



8th Savanna Science Network Meeting

**Spatial and temporal variation
of reservoir siltation**

**in selected ecozones
of the Kruger National Park**

Results of the 2008 reconnaissance survey

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Introduction



Fig. 1: Sabie river west of Kruger Gate (from: Google Earth)

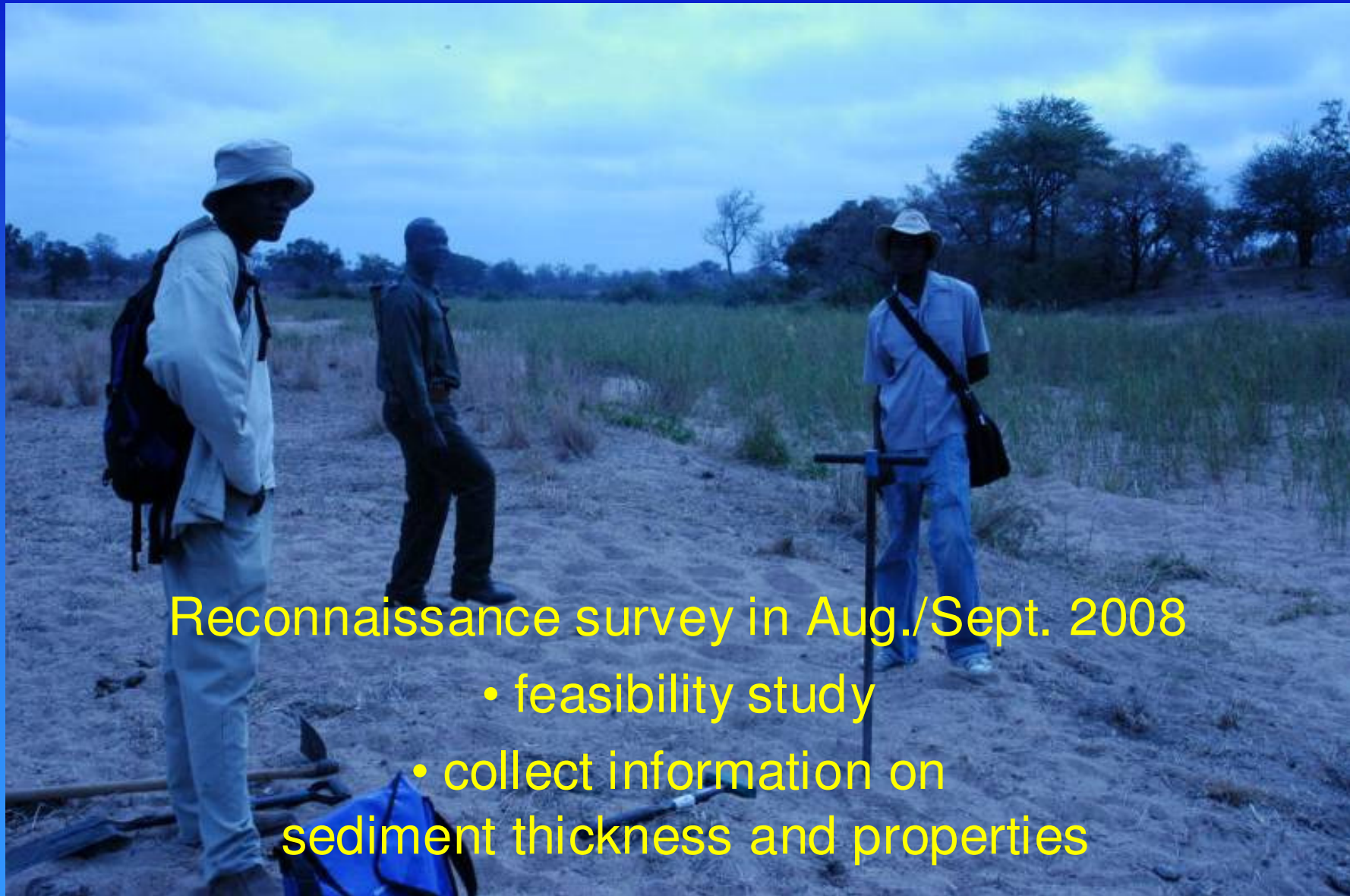
Introduction

Kruger Park

- variation of natural drivers
- protected from agricultural development for a century
- 50 years of water management provided artificial sediment traps
- reservoirs are accessible at the end of dry season

Fig. 2: Siloweni reservoir in Sep. 2008

Aims



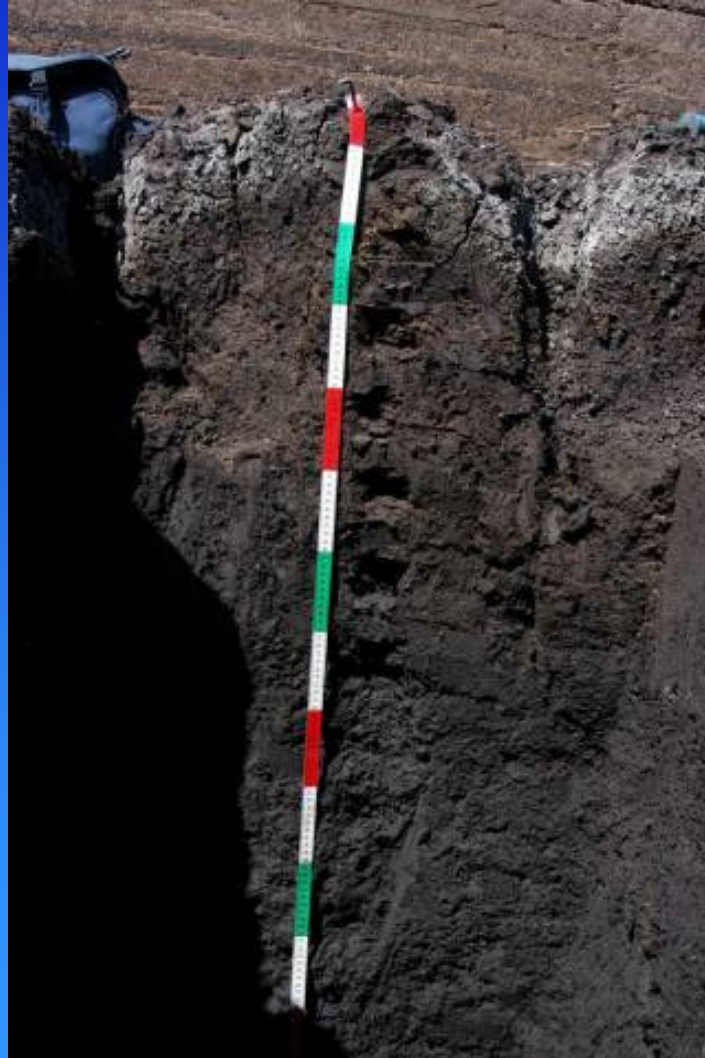
Reconnaissance survey in Aug./Sept. 2008

- feasibility study
- collect information on sediment thickness and properties

Fig. 3: Field work at the Byamati weir in Sep. 2008

Methods

Field work:
mapping,
sampling in
southern and
central KNP



Laboratory work:
sedimentological and
geochemical analysis

GIS work:
RUSLE-based soil
loss estimation

Fig. 4: Sampling pit in Mlondozi reservoir (Sept. 2008)

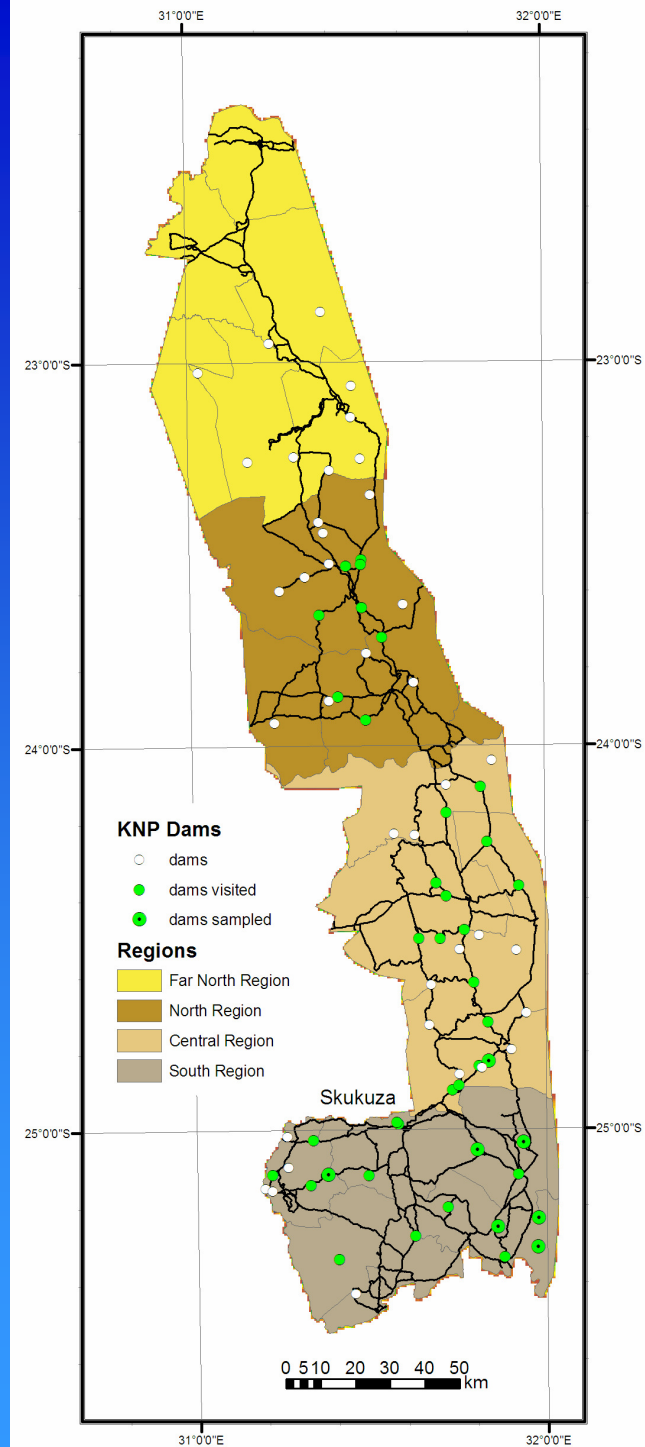
Results

Reconnaissance survey covered:

26 reservoirs in central and northern region (remote sensing from car)

14 reservoirs in southern part with sampling in 7 reservoirs

Fig. 5: Surveyed reservoirs in northern to southern KNP



Sediment thickness

Tab. 1: Thickness of reservoir sedimentation

| Reservoir | Max. thickness |
|--------------|----------------|
| Napi | 0.6 m |
| Siloweni | 1.0 m |
| Mlondozi | 1.3 m |
| N'watimhiri | 0.4 m |
| Makhohola | 0.3 m |
| Nlanganzwani | 1.3 m |
| Mpanamana | > 1.0 m |

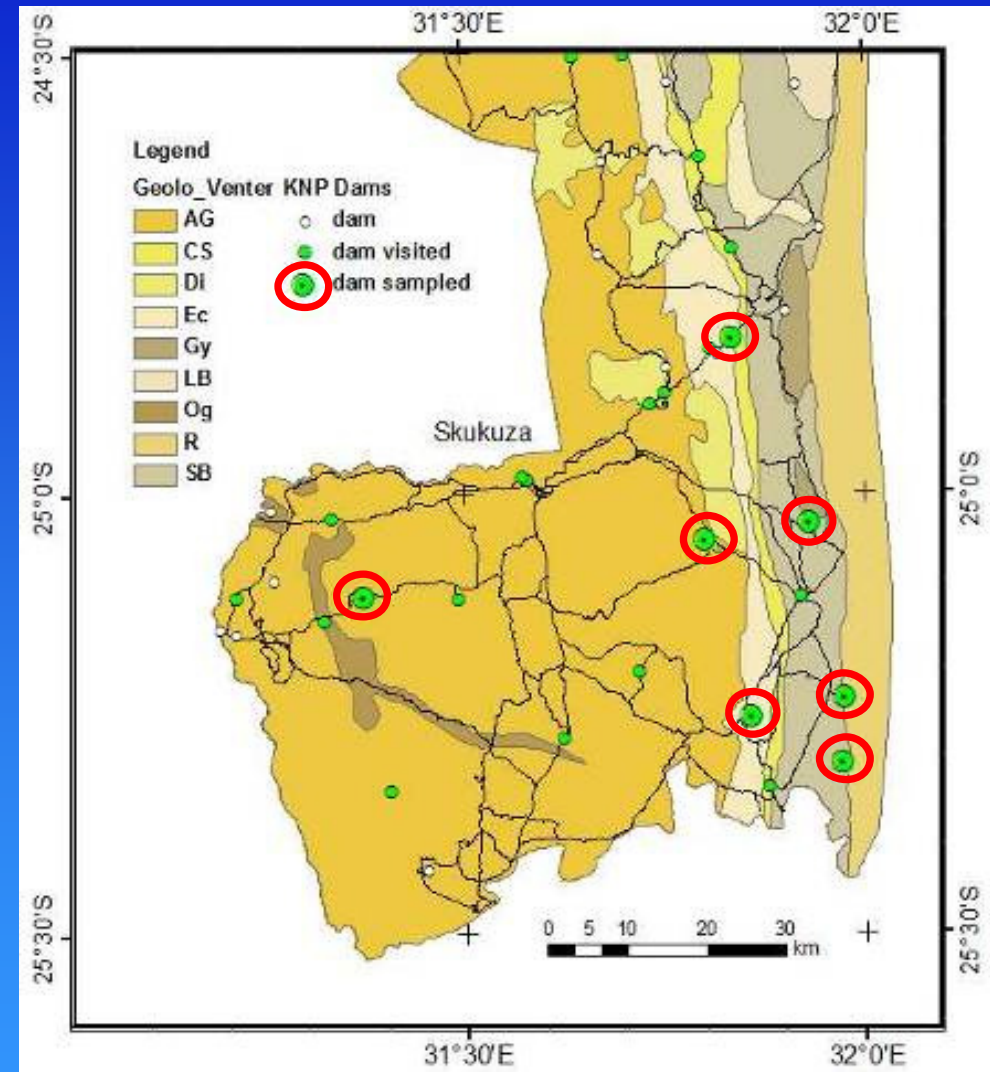


Fig. 6: Sampled reservoirs in southern KNP

Sediment properties

Tab. 2: Particle size distribution of surface sediments [0 – 5 cm in %]

| Reservoir | loc | Clay | Silt | Sand | Gravel |
|--------------|-----|--------|---------|---------|--------|
| Napi | 1 | 7 | 30 | 60 | 3 |
| Siloweni | 9 | 8 - 20 | 45 - 57 | 23 - 44 | 0 - 2 |
| Mlondozi | 1 | 4 | 51 | 46 | 0 |
| N'watimhiri | 1 | 8 | 66 | 26 | 0 |
| Makhohola | 1 | 10 | 21 | 62 | 0 |
| Nlanganzwani | 1 | 3 | 44 | 53 | 0 |
| Mpanamana | - | - | - | - | - |

Sediment properties

blackish silty
(lacustrine)

blackish sandy
(lacustrine ?)

grey sand
(fluvial ?)

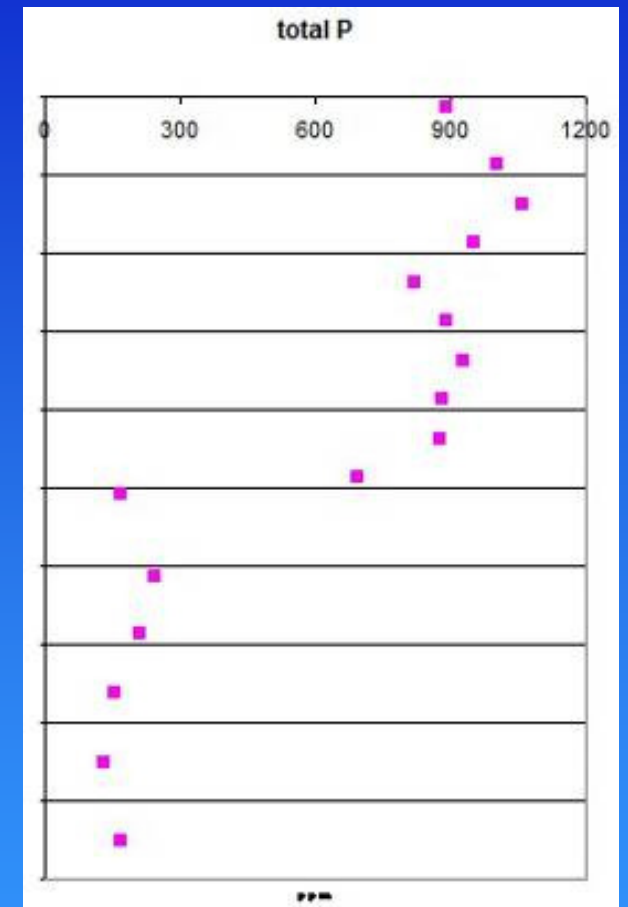
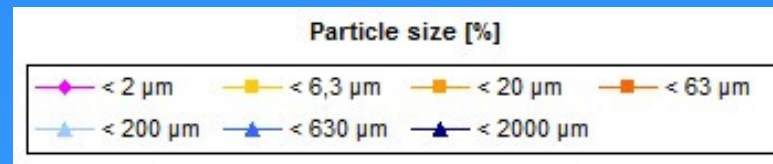
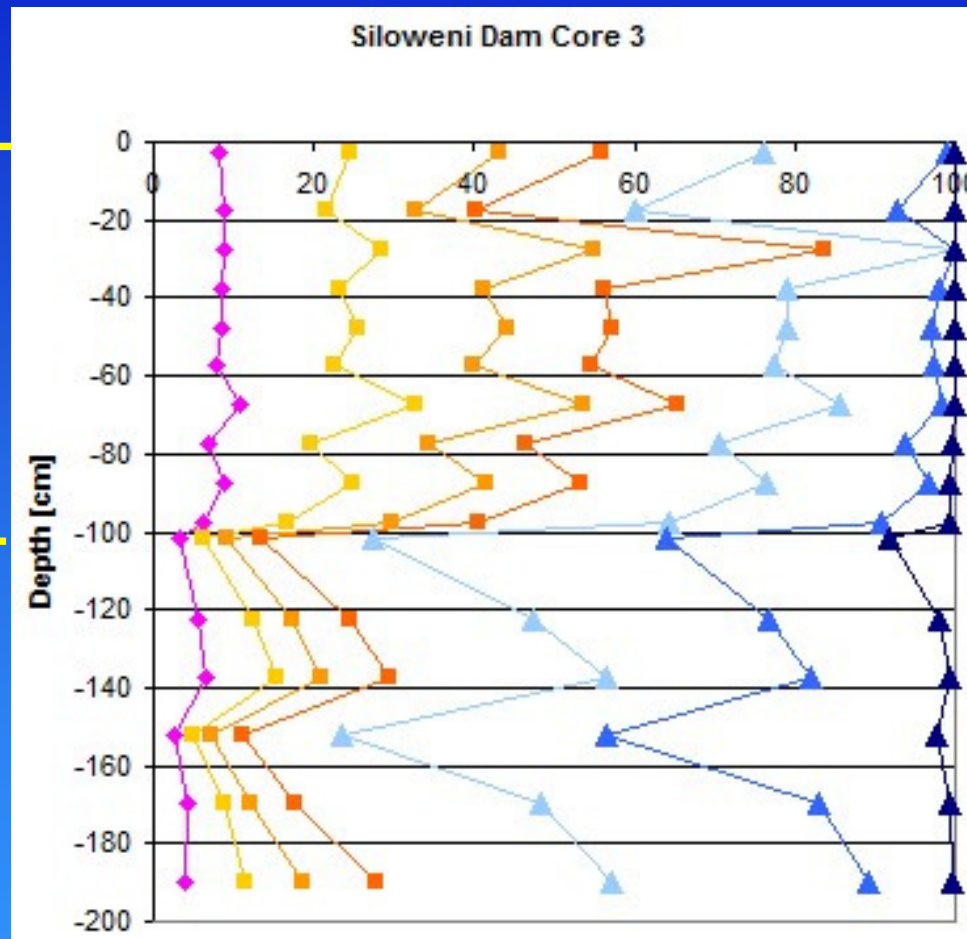


Fig. 7: Particle size distribution (clay, silt, sand) and total P from Siloweni Dam (Core 3)

Sediment properties

blackish
silt/sand
(lacustrine)

rocks

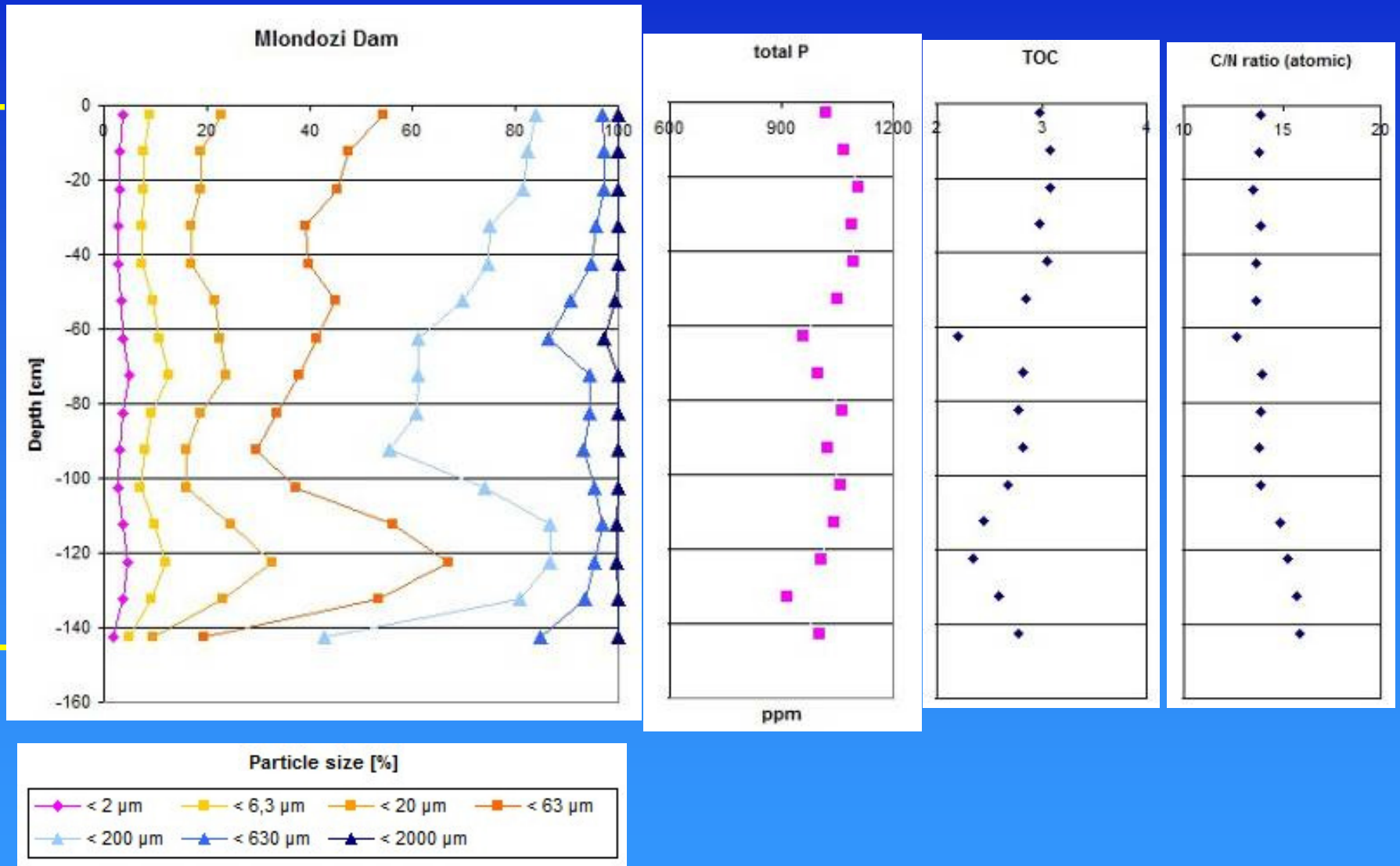


Fig. 8: Particle size distribution (clay, silt, sand) and geochemical properties (fraction < 1 mm) from Mlondozi Dam

Soil erosion estimate

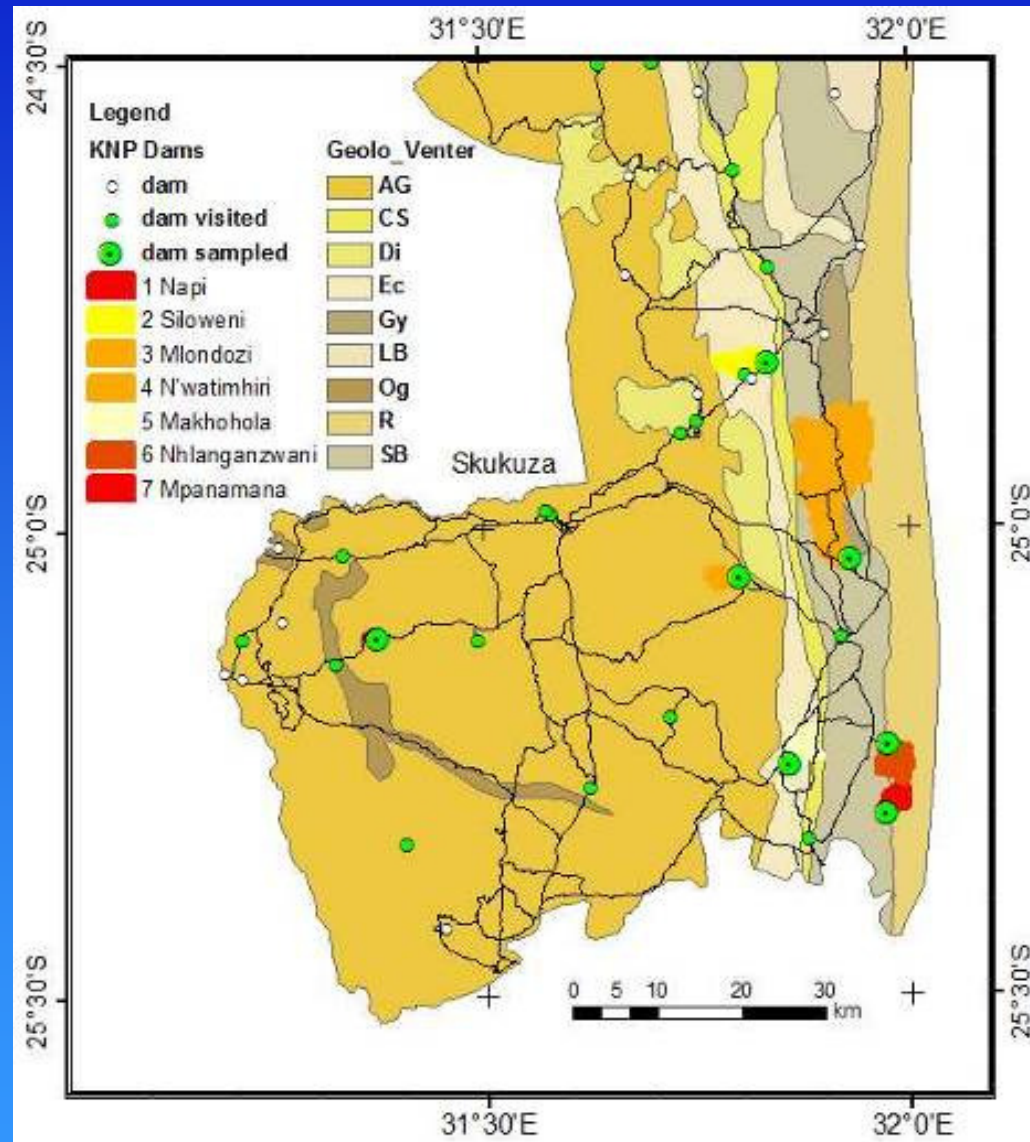
Tab. 3: RUSLE input data

| Parameter | Methods |
|-----------|-------------------------------------------------------------------------------------------|
| R | mean monthly precipitation from Venter et al. 2003, algorithm by Renard & Freimund (1994) |
| L S | 20-m-DEM, algorithm by Engel (1999) |
| K | from LeRoux et al. (2003, 2008) |
| C | vegetation data from Kemp et al. (1997), rangeland C-values from Wishmeier & Smith (1978) |

Soil erosion estimate

RUSLE
soil erosion risk
($R * LS * K$)

< 10 to 50
 $t ha^{-1} yr^{-1}$



RUSLE
soil loss
($R * LS * K * C$)

< 2
 $t ha^{-1} yr^{-1}$

Fig. 9: RUSLE soil erosion risk estimate for selected catchments

Tab. 4: Comparison of reservoir sedimentation derived denundation and RUSLE actual soil loss estimate

| Reservoir | Surface [ha] | Sed. Vol. [m ³] | Catchment [km ²] | Denundation [t ha yr] | RUSLE [t ha yr] |
|--------------|--------------|-----------------------------|------------------------------|-----------------------|-----------------|
| Siloweni | 8 | 28,250 | 14 | 1.5 – 3.0 | 1.1 |
| Mlondozi | 8 | | 102 | | 0.8 |
| N'watimhiri | 2 | | 6 | | 1.9 |
| Makhohola | 3 | | 13 | | 0.5 |
| Nlanganzwani | 14 | | 14 | | 1.2 |
| Mpanamana | 5 | | 8 | | 1.6 |

Conclusion

KNP is suitable for investigations of long term near natural denudation rates

Thank you for your attention

Acknowledgment

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