THE EFFECTS OF HYDROLOGICAL CHANGES ON THE ZAMBEZI DELTA

VEGETATION COMPONENT

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BACKGROUND

- When looking at conservation of wetland vegetation the main point to consider is that wetland systems are very dynamic in space and time. To remain healthy, they have to be allowed to remain so.
- Many vegetation types move around the landscape over the years. We should not try to keep each component in its original place. There is a danger of 'landscape sclerosis' or 'fossilisation' of vegetation patterns.
- Wetlands also provide ecological goods and services to a range of species and to people. We have to maintain these to the extent required.
- Perhaps the main conservation danger is of "terrestrialization" (= when woody vegetation starts to take over from swamp and wetland grassland). Shrubs invade readily, but are much harder to remove.

ASSUMPTIONS

There is nothing inherently "wrong" with a change in distribution of vegetation types across the wetland landscape. During this process some habitats or vegetation types will also become more common, others more scarce. We need to try and determine when reduced extent becomes unacceptable, resulting in absolute loss of biodiversity or in ecological simplification of the system.

Perhaps that point can be taken as when:

(a) There is an actual loss of overall biodiversity (i.e. lower number of species)

(b) There is loss to the system of restricted distribution species and a decline in their regional or global status (obligations under CBD)

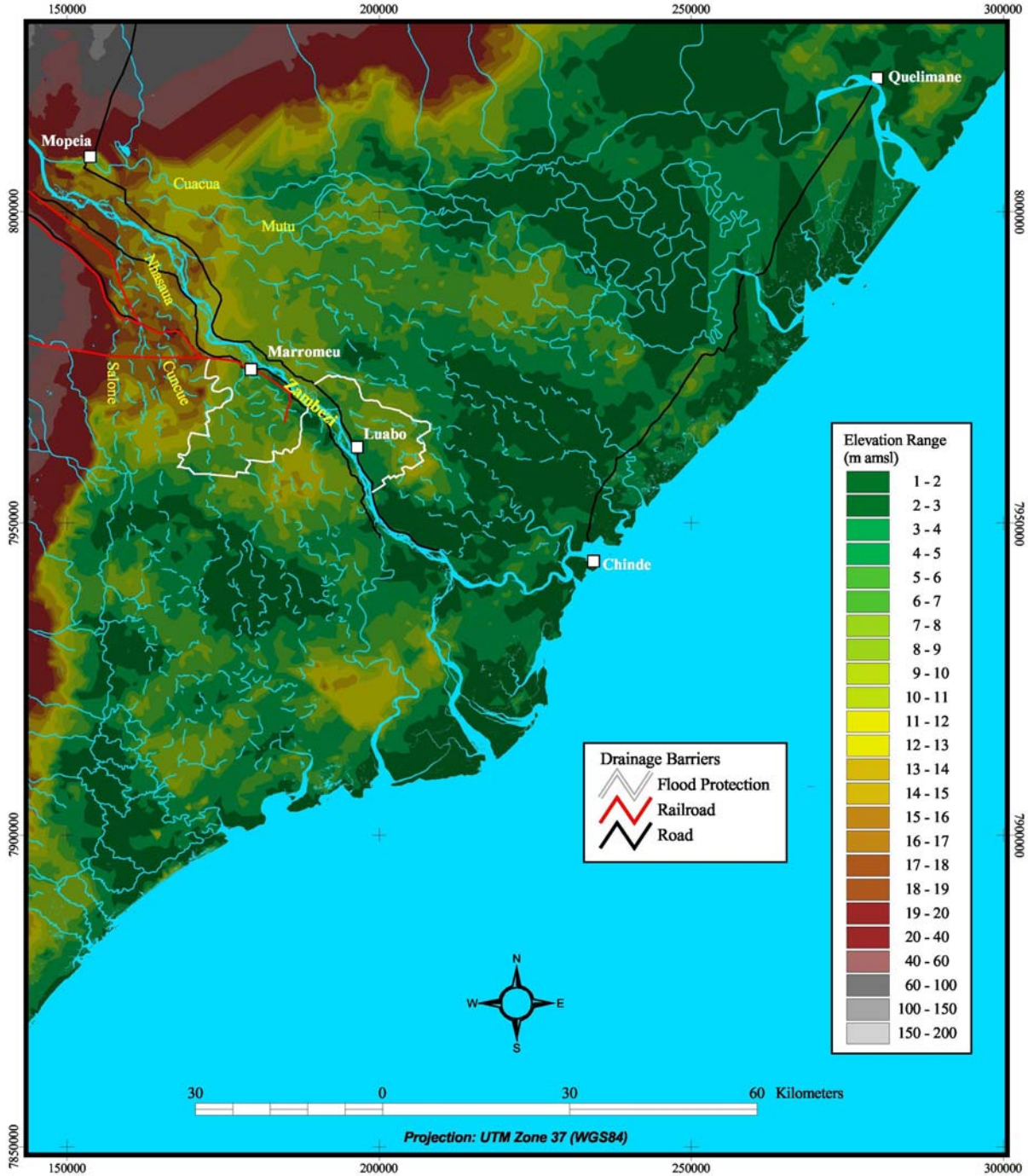
(c) There is loss of ecological goods and services (obligations under Ramsar).

The objective of this component of the study is aimed primarily at biodiversity conservation, particularly of vegetation and plant species. Economic aspects of resource utilization by people are covered separately.

CAUSES OF VEGETATION CHANGE OVER LAST 100 YEARS

1. Increased dry season base-flows owing to power generation from upstream dams;
2. Reduced flooding (both in incidence and extent) after the construction of Kariba and Cabora Bassa dams;
3. Construction of bunds across distributory channels (especially on the south bank) in the 1920s to control flooding;
4. Construction of the sugar estates and concomitant changes in land drainage in the 1920s and onward;
5. Introduction of cattle and peripheral "terrestrial" human settlements (compared to previous primarily river-fringing settlement) following on from development of the sugar estates;
6. Introduction of aquatic water weeds and their subsequent spread;
7. The loss of megaherbivore grazers (elephant, buffalo, hippo) soon after the establishment of sugar plantations through meat-hunting, and again at the end of the civil war in the early 1990s; [alternatively, one could say the change was the large rise in megaherbivores in the 1970s]
8. Logging industry on the Cheringoma plateau, especially in the 1950-1960s, and perhaps again now, with tree felling, local clearance, road construction, etc.;
9. Changes in the burning regime of the grasslands, especially the frequency of burning. Frequency is considered more important than timing.

Although flood regime and hydrology are not the full story, they are perhaps the most significant factors that have changed over the last 45 years.


150000
200000
250000
300000
8000000
7950000
7900000
7850000
Quelimane
Mopeia
Cuacua
Mutu
Nhamaua
Marromeu
Safone
Cuncue
Zambezi
Luabo
Chinde
Elevation Range
(m amsl)
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
9 - 10
10 - 11
11 - 12
12 - 13
13 - 14
14 - 15
15 - 16
16 - 17
17 - 18
18 - 19
19 - 20
20 - 40
40 - 60
60 - 100
100 - 150
150 - 200
Drainage Barriers
Flood Protection
Railroad
Road
N
W
E
S
30
0
30
60 Kilometers
Projection: UTM Zone 37 (WGS84)

CRITERIA FOR SELECTION

a) Choose vegetation types that are clearly defined and relatively limited in extent; thus any changes in distribution or status are readily measured

b) Cover vegetation types of particular biodiversity conservation concern, not necessarily those of utility value

c) Provide a cross-section of vegetation types; also cover some of most important biological conservation targets

VEGETATION TYPES CHOSEN

1. Mangrove woodlands/forests (excluding saline grasslands)

2. Riparian forest (the narrow fringing forests along smaller distributor channels)

3. Papyrus-dominated permanent swamps

4. Palm and Acacia savannas on the delta plain

MAIN FINDINGS - 1

- A more regulated hydrology with less inter-year and seasonal variation (e.g. reduced extent of annual flood, reduced incidence of big floods) has led to greater 'sclerosis' of the wetland landscape

- Of particular concern are: (i) invasion of what was seasonally flooded wetland grassland by Acacia and palms ('terrestrialization'), (ii) stabilization of sandbanks in river, and (iii) reduced 'flushing out' of nutrients from backwaters

- Insufficient evidence of reduced mangrove extent owing to changed CB hydrological regime. But a distinct possibility, especially in the longer-term (silt loads, reduced saline flushing, fewer suitable areas for establishment)

- No effect recorded so far on known plants of restricted distribution. Probably a function of lack of information.

MAIN FINDINGS - 2

- Most important hydrological feature that should be changed is duration and extent of flooding. Timing of flood is not of great significance.
- Major focal point should be to ensure that grassland areas remain waterlogged for some months to reduce woody invasion.
- Secondary focus should be to ensure sufficient flooding so that papyrus channels do not clog up. Or to ensure that new open channels are formed.
- Third focus should be to 'flush out' backwaters of nutrients to ensure aquatic weeds do not block up lagoons.

MONITORING

- There is a major need for monitoring. This can be done by remote sensing, air photos and ground transects
- Monitoring has to give moderately reliable results over a 5-10 year period such that management can make timely changes. Not produce results when changes are already well established
- Extent of burning can be recorded using remote sensing
- Changes in distribution of specific vegetation types best recorded from smaller areas using air photos
- Invasion of wetland grassland by woody plants best recorded using fixed transects in selected areas
- Such monitoring acts as an early warning system for managers. Results MUST be fed back institutionally into planning / management