

SECURING MULTIPLE ECOSYSTEMS BENEFIT THROUGH SUSTAINABLE LAND MANAGEMENT
IN THE PRODUCTIVE BUT DEGRADED LANDSCAPES OF SOUTH AFRICA

IMPACTS OF LAND USE LAND COVER CHANGE ON LAND DEGRADATION: CASE OF THE GREATER SEKHUKHUNE DISTRICT

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Introduction

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Land use and land cover (LULC) - interactions of human activities with the environment at the various scales.

Recent rates, extent and intensity of LULC Change (LULCC) are far greater than were in the past.

Land change process in developing worlds.

Complex land use management system and tensions in communal areas of SA.



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Severe land degradation (LD) in communal areas due to poor land use practices.

Many communal areas in North-West, Northern Cape, Eastern Cape, Mpumalanga and Limpopo provinces are severely degraded .

LULCC-central component for managing natural resources and monitoring environmental change.

Increasing research focus on the rates and predictors of habitat conversion, i.e., land degradation-remote sensing technologies



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Objective

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To understand the driving mechanism of LULCC and the influence of the latter on land degradation in the GSDM

- Assess Land-Use and Land-Cover Change (LULCC) Between 1990 and 2019
- Quantify and ascertain the influence of LULC on LD



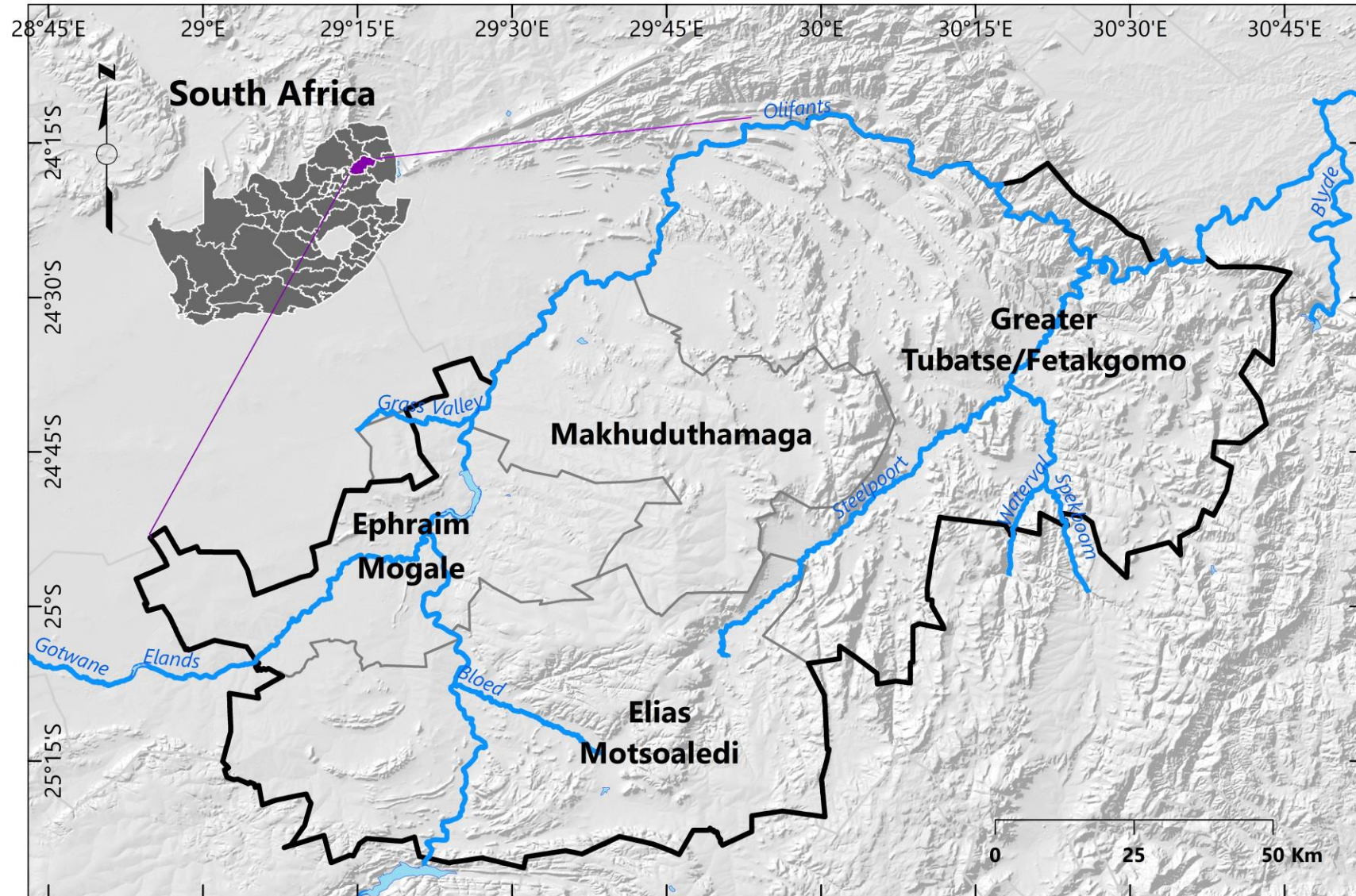
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Study Area

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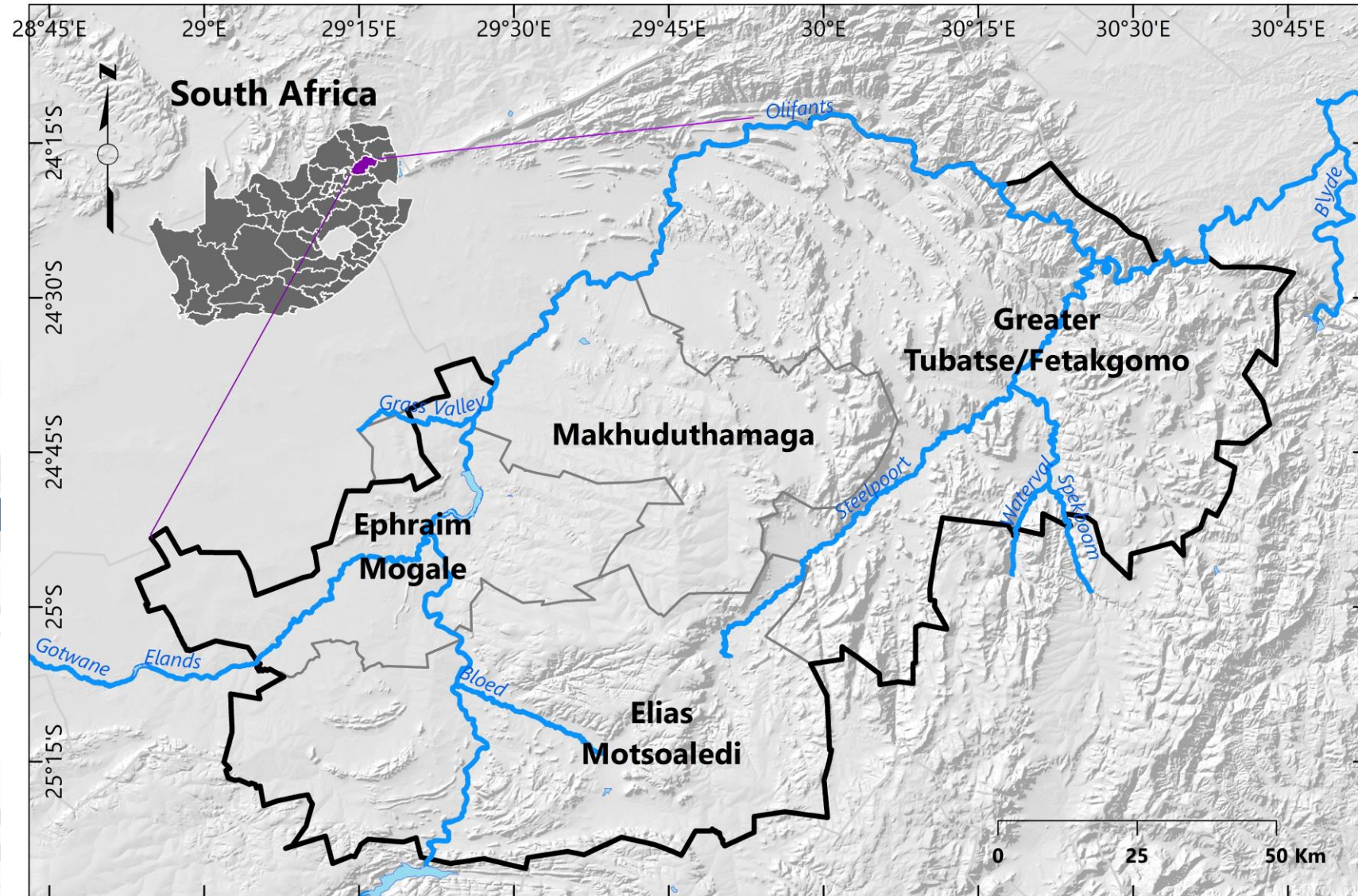
- **Semi-arid environment**- avg annual rainfall ± 560 mm
- Temperatures -avg summer temp of $\pm 23^{\circ}\text{C}$
- Dominating Geology: ultramafic substrates
 - low nutrient availability
- Topographically: undulating hills ranging from hilly to mountainous
- Dominating Land cover: Grassland



Study Area

- Population approx. 1 million
- Agriculture dominates land use -70% subsistence farmers engaged in livestock and crop farming

Future agricultural concerns:
water scarcity, land conflicts, high number of land claims, inappropriate infrastructure and services.
Uncontrolled grazing



Methodology-Mixed method: Quantitative and Qualitative

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Data Collection

- Wet and dry season Landsat 5TM,7ETM+, 8 Oli, Five-year interval
- Key Informants interviews: Semi-structured

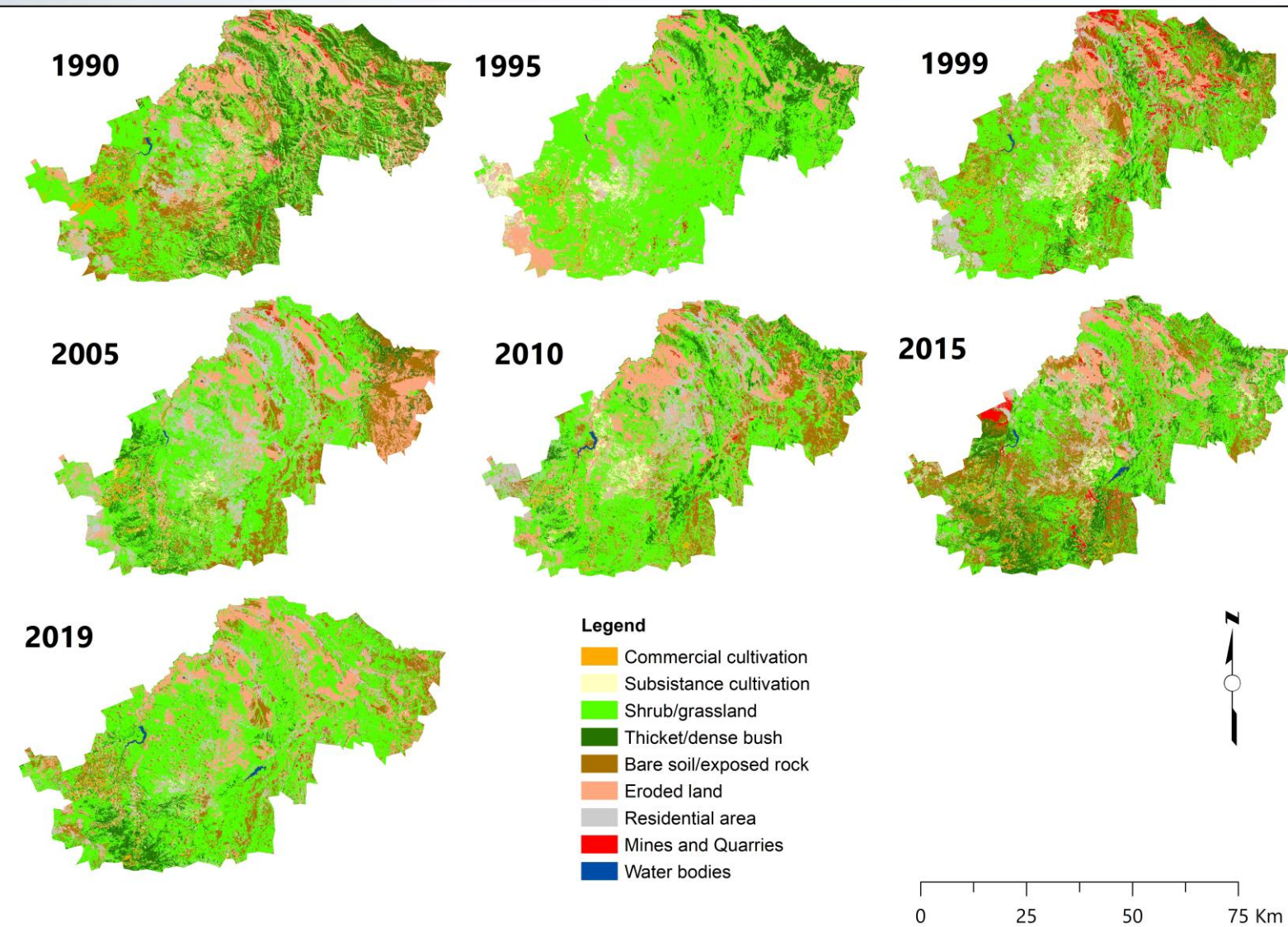
Dynamics of LULC

- Classification scheme
- Supervised classification, maximum likelihood
- Accuracy Assessment

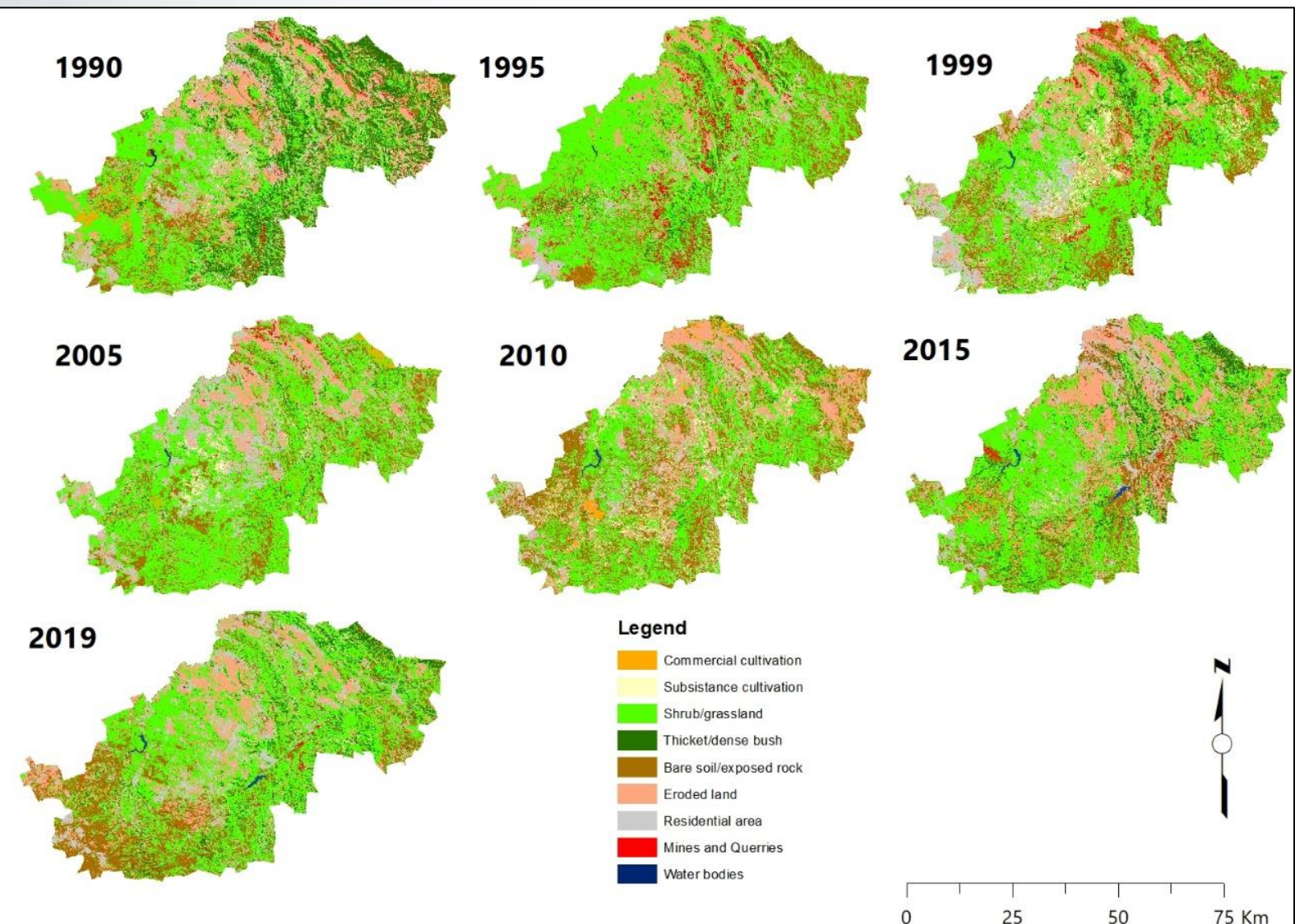
LULC Influence on land degradation

- LD indicator: LULCC, NDVI
- Key informant interviews

Results: LULC Maps – Wet Season



Results: LULC Maps – Dry Season



LULC Rate of change between 1990 and 2019

- **Declining (wet season):** : Industrial land (2.69%) , subsistence cultivation (2.65%), thicket/dense bush (2.30%), commercial cultivation (2.07%) annually
- **Increasing:** Water bodies (3.28%), residential area (2.52%), shrub/grassland (1.78%), Bare/exposed rock (1.75%) annually
- **NDVI analysis: Negative change** - recurring moderate drought, moderate vegetation, precipitation and temperature anomalies, urban expansion with a vegetation decrease

Year of change	Season	Positive change (%) NDVI	Little/No change (%) NDVI	Negative change (%) NDVI
2010-2015	Wet	0.00	69.01	30.99
	Dry	0.00	80.35	19.65

Results: 14 Common LULC Conversion



Rank	From Class name	To Class name	Period	Season	Area (Ha)	Percent (%)
1	Shrub/grassland	Bare soil/exposed rock	2015-2019	Dry	129255.85	9.55
2	Thicket/dense bush	Shrub/grassland	2010-2015	Wet	110625.63	8.18
3	Shrub/grassland	Bare soil/exposed rock	2010-2015	Wet	109736.63	8.11
4	Shrub/grassland	Bare soil/exposed rock	1995-1999	Dry	92186.56	6.81
5	Shrub/grassland	Eroded Land	2005-2010	Dry	79494.00	5.88
6	Thicket/dense bush	Bare soil/exposed rock	1990-1995	Dry	76749.93	5.67
7	Eroded Land	Shrub/grassland	2015-2019	Dry	74632.24	5.52
8	Residential	Shrub/grassland	2005-2010	Wet	73953.02	5.47
9	Bare soil/exposed rock	Shrub/grassland	2015-2019	Dry	71890.83	5.31
10	Bare soil/exposed rock	Shrub/grassland	2010-2015	Wet	70188.57	5.19
11	Bare soil/exposed rock	Shrub/grassland	2005-2010	Wet	69619.38	5.15
12	Bare soil/exposed rock	Shrub/grassland	1990-1995	Dry	69079.58	5.11
13	Shrub/grassland	Bare soil/exposed rock	2005-2010	Wet	65193.11	4.82
14	Shrub/grassland	Residential	1995-1999	Dry	64465.42	4.77

Results: Potential Driving Factors of LULCC and LD in the district



11 Key Informant Interviews:

Natural resource managers, crop production, animal production and extension services per local municipality

Main drivers of LULC changes contributing to LD are:

- soil erosion- sedimentation during flash floods
- increase in bare soil,
- cropland abandonment,
- settlement encroachment into productive cropping land,
- land tenure conflicts and
- Excessive wood harvesting.



Results: Potential Driving Factors of LULCC and LD in the district



Key Informant Interviews

- Overgrazing- main contributor of LD due to uncontrollable/lack of rotational grazing .
- Overgrazing and Bush encroachment into abandoned cropping fields
- Grazing capacity reduced due to lack of grazing management i.e. no rotational grazing, overstocking, lack of fencing.
- Illegal sand mining -second main contributor to soil erosion as existing gullies are further extended.



Conclusion



- Main drivers of LULCC and LD- **Anthropogenic activities**
- Further exacerbated by **effects of rainfall variability and intensive rainfall/flash floods.**
- Efforts made to address LD - erosion control structures fencing, eradicate alien species.
- **Vandalism, lack of accountability and improper land use** remains a challenge.
- **Key informants highlight Integrated and coordinated approach:**
 - Need for **sense of urgency** from the **government, tribal authority as custodians of natural resources and land users**
 - **Tribal authority as custodians of Natural resources- informed decisions on LU and impacts**
 - Coordinated Management -**tribal authority, gov officials, community**
 - **RS Capabilities-Landscape approach**



Acknowledgements



- UNDP-GEF5 Sustainable Land Management Project through the CSIR
- CSIR parliamentary grant
- Local community and Tribal Authority
- Dr Connie Musvoto for her mentorship
- Officials from Limpopo Department of Rural and Agriculture Development (LDARD) for participation in the key-informant interviews.

The background features a complex, layered design. On the left side, there are several interlocking gears of various sizes, some with a '150' marking. The right side is dominated by large, overlapping geometric shapes, primarily triangles, in various shades of blue. The overall aesthetic is technical and modern.

Thank you

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