazimap, 2023; Wazimap and Matatiele Local Municipality, 2022). Matatiele is dominantly Isixhosa and Sesotho speaking while Greater Taung is Setswana. Unemployment ranges between 22.1% and 49.8% of the working population, with 4.5%–29.0% of the households having no access to electricity, and 28.0%–87.5% of the households having access to piped water within their yards (Greenberg et al., 2022; Greater Taung Local Municipality, 2017; Matatiele Local Municipality, 2020).

### 2.2. Conceptual framework

The study integrated the social justice framework into the Sustainable Livelihoods Framework (SLF) (Fig. 1). The SLF focusses on and acknowledges the various strategies used by people to enhance their welfare and has been used to build their capacities (Ngarava, 2023; Gumede and Ehiane, 2022). These strategies are based upon the asset endowments that people have, and one of these assets is land. Central to the SLF are transformative structures and processes which entail laws, regulations and policies such as land restitution (Natarajan et al., 2022).

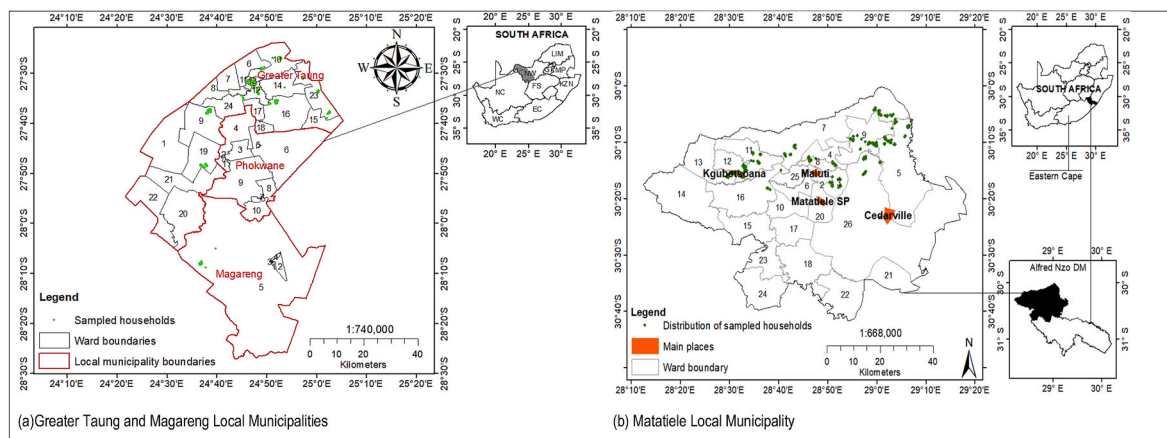


Fig. 1. Study area showing (a) Greater Taung and Magareng Local Municipalities and (b) Matatiele Local Municipality.

On the other hand, there are implicit shocks such as misgovernance and social injustice that can affect welfare outcomes. In the context of the current study, misgovernance and social injustice are externalities that can have a profound effect on the welfare outcomes of WEF security in lieu of benefiting from land restitution. Benefiting from land restitution thus has an effect on the vulnerabilities realized from WEF misgovernance and social injustice. Social injustice is a construct of redistributive, procedural, and distributive injustice. Redistributive injustice in land restitution shapes the human, social, natural, financial, and physical resources. Misgovernance is obtainable through political institutions and processes themselves shaping (or shaped by) procedural injustice. Welfare outcomes of WEF security signify distributive justice that is achieved by land restitution.

2.3. Study design

A multi-stage purposive sampling method was used in the cross-sectional survey. All study sites were purposively selected, with Magareng Local Municipality particularly targeting land restitution beneficiaries. All study areas were chosen as they exhibit households with water, energy, and food welfare challenges. This was informed by beneficiaries of land restitution (Magareng Local Municipality, 2012), the Matatiele Spatial Development Framework Review (Matatiele Local Municipality, 2020), Integrated Development Plans (Greater Taung Local Municipality, 2017; Dr S Mompoti District Municipality, 2017) and traditional leadership informants focusing on poor rural households. Yamane (1967) method was used to calculate the required sample size (Eq. (1)):

$$n = \frac{N}{1 + N(e)^2} \tag{1}$$

where  $n$  was the sample size,  $N$  is the population, which was 35 580 households (from sixteen purposively selected wards in the three study sites), and  $e$  was the degree of accuracy, which was 95% in the study. The sample size was calculated as follows:

$$n = \frac{35580}{1 + 35580(0.05)^2} \tag{2}$$

$$n = 396 \tag{3}$$

The availability of resource resulted in the study using a sample of 1184 households from the three study sites with distribution shown in Table 1.

2.4. Analytical framework

2.4.1. Vulnerability index

Exposure, sensitivity and adaptive capacities (ESAc) were used as abstract measures of vulnerabilities as used by Swami and Parthasarathy (2021).

$$VI_i = \frac{E_i + S_i + (1 - AC_i)}{3} \tag{4}$$

where  $VI_i$  is the vulnerability index of  $i$  (WEF misgovernance and social injustice),  $E_i$ ,  $S_i$  and  $AC_i$  are exposure, sensitivity, and adaptive capacity

Table 1  
Sample size.

Ward																	Total
Municipality	1	3	4	5	7	8	9	11	12	13	14	16	19	21	23	26	16
Matatiele		38	50	71	77	43	78	80	55				2			55	549
Greater Taung	65						80	52	72	75	1	59	73	1	78		556
Magareng				79													79
Total																	1184

(ESAc) to  $i$ , respectively. The variables used in the vulnerability models are shown in Table 2

2.4.2. Min-max normalization

Standardization of ESAc and the overall vulnerability to WEF misgovernance and social injustice was achieved through Min-Max normalization (Eq. (5)), which resulted in indices between 0 (low vulnerability) and 1 (extreme vulnerability) (Swami and Parthasarathy, 2021):

$$IndexV_i = \frac{V_{iobs} - V_{imin}}{V_{imax} - V_{imin}} \tag{5}$$

where the observed indicator of vulnerability component  $i$  (ESAc) is  $V_{iobs}$ , the global indicator minimum and maximum of vulnerability component are  $V_{imin}$  and  $V_{imax}$ . The indicators were combined using equal weighting using Eq. (4) after standardization. Composite scores were then calculated for each of the abstract vulnerability components (i.e., ESAc). The overall vulnerability indices for WEF insecurity, misgovernance and social injustice, were calculated using Eq. (6).

$$V_{comi} = \frac{\sum_{i=1}^n IndexV_i}{n} \tag{6}$$

2.4.3. Independent sample t-test

The independent sample  $t$ -test as was used to assess the mean difference in the WEF misgovernance and social injustice ESAc's and vulnerability indices for beneficiaries and non-beneficiaries of land restitution. The independent sample  $t$ -test is specified as follows (Eq. (7)) (Ngarava, 2022):

$$t = \frac{\mu_{lr} - \mu_{nlr}}{\sqrt{\frac{\delta^2}{n_{lr}} + \frac{\delta^2}{n_{nlr}}}} \tag{7}$$

where  $lr$  and  $nlr$  are the land restitution beneficiaries and non-beneficiaries that are to be compared.  $n_{lr}$  and  $n_{nlr}$  are the mean ESAc's and vulnerabilities to WEF misgovernance and social injustice of land restitution beneficiaries and non-beneficiaries that were compared.  $\delta^2$  is the two-sample common variance. It was obtained from (Eq. (8)):

$$\delta^2 = \frac{\sum (x - \mu_{lr})^2 + \sum (x - \mu_{nlr})^2}{n_{lr} + n_{nlr} - 2} \tag{8}$$

The test used the degrees of freedom using the following calculations (Eq. (9)):

$$df = n_{lr} + n_{nlr} - 2 \tag{9}$$

2.4.4. Propensity Score Matching

The impact of benefiting from land restitution on vulnerabilities to WEF misgovernance and social injustice was analyzed using Propensity Score Matching (PSM). For a household  $p$ , (where  $p = 1 \dots P$  and  $P$  denotes the population of households), the impact evaluation separated the impact of being a beneficiary of land restitution ( $D_p = 1$ ) on a certain outcome  $Y_p(D_p)$  [vulnerability to WEF misgovernance ( $MISG_{overall(j)}$ ) and social injustice ( $SOCINJ_{overall(j)}$ )] from what would happen without being a beneficiary of land restitution ( $D_p = 0$ ), the counterfactual. This is the



**Table 2**  
Measurements of variables used in constructing the indices.

Major component	Sub-component	Measure	Min	Max	Mean <sub>normalized</sub>			
Exposure	Misgovernance	Effectiveness of AWE producer/user group/associations	Ordinal	0	4	0.66		
		Effectiveness of ward committees	Ordinal	0	4	0.51		
		Effectiveness of IDP forum	Ordinal	0	4	0.78		
		Corruption is cause of failure	Nominal	0	1	0.27		
	Social injustice	Aware of laws, regulations and rules	Ordinal	0	4	0.80		
		Time spent collecting water (minutes)	Scale	0	660	0.04		
		Time spent collecting wood (minutes)	Scale	0	7200	0.02		
		Gender drift cause of failure	Nominal	0	1	0.97		
		Ethnic drift cause of failure	Nominal	0	1	0.97		
		Inequality cause of failure	Nominal	0	1	0.85		
		Lack of empowerment cause of failure	Nominal	0	1	0.72		
		Lack of right to access cause of failure	Nominal	0	1	0.92		
		Lack of participation cause of failure	Nominal	0	1	0.76		
		Sensitivity	Misgovernance	WEF complaints effectively dealt by municipality	Nominal	0	1	0.68
Provide recommendation through AWE producer/user group/associations	Ordinal			0	3	0.72		
Provide recommendations through ward committees and IDP forums	Nominal			0	1	0.68		
Any recommendations taken based on recommendations	Nominal			0	1	0.64		
Feel able and comfortable to publicly discuss about WEF issues	Ordinal			0	4	0.50		
Lack of cohesion cause of failure	Nominal			0	1	0.89		
Community level decision-making is accurate, adequate and timely	Nominal			0	1	0.80		
Community level decision-making accommodates the poor and underrepresented	Ordinal			0	4	0.79		
Social injustice	Community level decision-making is objective and independent		Ordinal	0	4	0.75		
	Who benefits from indigent support		Categorical	0	4	0.50		
	Adaptive capacity		Misgovernance	Existence of agricultural producer group	Nominal	0	1	0.61
				Existence of water user group	Nominal	0	1	0.76
				Existence of energy user/producer group	Nominal	0	1	0.83
			Social injustice	Existence of ward committees	Nominal	0	1	0.01
Existence of IDP forums		Nominal		0	1	0.71		
Willing to work with other community members		Ordinal		0	4	0.52		
Gender inclusion in AWE producer/user group/associations	Nominal	0		1	0.90			
Disability inclusion in AWE producer/user group/associations	Nominal	0		1	0.94			
Stakeholder inclusion in AWE producer/user group/associations	Nominal	0		1	0.91			
Race inclusion in AWE producer/user group/associations	Nominal	0		1	0.97			
Locational inclusion in AWE producer/user group/associations	Nominal	0		1	0.96			
Age inclusion in AWE producer/user group/associations	Nominal	0		1	0.91			
Social injustice	Gender inclusion in ward committees	Nominal	0	1	0.86			
	Disability inclusion in ward committees	Nominal	0	1	0.88			
	Stakeholder inclusion in ward committees	Nominal	0	1	0.91			
	Race inclusion in ward committees	Nominal	0	1	0.96			
	Locational inclusion in ward committees	Nominal	0	1	0.92			
	Age inclusion in ward committees	Nominal	0	1	0.81			
	Gender inclusion in IDP forums	Nominal	0	1	0.94			
	Disability inclusion in IDP forums	Nominal	0	1	0.97			
	Stakeholder inclusion in IDP forums	Nominal	0	1	0.96			
	Race inclusion in IDP forums	Nominal	0	1	0.99			
	Locational inclusion in IDP forums	Nominal	0	1	0.98			
Age inclusion in IDP forums	Nominal	0	1	0.96				

difference between the outcome of being a beneficiary of land restitution for household  $p$  and the counterfactual potential before/without being a beneficiary of land restitution (Eq. (10)).

$$\omega_p = Y_p(1) - Y_p(0) \tag{10}$$

The impact  $\omega_p$  cannot be observed since a household either is a beneficiary of land restitution or is not, but never both. The next stage was to ascertain the average treatment effect of the treated (ATET) (Eq. (11)):

$$\omega_{ATET} = E[\omega|D = 1] = E[Y(1)|D = 1] - E[Y(0)|D = 1] \tag{11}$$

The resulting PSM estimator for ATET was generalized as (Eq. (12)):

$$\omega_{ATET}^{PSM} = E_{Pr(X)|D=1} \{E[Y(1)|D = 1, Pr(X)] - E[Y(0)|D = 0, Pr(X)]\} \tag{12}$$

In the PSM, a Probit model was used with variables in Table 3. This reclassification of the data that was used as shown in Table 3 however limits the internal validity of the findings.

The data was analyzed using SPSS 27 and STATA 14 from 1184 questionnaires obtained through face-to-face interviews. The study observed ethical issues such as integrity, confidentiality, and anonymity after obtaining informed consent (Ethical Clearance No: NWU-01216-

21-S3 Law) (Ngarava et al., 2024).

### 3. Results

#### 3.1. Descriptive statistics

Table 4 shows the comparable demographic and descriptive statistics of the study areas. There were significant differences in the age, ethnicity, educational levels, duration of stay, employment status, household size, main source of income, energy, and food expenditure as well as WEF insecurities between benefactors and non-benefactors of land restitution. On average, benefactors of land restitution were 7.66 years younger, mostly Setswana’s, with lower educational levels, having stayed in their residential areas 18.56 years less than non-benefactors. Furthermore, land restitution benefactors were also informally employed with a lower household size and R80.39 and R182.62 less expenditure on energy and food than their non-benefactor counterparts. Land restitution benefactors had 17.1% lower water insecurity compared to 4.7% and 23.2% higher food and energy insecurities relative to non-benefactors, respectively.

Fig. 3 shows that there were significant associations at the 1% level between exposure, sensitivity, and adaptive capacities to misgovernance

**Table 3**  
Variables used in the PSM.

Variable	Explanation	Type of measurement	Expected sign
<b>Outcome variable</b>			
MISG	Vulnerability index to WEF misgovernance	Truncated: 0-1	
SOCINJ	Vulnerability index to WEF social injustice	Truncated: 0-1	
<b>Treatment variable</b>			
Y	Beneficiation of land restitution	Nominal: 0-Beneficiary of land restitution, 1-Otherwise	
<b>Independent variable</b>			
EDU	Educational level of household head	Nominal: 0-None, 1-Otherwise	-
TEN	Tenure	Nominal: 0-Own, 1-Otherwise	-
EMPL	Employment status of household head	Nominal: 0-Unemployed, 1-Otherwise	-/+
HH	Household size	Ordinal: 0-Less than 3, 1-Otherwise	+
GEN	Gender of household head	Nominal: 0-Male, 1-Female	+
SOURCEINC	Main source of income	Nominal: 0-Formal employment, 1-Otherwise	+

and social injustice with beneficiation from land restitution. Significant association was also realized between overall vulnerability to misgovernance with benefiting from land restitution at the 1% level. However, there was no association between benefiting from land restitution and overall vulnerability to WEF social injustice. The model fit for the significant associations ranged between 14.3% and 27.0%. Fig. 2 shows that 70.89% of the land restitution beneficiaries were vulnerable to WEF misgovernance. This was mostly informed by high exposure (37.39%), high sensitivity (45.57%) and an average level of adaptive capacity (22.35%) to WEF misgovernance. Exposure to WEF misgovernance was mainly informed by the awareness of WEF laws, regulations, and policy. In contrast, sensitivity and adaptive capacity were informed by a lack of cohesion and existence of energy user/producer groups, respectively (Table 2). Even though there was no significant

**Table 4**  
Independent sample t-test showing mean differences in socio-economic characteristics between beneficiaries and non-beneficiaries of land restitution.

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Household head age (years)	0.116	0.734	-4.187	1182.000	0.000	-7.657	1.829	-11.245	-4.069
Household head gender	0.004	0.953	-1.350	1182.000	0.177	-0.079	0.059	-0.194	0.036
Household head ethnicity	135.538	0.000	-7.788	1182.000	0.000	-2.497	0.321	-3.126	-1.868
Household head marital status	16.463	0.000	0.626	1182.000	0.531	0.149	0.239	-0.319	0.618
Household head highest educational level	8.932	0.003	-2.932	1182.000	0.003	-0.325	0.111	-0.542	-0.107
Duration of stay in the area (years)	35.872	0.000	-5.928	1182.000	0.000	-18.562	3.131	-24.705	-12.419
Household tenure	8.176	0.004	-1.318	1182.000	0.188	-0.109	0.083	-0.271	0.053
Household head employment status	1.534	0.216	1.826	1182.000	0.068	0.262	0.143	-0.019	0.543
Household size	2.088	0.149	-3.539	1182.000	0.000	-1.139	0.322	-1.771	-0.508
Main source of income	11.635	0.001	-2.623	1182.000	0.009	-0.448	0.171	-0.783	-0.113
Total monthly household income (Rand)	1.207	0.272	-0.980	1132.000	0.327	-360.330	367.749	-1081.877	361.217
Water expenditure (Rand)	3.643	0.057	0.556	1118.000	0.578	13.748	24.723	-34.760	62.256
Energy expenditure (Rand)	17.905	0.000	-2.453	1118.000	0.014	-80.391	32.777	-144.703	-16.079
Food expenditure (Rand)	1.731	0.189	-2.034	1118.000	0.042	-182.622	89.795	-358.808	-6.437
HFIAS	1.820	0.178	1.718	1182.000	0.086	0.047	0.028	-0.007	0.102
HWISE	0.987	0.321	-6.066	1182.000	0.000	-0.171	0.028	-0.227	-0.116
HMEPI	6.069	0.014	10.461	1181.000	0.000	0.232	0.022	0.188	0.275

Household Food In-access Scale.  
Household Water Insecurity Experiences.  
Household Multi-dimensional Poverty Index.

association between benefiting from land restitution and vulnerability to WEF social injustice, 49.37% of the benefactors still experienced high exposure, 56.72% had high sensitivity and 59.49% had extreme levels of adaptive capacity to social injustice. Exposure, sensitivity, and adaptive capacity to WEF social injustice for land restitution beneficiaries emanated from gender and ethnic drift, indigent support beneficiation and inclusion based on race, respectively (Table 2).

Land restitution benefactors experienced 6.2% and 13.8% more exposure and sensitivity as well as 6.1% less adaptive capacity to WEF misgovernance relative to non-benefactors (Table 5). Overall, land restitution benefactors experienced 8.7% higher levels of vulnerability to WEF misgovernance compared to non-benefactors. Even though Table 4 shows that there were no significant differences in the vulnerability to social injustice between the two groups, land restitution benefactors experienced 10.7% and 8.3% more exposure and adaptive capacity to social injustice relative to non-benefactors.

### 3.2. Impact of land restitution on vulnerability to WEF misgovernance and social injustice

The Propensity Score Matching (PSM) results in Table 6 show that beneficiation of land restitution had significant impact on vulnerability to misgovernance, mainly through exposure and sensitivity at the 1% levels. Beneficiation of land restitution did not have a significant impact on social injustice even though there was an impact on exposure and adaptive capacity to social injustice. Table 5 shows that beneficiaries of land restitution were experiencing 7.6% and 15.8% more exposure and sensitivity resulting in 9.3% more vulnerability to WEF misgovernance. In addition, land reform benefactors were also experiencing 11.8% and 8.9% more exposure and adaptive capacity to social injustice, even though it had no overall effect on vulnerability to social injustice.

Table 7 shows the different matching methods used to confirm the impact of benefiting from land restitution on vulnerability to WEF misgovernance and social injustice. The results confirm the impact on vulnerability on WEF misgovernance, ranging between 8.9% and 9.3%. There was no significant impact on vulnerability to social injustice based on the low t-statistics. The diagnostics shown in Fig. 4 show that comparability between the beneficiaries and non-beneficiaries of land

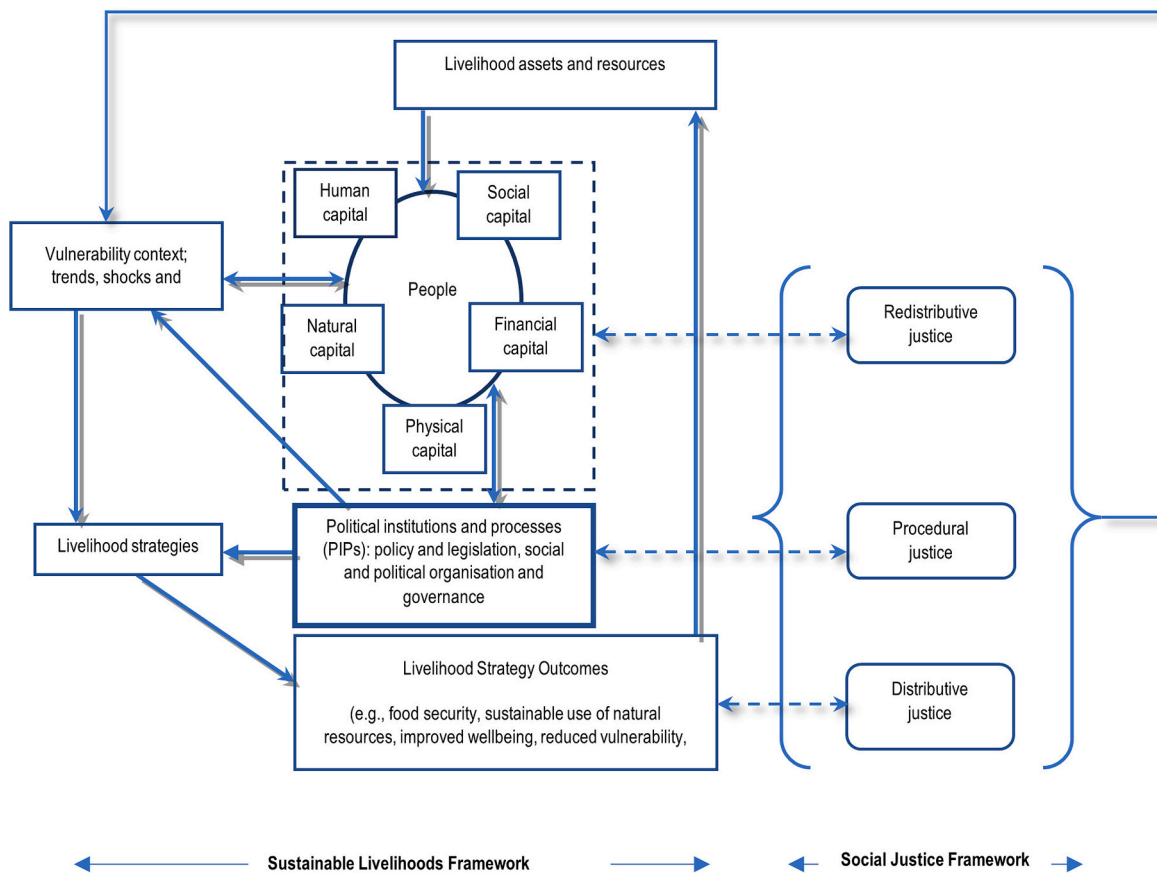


Fig. 2. Conceptual framework.

restitution was achieved, making the impact assessment reliable and useful.

4. Discussion

Land restitution beneficiaries had lower water insecurity and higher food and energy insecurities relative to non-benefactors. Water, energy and food (WEF) insecurity is an outcome in community socio-ecological systems. The WEF insecurity indicators, and the fact that agency was not localized, puts pressure on nature based resources. The consequence is the reinforced need for good resource governance within the community of land restitution beneficiaries. Community food systems and mainstreaming community energy (Roby and Dibb, 2019) can provide pathways to improve food and energy securities. This is in cognizance of the promotion of regenerative agriculture and renewable energy for environmental sustainability. According to Campbell et al. (2022), food systems are socio-ecological systems by nature, integrating management of human capital with soil and land management to produce goods. However, their success depends on social constructs such as governance capacity, and their frameworks and indicator models include community and livelihood approaches (Campbell et al., 2022) which result in welfare outcomes of WEF security. Higher food and energy insecurities result in more demand which can be addressed through nature-based solutions and ecosystem services, which, however, if left unchecked can result in further natural resource depletion, creating a feedback loop into their poverty levels. Ngarava (2023) also found similar results, highlighting issues such as lack of infrastructure which has compromised WEF security for land restitution beneficiaries. Similar findings were also obtained in a land restitution study in Limpopo, South Africa, by Okumbor et al. (2018) who identified a disjuncture between benefiting from land restitution to enhancing the recipients' welfare.

This was because the redistributive justice nature of land restitution did not address the fundamental objectives of broad-based land reforms which centered around inequality, unemployment and poverty, but rather historical rights (Okumbor et al., 2018). Historical rights in the context of community socio-ecological systems can set the conditions for land restitution as well as the rules and norms for the actors in land restitutions. Historical rights reinforce the community-nature interactions as the natives live in equilibrium with nature. There was self-organization among the users of common-pool goods before the Land Act of 1913 which disposed the natives of their land, thereby having a bearing on the outcomes that can be realized from a policy such as land restitution. According to Teladia and van der Windt (2022), history or past experiences shape the actors in the socio-ecological framework.

In the Eastern Cape, South Africa, Xaba (2020) indicated that energy and water for land restitution beneficiaries were made available through state provisions. However, Dikgang and Muchapondwa (2016) attest that land restitution has had a negative livelihoods impact. In their study of the Khomani San land restitution in South Africa, they found it had no influence on income and consumption and increased poverty but did however have a positive impact on accessing nature. This is because there are enhanced human-environmental interactions provided through land restitution resulting in improved household and community welfare. Promotion of nature based remedial solutions therefore becomes a necessity if land restitution beneficiation is to bear fruit. This is cemented by (i) the intimate interactions that beneficiaries of land restitution have with nature and (ii) the lack of infrastructure necessitating the need for nature based solutions. Land restitution in South Africa is a community driven initiative in its own right and design, capitalizing on social capital to access land resource (Zeka, 2011). In a study of three land restitution communities of Mophela

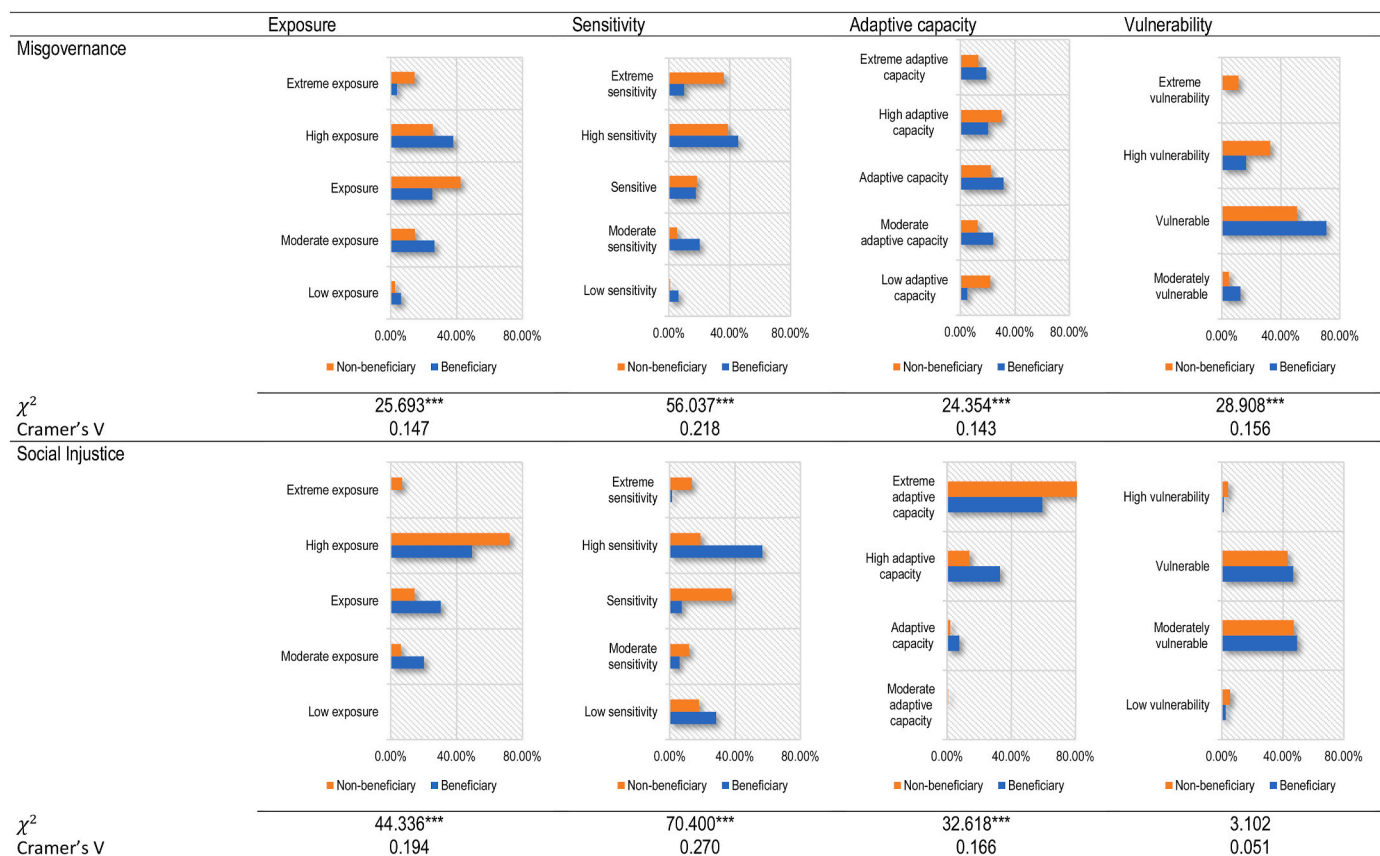


Fig. 3. Exposures, sensitivities, adaptive capacities and vulnerabilities to WEF misgovernance and social injustice.

Table 5

Independent sample *t*-test showing mean differences in vulnerability to WEF misgovernance and social injustice between beneficiaries and non-beneficiaries of land restitution.

		Levene's Test for Equality of Variances		<i>t</i> -test for Equality of Means						
		F	Sig.	<i>t</i>	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Misgovernance	Exposure	0.568	0.451	-2.544	1182.000	<b>0.011</b>	0.062	0.024	-0.109	-0.014
	Sensitivity	4.599	0.032	-6.167	1182.000	<b>0.000</b>	0.138	0.022	-0.182	-0.094
	Adaptive Capacity	7.593	0.006	1.825	1182.000	<b>0.068</b>	-0.061	0.033	-0.005	0.126
	Vulnerability	16.407	0.000	-5.298	1182.000	<b>0.000</b>	0.087	0.016	-0.119	-0.055
Social injustice	Exposure	0.324	0.569	-6.586	1182.000	<b>0.000</b>	0.107	0.016	-0.139	-0.075
	Sensitivity	8.182	0.004	-0.082	961.000	0.934	0.003	0.040	-0.081	0.075
	Adaptive Capacity	9.580	0.002	-6.310	1182.000	<b>0.000</b>	0.083	0.013	-0.109	-0.058
	Vulnerability	4.415	0.036	-0.155	1182.000	0.877	0.002	0.015	-0.032	0.027

Table 6

Impact of land restitution on WEF misgovernance and social injustice.

	Misgovernance			Social injustice		
	$\beta$	Std. Err.	$P >  z $	$\beta$	Std. Err.	$P >  z $
Exposure	0.076***	0.023	<b>0.001</b>	0.118***	0.024	<b>0.000</b>
Sensitivity	0.158***	0.032	<b>0.000</b>	-0.011	0.052	0.833
Adaptive capacity	-0.045	0.032	0.162	0.089***	0.020	<b>0.000</b>
Vulnerability	0.093***	0.014	<b>0.000</b>	-0.009	0.017	0.574

(KwaZulu-Natal), Mashishimale (Limpopo) and Ebenhaeser (Western Cape), South Africa, Puttergill et al. (2011) found food security was compromised by not engaging in subsistence farming. Subsistence farming is a stock-flow type of provisioning ecosystem service. In this

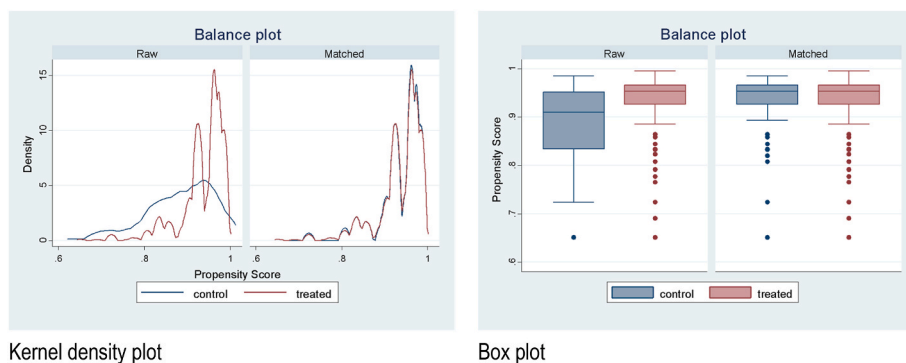
instance what is produced is solely for use only and not for commercial purposes. This reduces productive pressure on the land and also allows for regeneration, enhancing sustainable production. In the community socio-ecological framework, subsistence farming can have a marked



**Table 7**  
Diagnostic matching methods<sup>a</sup>.

Matching	Misgovernance				Social injustice			
	ATET	Std. Err.	t	% bias	ATET	Std. Err.	t	% bias
Nearest neighbour	0.093	0.022	4.243	-0.003	-0.010	0.013	-0.727	-0.002
Radius	0.089	0.007	12.695	-0.009	0.004	0.07	0.251	-0.009
Kernel	0.089	0.013	7.087	-0.012	0.003	0.012	0.273	-0.005
Stratified	0.090	0.015	5.833	-0.003	-0.005	0.012	-0.394	-0.001

<sup>a</sup> The diagnostic test run was for the impact on overall vulnerability and not on exposure, sensitivity and adaptive capacity.



**Fig. 4.** Kernel density and box diagnostics plots.

difference in the food system and security that is realized. This is through differentiated human capital and land management practices (Campbell et al., 2022). Subsistence farming is part of the interactions that are found within the socio-ecological framework (Teladia and van der Windt, 2022).

Benefiting from land restitution had significant associations with exposure, sensitivity, and adaptive capacities to WEF misgovernance and social injustice. There was also an association between benefiting from land restitution and overall vulnerability to WEF misgovernance with however no association with social injustice. This demonstrates the intricate relationship between community-led initiatives such as land restitution and developmental outcomes through governance systems. The community socio-ecological framework provides for governance systems to set conditions for land restitution as well as the rules for the actors (Teladia and van der Windt, 2022). The findings from the study provide governance and social justice indicators that account for the systems and the rules for the actors, even though they were not exhaustive. Awareness of WEF laws, regulations and policy, lack of cohesion and energy user/producer groups/associations informed the exposure, sensitivity, and adaptive capacity to WEF misgovernance. Gender and ethnic drift, indigent support and race-based inclusion also informed WEF social injustice. Teladia and van der Windt (2022) highlighted that constitutional rules, collective-choice rules, monitoring and sanctioning rules as well as property rights systems formed part of the governance system in the socio-ecological framework. Furthermore, network structure and non-state organizations were part of the socio-ecological governance system framework, while the actual networking activities were part of the socio-ecological interactions system framework (Teladia and van der Windt, 2022). The results provided measurement and indicators of how rules, regulations and policy, networking through cohesion and non-state actors account for WEF governance of the land restitution community. According to Bradstock (2006), discriminatory legislation negatively impacts asset accumulation which can have a bearing on welfare outcomes. Subjectivity to legislative discrimination emanates from a lack of awareness, which exposes households and increases their vulnerability to misgovernance. de Queiroz Ribeiro and dos Santos Junior (2010) aver that lack of cohesion can be a precursor or result of misgovernance, increasing

exposure to misgovernance and can actually increase inequalities. The fact that South Africa does not have a decentralized energy governance system (therefore promoting misgovernance), with Eskom (a power utility company) responsible for 95% of the energy supply, the adaptive capacity to misgovernance that can be realized from energy producer/user groups/associations is compromised. Ballabh (2008) avers that to achieve good governance, apart from emphasizing social equity and justice, there should also be consideration of decentralization. Socio-ecological systems allow for a localized governance of common goods by focusing on the degree of self-organization (Acosta et al., 2018). Norms and social capital realized by different genders, race and ethnic groups as well socio-economic attributes such as poverty necessitating indigent support form part of actors within the socio-ecological framework. The study findings account for the measurement and indicators of these social constructs in the socio-ecological framework (Teladia and van der Windt, 2022) and ultimately social justice through inclusion. Akinboade (2008) found that women beneficiaries of land restitution in the Capricorn district of Limpopo, South Africa had negative welfare outcomes, with however limited adaptation strategies such as social protection. This has been one of the downsides of land restitution, with Hellum and Derman (2013) highlighting that it has paid lip service to community complexities including ethnicity. This is due to the fact that land restitution claims were submitted as group claims, which was also reflected in ownership where the Chief of the land was the ultimate owner of communal land Hellum and Derman (2013). Ngarava (2023) highlighted that social protection initiatives such as indigent support were significant not only in subsidized water and energy but indirectly for food security. Due to the fact that the policy targets a demographic that has high levels of poverty, it affects the sensitivity to social injustice through allocative justice.

Beneficiaries of land restitution were experiencing higher levels of exposure and sensitivity resulting in higher levels of vulnerability to WEF misgovernance. In addition, land restitution benefactors were also experiencing higher levels of exposure and adaptive capacity to social injustice, even though there was no overall effect on vulnerability to social injustice. The community appears to be more adapted to the impact (exposure plus sensitivity) of WEF social injustice resulting in negligible vulnerability relative to misgovernance which has high

impact and thus vulnerability. In the socio-ecological framework, these results inform the social performance measurement and indicators of accountability and equity (Teladia and van der Windt, 2022). Even though the land restitution program achieved some extent of equitable distribution of land thus achieving redistributive justice through restorative justice, there is compromised accountability affecting WEF security. According to Xaba (2020), even though the state has been active in providing energy and water to land restitution beneficiaries, the beneficiaries have had limited freedoms, agency, capabilities and choices, and thus are unable to provide a just society. However, exceptions exist such as the Bela-Bela land restitution program in Limpopo, South Africa, which has been termed the best in the country with recognition of good governance and capacitating female entrepreneurs (BRICS and BRICS and Africa, 2023; Nawa, 2013). In terms of water, Msibi and Dlamini (2011) highlight the precarious water rights that are compromised in land-restituted areas. This can have dire consequences on rights and social justice in water access and use. This is despite the fact that the Water Allocation Plan (WAP) indicates that water reform should precede land restitution (DWS, 2022). van Koppen et al. (2009) noted that land restitution compromised water rights especially in riparian water rights which were not completely registered. Some of the water rights for land that were claimed were also sold, resulting in the introduction of legislation to curb this.

The overall findings of the study can be synthesized into measurements and indicators in a community socio-ecological systems framework adapted from Teladia and van der Windt (2022) (Fig. 5). The resource units in the context of the current study is mainly the land that is input into the land restitution program. The land is also part of the resource system which includes water, energy and food. These resource systems also set the conditions for the land restitution program. Localized and community level governance systems set the rules for the actors, who in this case are the benefactors, who engage in the land restitution program. The governance systems also set the conditions for the program. Overall, the outcomes that are realized are the welfare realities of water, energy and food, their governance and social justice. All these processes occur in conjunction with other social, economic and political systems as well as related ecosystems. The current study provided community outcome indicators of the water, energy and food (in) security, its (mis)governance and social (in)justice and how they are

shaped by resource systems, governance systems, resource units, actors and interactions within the socio-ecological framework.

### 5. Conclusion and recommendations

The study sought to ascertain the impact of land restitution beneficiaries on WEF misgovernance and social injustice. The results showed that land restitution benefactors had lower water insecurity, and higher food and energy insecurities relative to non-benefactors. Furthermore, beneficiaries from land restitution had significant associations with exposure, sensitivity, and adaptive capacities to WEF misgovernance and social injustice. An association between land restitution beneficiaries and overall vulnerability to WEF misgovernance was established, which was however non-existent with social injustice. Benefiting from land restitution resulted in higher levels of exposure and sensitivity leading to higher levels of vulnerability to WEF misgovernance. However, even though there was no impact on WEF social injustice, land restitution beneficiaries still experienced higher levels of exposure and adaptive capacity to social injustice. The study concludes that land restitution beneficiaries had a negative impact on WEF misgovernance by increasing exposure and sensitivities. In addition, even though there was high exposure to WEF social injustice for land restitution beneficiaries, it was offset by high adaptive capacity resulting in a negligible impact on social injustice. The implication of this conclusion on the socio-environment-development nexus in the land restituted area is that (i) the heightened WEF insecurities will require nature and ecosystem based solutions and (ii) governance and decision making from the bottom-up. The study demonstrated social justice in community socio-ecological governance processes. Even though the misgovernance and social injustice indicators were obtained at the household levels, their constructs into exposure, sensitivity and adaptive capacity exposed the community level vulnerabilities that are experienced. This has a bearing on both household and community-level welfare outcomes of water, energy, and food security, as well as sustainable development. This study opens avenues of further social injustice and misgovernance theoretical development as well as policy formulation and implementation.

The study recommends improving access to and fixing dilapidated WEF infrastructure in land-restituted areas. This aids in improving access to WEF resources. To enhance access to WEF resources, livelihood programs can be implemented in addition to social protection support. Livelihood-improving programs are more sustainable than social protection support to enhance access to WEF resources in land-restituted areas. WEF governance and social justice can be improved by enhancing the awareness of WEF laws, regulations, and policies. This can be through electronic and print media as well as public campaigns. Decentralizing WEF decision-making can also enhance participation, governance, and procedural justice by accommodating diverse and representative stakeholders in land-restituted areas. This increases accountability and inclusiveness which are precursors for governance and social justice.

One of the biggest drawback in achieving WEF security for land restitution beneficiaries was the lack of or dilapidated infrastructure. Nature based solutions and ecosystem services can overcome this challenge. This is bearing in mind that the initial occupiers of the land before the Natives Land Act of 1913 were living in harmony and sustainably utilizing the land without complex infrastructure. Nature-based solutions such as promotion of sustainable land use practices such as cover cropping and conservation tillage can be instrumental in water retention and improving soil health which can improve the food security of the land restituted communities. Retention and detention basins as well as other rainwater harvesting measures can aid in improving water storage which can improve the water security. Provisioning ecosystem services such as food production, fuel raw materials and water supply can also improve the WEF security of land restitution beneficiaries and lessens the burden on conventional ways of obtaining these resources. These

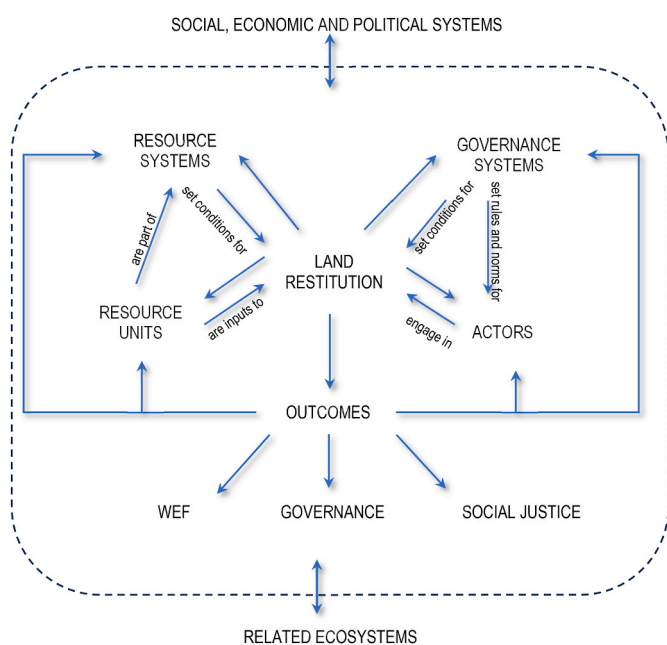


Fig. 5. Land restitution community socio-ecological systems framework. Source: Adapted from Teladia and van der Windt (2022) and (Nawa, 2013)

recommendations should however take cognizance of the vulnerability to misgovernance that was highlighted in the study. This is debilitating especially for nature based products which are treated as common goods. Overexploitation and the “tragedy of the commons” requires a sustainable regulating and governing system that accommodates for social justice.

Spatially, the study was limited to land restitution beneficiaries in Majeng, Ward 5 of Magareng Local Municipality, while the counterfactual respondents were obtained from Matatiele and Greater Taung Local Municipalities. Furthermore, land restitution in the context of the study referred to benefiting from land claims and excluding cash-out benefits which were an option for compensation. External validity is limited due to the spatially concentrated and small representative sample compared to the country’s total land restitution beneficiaries. Any findings must therefore be cautiously superimposed on the whole country. Internal validity is also limited, especially in measuring vulnerability to WEF misgovernance and social injustice. The variables included in the constructs of exposure, sensitivity, and adaptive capacity to WEF misgovernance and social injustice were at the author’s discretion and thus were open to subjectivity. Internal validity can be improved by including other variables to make the constructs more robust. In addition, the internal validity is also limited by the reclassified variables used in the PSM. This can be overcome by expanding the data set through other studies using similar design and tools, thereby improving the probability of comparisons of treated and untreated groups based on micro-characteristics. Furthermore, land restitution programs are managed by Community Property Associations (CPAs). However, most of their decisions are overridden by departmental decision-making. This can be an area to pursue further studies, as the current study focused on higher levels of governance.

Temporally, the study was a cross-sectional survey. A longitudinal study can offer a more nuanced perspective on the changes to WEF misgovernance and social injustice, capturing the dynamic nature of the constructs that lead to ultimate vulnerability. Conceptually, there are various measures of vulnerability which can be adopted and adapted from other disciplines, thus can provide varying conclusions other than the ones obtained by the current study. This is an area worth pursuing for further studies to augment and, in some instances, counter the findings from the study.

#### CRedit authorship contribution statement

**Saul Ngarava:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Data availability

Data is available at <https://data.mendeley.com/datasets/56zskrvfwf/1at>.

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#### References

- Acosta, C., Ortega, M., Bunsen, T., Koirala, B.P., 2018. Facilitating energy transition through energy commons: an application of socio-ecological systems framework for integrated community energy systems. *Sustainability* 10, 1–15. <https://doi.org/10.3390/su10020366>.
- Akinola, A.O., 2008. Gender, HIV-AIDS, land restitution and survival strategies in the Capricorn district of South Africa. *Int. J. Soc. Econ.* 35, 857–877. <https://doi.org/10.1108/03068290810905469>.
- Akinola, A.O., Kaseeram, I., 2021. Globalisation of South African land reform scheme: an interrogation. In: Akinola, A.O., Kaseeram, I., Jili, N.N. (Eds.), *New Polit. Econ. L. Reform South Africa*. Palgrave MacMillan, Cham, Switzerland, pp. 35–54.
- Almgren, G., 2018. A primer on theories of social justice and defining the problem of health care. In: *Heal. Care Polit. Policy*. Serv. Springer Connect, pp. 1–38. <https://doi.org/10.1891/9780826168986.0001>.
- Ballabh, V., 2008. Governance of water: issues and challenges, gov. *Water institutional altern. Politic. Econ.* 2050, 3–17.
- Barak, G., 2015. *Social Justice and Social Inequalities*, second ed. Elsevier. <https://doi.org/10.1016/B978-0-08-097086-8.45085-3>.
- Barati, A.A., Azadi, H., Scheffran, J., 2019. A system dynamics model of smart groundwater governance. *Agric. Water Manag.* 221, 502–518. <https://doi.org/10.1016/j.agwat.2019.03.047>.
- Bradstock, A., 2006. Land reform and livelihoods in South Africa’s Northern Cape province. *Land Use Pol.* 23, 247–259. <https://doi.org/10.1016/j.landusepol.2005.01.002>.
- BRICS, BRICS and Africa, 2023. Partnership for mutually accelerated growth, sustainable development and inclusive materialism. In: *13th Meet. BRICS Minist. Agric., South Africa*.
- Campbell, C.G., Papanek, A., Delong, A., Diaz, J., Gusto, C., 2022. Community food systems resilience: values, benefits, and indicators. *J. Agric. Food Syst. Community Dev.* 11, 89–113. <https://doi.org/10.5304/jafscd.2022.114.006>.
- Chitonge, H., 2022. Resettled but not redressed: land restitution and post-settlement dynamics in South Africa. *J. Agrar. Change* 22, 722–739. <https://doi.org/10.1111/joac.12493>.
- Cousins, B., 2021. Rights to land: a guide to tenure upgrading and restitution in South Africa. *S. Afr. Hist. J.* 73, 187–195. <https://doi.org/10.1080/02582473.2021.1896572>.
- Daramola, M.A., 2021. Land reform and the quest for women’s land rights in South Africa: a case of KwaZulu-Natal Province. In: Akinola, A.O., Kaseeram, I., Jili, N.N. (Eds.), *New Polit. Econ. L. Reform South Africa*. Palgrave MacMillan, Cham, Switzerland, pp. 255–278.
- de Koning, M., De Beer, F., 2014. Land restitution and income generation in protected areas in Mpumalanga, South Africa. *Dev. Pract.* 24, 118–128. <https://doi.org/10.1080/09614524.2014.866214>.
- de Queiroz Ribeiro, L.C., dos Santos Junior, O.A., 2010. Large cities and the Brazilian social question: reflections about the ‘state of exception’ in Brazilian metropolises. In: McGee, T., de Castro, E. (Eds.), *Inclusion, Collab. Urban Gov. Challenges Metrop. Reg.* The University of British Columbia, British Columbia, Brazil Canada, pp. 51–90. [http://www.chs.ubc.ca/consortia/outputs3/5-Challenges\\_Metro\\_Regions\\_Brazil\\_Canada-final.pdf](http://www.chs.ubc.ca/consortia/outputs3/5-Challenges_Metro_Regions_Brazil_Canada-final.pdf).
- Del Río Duque, M.L., Rodríguez, T., Lora, Á.P.P., Löhr, K., Romero, M., Castro-Nunez, A., Sieber, S., Bonatti, M., 2022. Understanding systemic land use dynamics in conflict-affected territories: the cases of Cesar and Caquetá, Colombia. *PLoS One* 17, 1–19. <https://doi.org/10.1371/journal.pone.0269088>.
- Dikgang, J., Muchapondwa, E., 2016. The effect of land restitution on poverty reduction among the Khomani san “bushmen” in South Africa. *South African. J. Econ.* 84, 63–80. <https://doi.org/10.1111/saje.12088>.
- DoENC, 2014. *Environmental Impact Assessment*, Kimberly, South Africa.
- Dr S Mompoti District Municipality, 2017. *Integrated Development Planning Fourth Generation 2017/2022 Draft 2021/2022 Review*, Vryburg.
- DWS, 2022. *Revised National Water Resource Strategy -Draft 3*, Pretoria, South Africa. [www.dws.gov.za](http://www.dws.gov.za).
- Fitz, D., 2018. Evaluating the impact of market-assisted land reform in Brazil. *World Dev.* 103, 255–267. <https://doi.org/10.1016/j.worlddev.2017.10.007>.
- GoSA, Local Government, 1998. *Municipal Structures Act, No 117 of 1998*. South Africa. [http://www.gov.za/sites/www.gov.za/files/a117-98\\_0.pdf](http://www.gov.za/sites/www.gov.za/files/a117-98_0.pdf).
- Greater Taung Local Municipality, 2017. *Greater Taung LM Fourth Generation Integrated Development Plan*. Taung. <https://gtlm.gov.za/wp-content/uploads/2018/06/0-GTLM-Final-Fourth-Generation-IDP-2.pdf>.
- Greenberg, S., Drimie, S., Losch, B., Jila, N., 2022. Transitions to agroecological food systems: agroecological initiatives in Matatiele and Umzimvubu. Eastern Cape, Matatiele. <https://www.southernafricafoodlab.org/wp-content/uploads/2022/08/TAFS-Umzimvubu-Matatiele-report-for-sharing-July-2022-final.pdf>.
- Gumede, M., Ehiane, S., 2022. The challenges of sustainable livelihoods through land restoration in South Africa. *J. Asian Afr. Stud.* 57, 391–405. <https://doi.org/10.1177/00219096211025809>.
- Hedin, S., 2005. Land restitution in the former Swedish settlement areas in Estonia consequences for land ownership, land use and landscape. *Landsc. Urban Plann.* 70, 35–44. <https://doi.org/10.1016/j.landurbplan.2003.10.003>.
- Hellum, A., Derman, B., 2013. *Between common community interest and gender difference: women in South Africa’s land restitution process*. In: Derman, B.,

- Hellum, A., Sandvik, K.B. (Eds.), *World Hum. Rights Ambiguities Rights Claiming Africa*. Koninklijke Brill NV, Leiden, The Netherlands, pp. 143–168.
- Le Grand, J., 1991. *The Theory of Government Failure*, vol. 21, pp. 423–442.
- Magareng Local Municipality, 2012. Integrated development plan review. Warrenton. [https://ia802908.us.archive.org/15/items/ted\\_development\\_plans\\_2011-12\\_02\\_1ocal\\_municipalities\\_nc093\\_magareng\\_nc093\\_magareng\\_-\\_idp\\_-\\_1112.pdf/Documents/01.IntegratedDevelopmentPlans/2011-12/02.LocalMunicipalities/NC093Magareng/NC093Magareng-IDP](https://ia802908.us.archive.org/15/items/ted_development_plans_2011-12_02_1ocal_municipalities_nc093_magareng_nc093_magareng_-_idp_-_1112.pdf/Documents/01.IntegratedDevelopmentPlans/2011-12/02.LocalMunicipalities/NC093Magareng/NC093Magareng-IDP).
- Magareng Local Municipality, 2014. Magareng local municipality spatial development framework 2014-2019. Warrenton. <https://francesbaard.gov.za/wp-content/uploads/2015/06/Magareng-SDF-2014-19-reduced-size.pdf>.
- Maloka, T., 2021. Balancing land redistribution and public interest in South African socio-economic development: a critical appraisal of the Restitution of Land Rights Act. In: Akinola, A.O., Kaseeram, I., Jili, N.N. (Eds.), *New Polit. Econ. L. Reform South Africa*. Palgrave MacMillan, Cham, Switzerland, pp. 199–216.
- Mark, S.S., Belton, B., 2020. Breaking with the past? The politics of land restitution and the limits to restitutive justice in Myanmar. *Land Use Pol.* 94, 0–28. <https://doi.org/10.1016/j.landusepol.2020.104503>.
- Masuku, M.M., Sithole, M.S., Ngwenya, B., 2023. Land dispossession and food insecurity in contemporary South Africa: consequences of land looting institutionalized through the Natives Land Act 27. In: Masuku, M.M., Ngobese, D., Maguvhe, M.O., Ndlovu, S. (Eds.), *The Afrocentric Trajectories of Looting in South Africa*. The Rowman and Littlefield Publishing Group, Maryland, pp. 33–46.
- Matatiele Local Municipality, 2020. Matatiele local municipality spatial development framework review. Matatiele. [https://www.cogta.gov.za/cgta\\_2016/wp-content/uploads/2021/02/MATATIELE-ADOPTED-2020-21-IDP-document-1.pdf](https://www.cogta.gov.za/cgta_2016/wp-content/uploads/2021/02/MATATIELE-ADOPTED-2020-21-IDP-document-1.pdf).
- Moroni, S., 2020. The just city . Three background issues: institutional justice and spatial justice , social justice and distributive justice , concept of justice and conceptions of justice. *Plann. Theor.* 19, 251–267. <https://doi.org/10.1177/1473095219877670>.
- Msibi, M.I., Dlamini, P.Z., 2011. *Water Allocation Reform in South Africa: History, Processes and Prospects for Future Implementation*, Pretoria, South Africa.
- Narh, P., Lambini, C.K., Sabbini, M., Pham, V.D., Nguyen, T.T., 2016. Land sector reforms in Ghana, Kenya, and Vietnam: a comparative analysis of their effectiveness. *Land* 5, 1–17. <https://doi.org/10.3390/land5020008>.
- Natarajan, N., Newsham, A., Rigg, J., Suhardiman, D., 2022. A sustainable livelihoods framework for the 21st century. *World Dev.* 155, 105898 <https://doi.org/10.1016/j.worlddev.2022.105898>.
- Nawa, L.L., 2013. *Bela-Bela Land Claim: the Best Land Restitution and Development Model in South Africa*. Porcupine Press, Johannesburg.
- Ngarava, S., 2020. Impact of the Fast Track Land Reform Programme (FTLRP) on agricultural production: a tobacco success story in Zimbabwe. *Land Use Pol.* 99, 105000 <https://doi.org/10.1016/j.landusepol.2020.105000>.
- Ngarava, S., 2022. Empirical analysis on the impact of the COVID-19 pandemic on food insecurity in South Africa. *Phys. Chem. Earth* 103180. <https://doi.org/10.1016/j.pce.2022.103180>.
- Ngarava, S., 2023. Implications of land restitution as a transformative social policy for water-energy-food (WEF) insecurity in Magareng local municipality , South Africa. *Land Use Pol.* 133, 106878 <https://doi.org/10.1016/j.landusepol.2023.106878>.
- Ngarava, S., Vijge, M., DuPlessis, W., Zhou, L., Viljoen, G., Nyambo, P., Mugadza, A., Rantlo, J., Mokadem, N., Fontana, M.D., 2024. Water-energy-food nexus: multi-actor governance for social justice (household survey). Mendeley Data. <https://doi.org/10.17632/56zskrvfwf.1>.
- Nilsson, M., Taylor, L.K., 2017. Applying the security-development nexus on the ground: land restitution in Colombia. *Conflict Secur. Dev* 17, 73–89. <https://doi.org/10.1080/14678802.2016.1231844>.
- Nortje, K., Mbhele, R., Polasi, T., Zulu, S., Meissner, R., Muller, M., 2022. *Legal and Institutional Barriers to Community Owned Water Supply Schemes*, Pretoria, South Africa.
- Okumbor, J.C., Sithole, S.L., Kirk, N.C., 2018. Sustainable rural livelihood and agri-food system : lessons from Manavhela and restitution. *J. Public Adm.* 53, 446–473.
- Puttergill, C., Bomela, N., Grobbelaar, J., Moguerane, K., 2011. The limits of land restitution: livelihoods in three rural communities in South Africa. *Dev. South Afr.* 28, 597–611. <https://doi.org/10.1080/0376835X.2011.623921>.
- Roby, H., Dibb, S., 2019. Future pathways to mainstreaming community energy. *Energy Pol.* 135, 111020 <https://doi.org/10.1016/j.enpol.2019.111020>.
- Stats, S.A., 2021. General household survey, Pretoria, South Africa, 2022. <http://www.ncbi.nlm.nih.gov/pubmed/11469378>.
- Swami, D., Parthasarathy, D., 2021. Dynamics of exposure, sensitivity, adaptive capacity and agricultural vulnerability at district scale for Maharashtra, India. *Ecol. Indic.* 121, 107206 <https://doi.org/10.1016/j.ecolind.2020.107206>.
- Teladia, A., van der Windt, H., 2022. A new framework for analysing local participation in community energy initiatives A new framework for analysing local participation in community energy initiatives. *Conf. Ser. Earth Environ. Sci.* 1085, 1–17. <https://doi.org/10.1088/1755-1315/1085/1/012034>.
- Tshishonga, N.S., 2020. Rural development and the struggle for land reform in post-Apartheid South Africa. In: Mavhungu, A.M., Khathutshelo, A.T. (Eds.), *African Perspect. Reshaping Rural Dev.*, IGI Global, Hershey, PA, pp. 95–117. <https://doi.org/10.4018/978-1-7998-2306-3.ch005>.
- V Banerjee, A., 1997. A theory of misgovernance. *Q. J. Econ.* 112, 1289–1332. <https://doi.org/10.1162/003355300555484>.
- van Koppen, B., Sally, H., Aliber, M., Cousins, B., Tapela, B., 2009. Water resources management, rural redress and agrarian reform. <http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Water+resources+management+,+rural+redress+and+agrarian+reform#0>.
- Vining, A.R., Weimer, D.L., 1990. Government supply and government production failure: a framework based on contestability. *J. Public Policy.* 10, 1–22. <https://doi.org/10.1017/S0143814X00004657>.
- Wazimap, 2023. Greater Taung local municipality. <https://wazimap.co.za/profiles/municipality-NW394-greater-taung/>. (Accessed 2 February 2023).
- Wazimap, Magareng Local Municipality, 2022. <https://wazimap.co.za/profiles/municipality-NC093-magareng/>. (Accessed 19 October 2022).
- Wazimap, Magareng Ward 5, 2022. <https://wazimap.co.za/profiles/ward-30903005-magareng-ward-5-30903005/>. (Accessed 19 October 2022).
- Wazimap, Matatiele Local Municipality, 2022. [https://wazimap.co.za/profiles/municipality-EC441-matatiele/#service\\_delivery](https://wazimap.co.za/profiles/municipality-EC441-matatiele/#service_delivery). (Accessed 23 June 2022).
- Wolford, W., Wolford, W., 2010. Participatory democracy by default : land reform , social movements and the state in Brazil. *J. Peasant Stud.* 37, 91–109. <https://doi.org/10.1080/03066150903498770>.
- Xaba, M.B., 2020. South African land restitution and development: the capabilities approach to an understanding of the Macleantown and Salem restitution projects in the Eastern Cape, Transform. *Crit. Perspect. South. Africa.* 102, 49–72. <https://doi.org/10.1080/1035313531.2020.0002>.
- Xaba, M.B., 2022. Examining the meanings of ‘restitution’ for beneficiaries of the Macleantown and Salem restitution cases in the Eastern Cape, South Africa. *Soc. Dynam.* 48, 338–356. <https://doi.org/10.1080/02533952.2022.2103617>.
- Yamane, T., 1967. *Statistics: an Introductory Analysis*, second ed. Harper and Row, New York, USA.
- Yingi, L., 2021. Motivation for land reform in contemporary South Africa: the case of Balobedu in Tzaneen Province, South Africa. In: Akinola, A.O., Kaseeram, I., Jili, N.N. (Eds.), *New Polit. Econ. L. Reform South Africa*. Palgrave MacMillan, Cham, Switzerland, pp. 143–160.
- Zeka, S., 2011. Intricacies of land restitution in Africa. In: *The Case of the Mkambati Community*. South Africa, Pretoria, South Africa. <https://africaportal.org/publication/intricacies-of-land-restitution-in-africa-the-case-of-the-mkambati-community-south-africa/>.