

A Review of Land Degradation Assessment & Monitoring Methods


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Layout

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Introduction

Land degradation (LD):

- ◆ **LD is a complex term (NRC, 1994).**
- ◆ **Immediate causes:**
 - **Inappropriate land use**
 - ◆ Degradation of soil, water & vegetation cover
 - ◆ Loss of both soil and vegetative biological diversity
 - ◆ loss of ecosystem structure and function

(Snel and Bot, 2003)



Introduction cont...

◆ 20 % of cultivated areas, 30% of forests and 10% of grasslands Undergoing degradation (Bai *et al.*, 2008).



Wood sale in Malawi

◆ Land degradation is associated with poverty and drought.

◆ Estimated: 2.6 billion people are affected in more than 100 countries (Adams and Eswaran, 2000).

Introduction cont....

◆ LD is a HOT TOPIC

◆ Global development and environmental issue highlighted in:

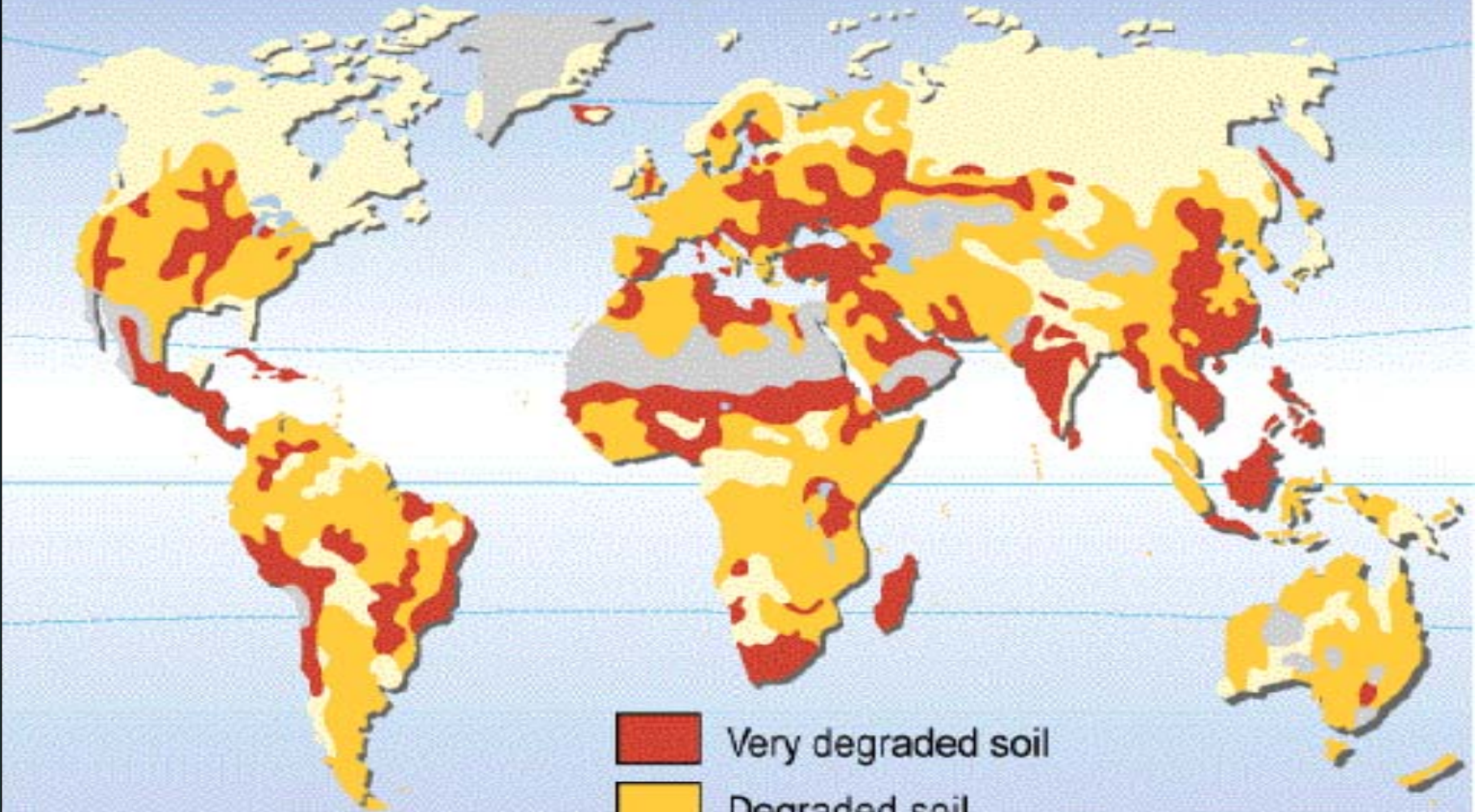
- UNCCD,
- COD,
- Kyoto protocol on global climate change and
- MDG




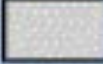
(UNCCD, 1992; UNEP, 2007).



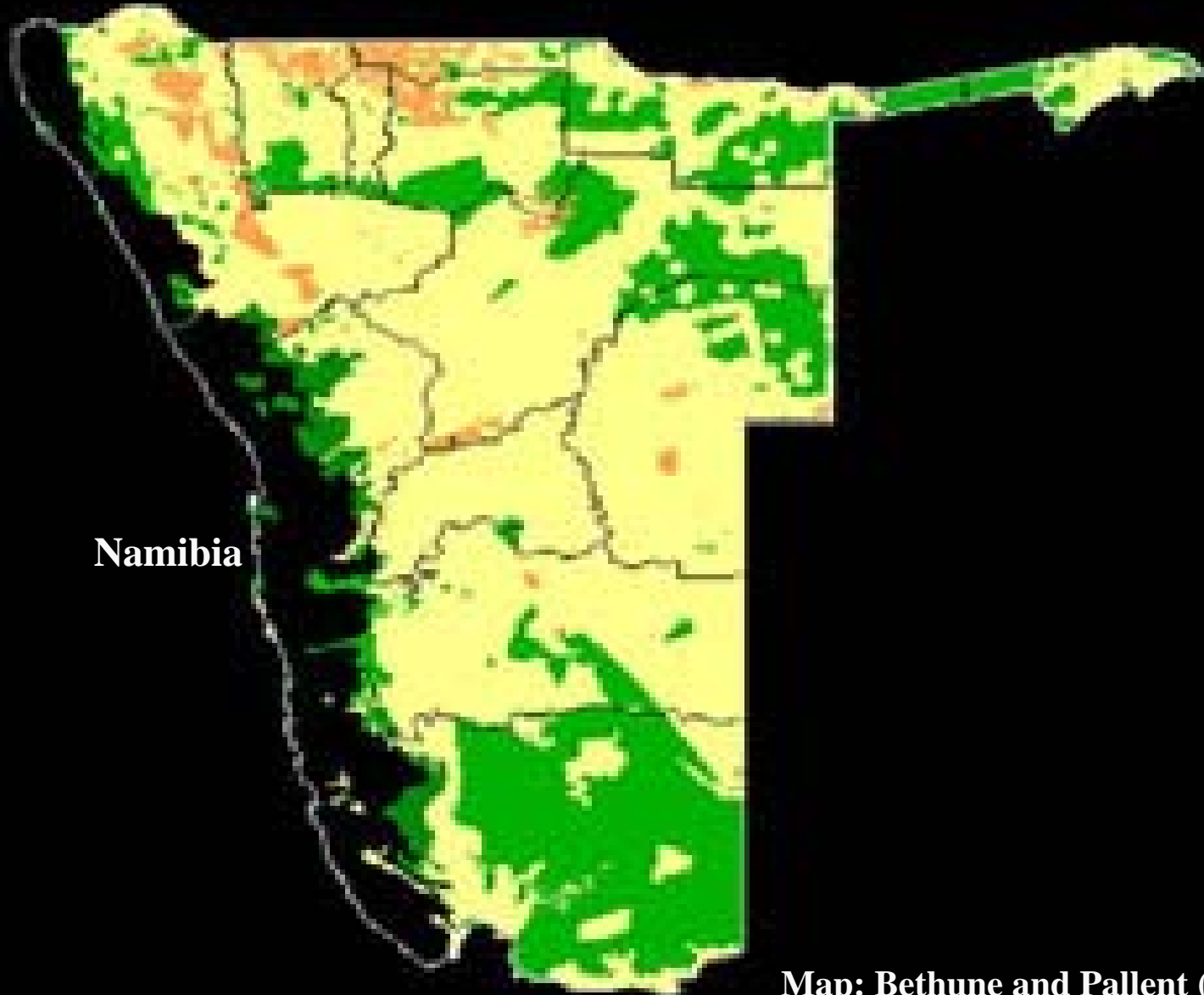
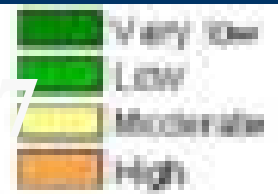
Eroded Wastelands in Rajasthan, India

Soil degradation



-  Very degraded soil
-  Degraded soil
-  Stable soil
-  Without vegetation

National Land Degradation Risk Map 1997

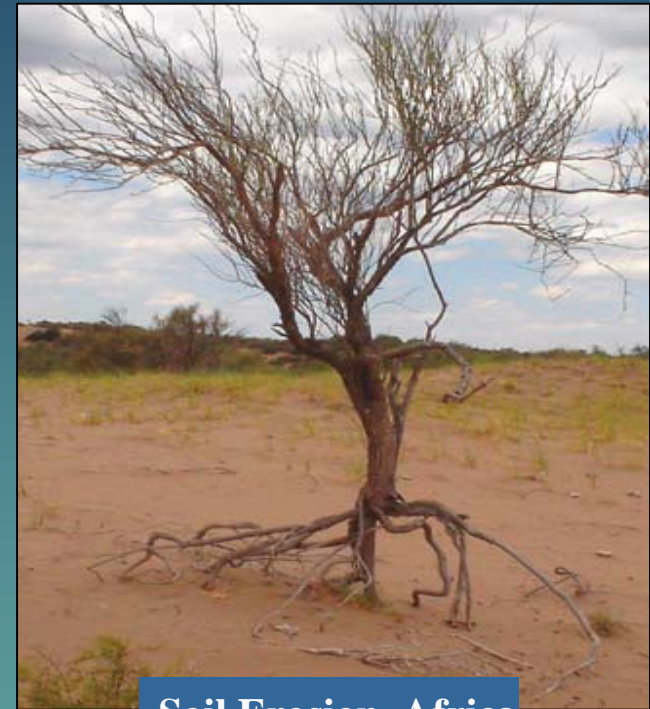


Map: Bethune and Pallent (2002)

Introduction cont.....

Why LD assessment and monitoring?

- ◆ To improve understanding of causes, impacts, degree and acquaintances with climate, soil, water, land cover and socio-economic factors.

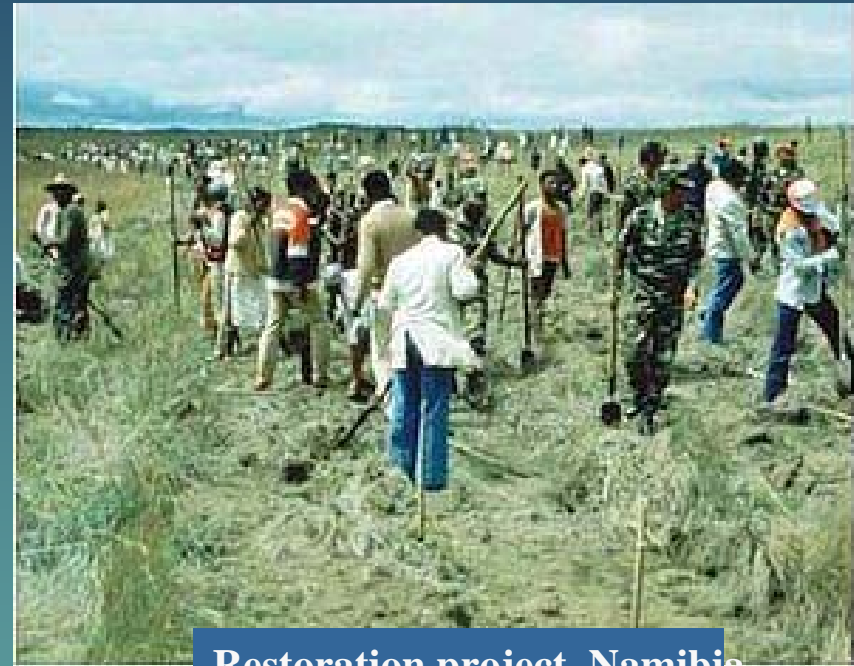


Soil Erosion, Africa

Introduction cont.....

Why assessment and monitoring?

- ◆ A primary goal in decision support systems for reversing degradation



Restoration project, Namibia

Introduction cont.....


Assessment and monitoring methods:

- ◆ Different methods have been developed and used to assess and monitor land degradation.



Biodiversity monitoring, Namibia

Aim of the study

- ◆ **Explore and Review existing land degradation assessment and monitoring methods or approaches used at global, national, local & farm.**
 - Have a broad understanding
 - Recommend suitable methods for Namibia's environment
 - **Contribute to a database for LD assessment and methods**
- 

Methodology

- ◆ Desktop study

- **Published and unpublished materials**


- ◆ Library

- ◆ Internet


- ◆ Personal communication with specialists



Main questions for the study

- ◆ **What systems were assessed?**
 - ◆ **What process/factors were assessed?**
 - ◆ **What approaches were used?**
 - ◆ **What units / values?**
 - ◆ **What level?**
 - ◆ **Where?**
- 

Outcomes of the study

- ◆ **65 papers were reviewed.**
 - ◆ **These focused on:**
 - **Soil degradation and erosion assessment**
 - **Land, water and vegetation assessment**
 - **Rangelands & croplands Assessment**
 - **Dry and wet lands**
 - **others**
- 

Systems and Process/Factors assessed

e.g. Systems

- ◆ Soils
- ◆ Rivers and other catchments
- ◆ Forests
- ◆ Rangelands & croplands
- ◆ Drylands

e.g. Processes/Factors

- ◆ Fertility decline
- ◆ Soil erosion
- ◆ Land use and Cover
- ◆ Rangelands health
- ◆ Crop yield
- ◆ Climatic factors
- ◆ Biodiversity loss

Six extensively used methods for Land Degradation assessments

- ◆ Expert opinion
- ◆ Land user's opinion
- ◆ Modelling
- ◆ Field observations, monitoring and measurements
- ◆ Productivity change estimates
- ◆ Remote sensing and GIS

Summary of some reviewed papers

Initiatives	Methods	Levels
RALA Classification method	Expert opinion, remote sensing, GIS	National (Iceland)
NZLRI erosion classification	Experts opinion, Remote sensing, GIS	National, local (New Zealand)
Classification of the state of erosion	Expert opinion, field observation	local/farm (Chile)
BIOTA	Expert & land users opinion, remote sensing, GIS, field	Regional, National, local

Summary of some reviewed approaches cont..

Initiatives	Methods	Level
REMOTE SENSING (MSR, NDVI, FID54, SAVI)	Remote sensing	All levels (most countries)
Attributes, indicators and Classification approach	Expert & land users opinion, remote sensing, GIS, field assessment	Local/Farm (USA, Australia, Mexico)
VS-FAST methodology	Land users opinion, field assessment, field and laboratory	Local/Farm (China)

Summary of reviewed papers cont...

Initiatives	Methods	level
LFA approach	Expert & land users opinion, GIS, field	National, Local/Farm assessment, monitoring
LLM approach	land users opinion, field assessment,	National, Local/Farm monitoring, measurement
Grazing Gradient Method (GGM)	Expert & land users opinion, remote	Local/Farm sensing, GIS, field monitoring
Participatory Degradation Appraisal (PDA)	farm-level field criteria,	field (Katham



Land degradation assessment & monitoring in Namibia

◆ National Monitoring System

– Indicators;

- ◆ Population pressure
- ◆ Livestock pressure
- ◆ Rainfall variability
- ◆ Soil erosion hazards

(Klintonberg and Seely, 2004)


Outcomes of the study



Land degradation assessment & monitoring in Namibia cont..

- ◆ Remote Sensing and GIS
- ◆ Degradation Gradient Method
- ◆ Canonical Correspondence Analysis (CCA)
- ◆ Local Level monitoring
- ◆ Landscape Function Analysis (LFA)
- ◆ others

Conclusion

- ◆ **There are several approaches for assessing and monitoring land degradation worldwide.**
 - ◆ **NO single best method for assessing land degradation.**
 - ◆ **The first distinctions to be made: land use, type and scale**
- 

Conclusion cont...

- ◆ **Methods or techniques need to be critically selected**
 - **taking into account: suitability, applicability and adaptability level to local conditions**
- ◆ **Integration of Local knowledge with scientific knowledge is very important.**



Conclusion cont...

- ◆ **The use of statistical methods, ordination, and modelling approaches provide good results**
- ◆ **Stories of failures in using different assessment approaches & methods are very few,**

Does that mean everything works?



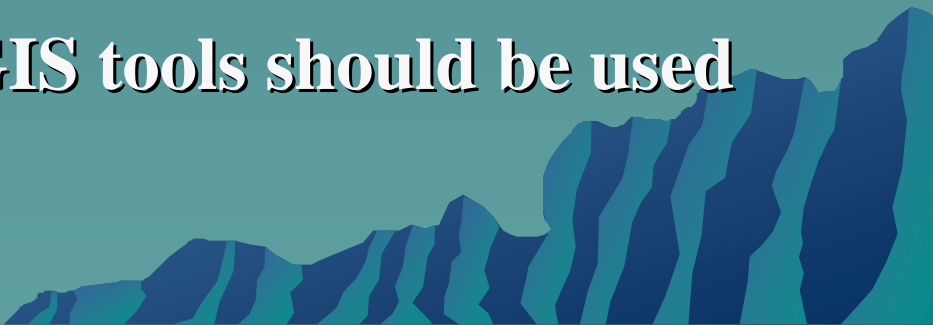
Assessment and Monitoring of
Land Degradation
is crucial
to improve understanding
and assist in
decision-making
Processes

A stylized graphic of a mountain range in shades of blue and teal, located in the bottom right corner of the slide.

Recommendations for Namibia


- ◆ **Improve the national monitoring system indicators. E.g. use example of indicators developed by other countries.**
 - ◆ **LLM approaches should be introduced to all communities.**
- 

Recommendations for Namibia cont...

- ◆ **More participatory approaches that involve all land stakeholders.**
 - ◆ **New methods could be tried on the more sensitive satellites that are being developed, in the hope of finding better interpretation.**
 - **Remote Sensing and GIS tools should be used more**
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Recommendations for Namibia conti...

- ◆ **Specialists should equip themselves with assessment and monitoring skills and**
 - **Encourage involvement & leadership of local people**

 - ◆ **Review full version of this paper.**
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Thank you

for

taking assesement and monitoring of any environmental issue seriously, before and after taking action to reverse problem.

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