

SMALLHOLDER RESETTLEMENT IN SEMI ARID WATERSHEDS: A CASE STUDY IN BULAWAYO'S WATER SUPPLY DAM CATCHMENTS AND IMPLICATIONS FOR ENVIRONMENTAL MANAGEMENT

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ABSTRACT

The year 2000 marked a turning point for Zimbabwe's history, particularly Land and Agrarian Reform. The study area included the dam catchment areas for Bulawayo city water supply dams in Umzingwane district, Zimbabwe. It sought to determine the appropriateness of A1 schemes in catchment areas of Bulawayo's supply dams. Methodology involved use of primary and secondary sources. The rate of soil erosion was determined using Whitlow, (1988) benchmarks based on population changes in different land use areas. Further, the amount of soil loss on croplands was calculated based on the 43 tonnes soil loss per hectare benchmark (Chenje *e tal.*, 1998). Subsequently, implications for water supply and water resources management in the watersheds were explored. Results revealed that smallholder resettlement in dam catchments of the Bulawayo city supply dams has increased siltation and reduced dam capacities. In order to achieve full benefits of the fast track land reform programme, technical support would be required to reduce environmental degradation in the watersheds.

Key words: Fast track land reform, soil erosion rates, siltation, catchment, smallholder resettlement

INTRODUCTION

The year 2000 marked a turning point for Zimbabwe's history, particularly Land and Agrarian Reform. The year witnessed a paradigm shift in thinking and practices as regards the Land and Agrarian Reform. Hitherto, there was talk of the land question; in the year 2000 there was a shift as talk was on land as an answer to the economy. On the basis of the jingle, 'land is the economy and the economy is land', the Zimbabwean government undertook a major land reform program in which over 150 000 families were to be resettled. The government acquired about 5 million hectares and resettled about 46111 families on 2.5 million hectares under the fast track land reform programme (FTLRP) (Feltoe, 2004). The fast track land reform program was anchored on the Compulsory Land Acquisition Act and the land policy. The policy spelt out land to be acquired and land that was not to be targeted. The fast track program was the vehicle for resettling people. It was given a democratic face by devolving power and decision making to District Land Committees who in essence comprised a legion of stakeholders. This democratisation of the programme had its own weaknesses as stakeholders wielded more power than technocrats with consequent deviation and flouting of policies. As a result properties not to be targeted were resettled and in some instances inappropriate models were implemented. Whilst this is a national problem, its consequences are also severe in Umzingwane District as dams are silting up and the backlash is borne more by Bulawayo residents who now run for months without water.

The Land and Agrarian Reform in Umzingwane resulted in a predominance of A1 schemes A2 schemes. The A1 schemes adopted involve a villagised form of settlements similar to contemporary communal lands. On the other hand, the A2 model is essentially, small-scale commercial farms of over 200ha. It should be observed that many of the A1 schemes are at the catchment areas of the major supply dams of the city of Bulawayo. Hence the study sought to determine the appropriateness of A1 schemes in catchment areas of Bulawayo's supply dams. These include Umzingwane, Upper, Lower Ncema, Inyankuni and Insiza (Mayfair) dams.

LITERATURE REVIEW

The Fast Track Land reform (FTLR) in Zimbabwe was undertaken without proper planning and in a context of democratic deficiency (Chigumira, 2010). Consequently, people were resettled without first laying out development infrastructure and were not psychologically prepared to live in relatively pristine environments. Environmental issues were relegated to the background during the land reform in Zimbabwe. Chigwenya, (2010) contended that the economic meltdown culminated in the breakdown of nearly all systems responsible for the management of natural resources. Gore *et al.*, (1992) argue that early resettlement programmes just after independence began with support from the international community and started in good footing with all institutions needed for the management of the environment. Hitherto, the Ministry of Lands had an officer at ward level who was responsible for enhancing sustainable land utilization. Quasi government agencies such as Forestry Commission, District Development Fund (DDF) and the Rural District Council (RDC) also played a critical role. For example, Forestry Commission established woodlots and it was also very instrumental in curtailing harvesting and selling of forest resources. Non Governmental organizations (NGOs) were also critical in infrastructure development and other software interventions. For example, DANIDA sponsored exchange programmes aimed at giving farmers skills in the management of the environment and also visits to schemes that were running good environmental schemes. The community was also an important component in the management of the environment (Chigwenya, 2010). In every committee that was selected to run a village, deliberate effort was made to

ensure that one member was responsible for environmental issues. However, the severing of relations between Zimbabwe and the international community after the adoption of the FTLRP witnessed the crumbling of all institutions of environmental management and this was followed by a trail of destruction on the environment (Chigwenya, 2010). International institutions withdrew their funding and the office of the resettlement officer at ward level was closed for example. Consequently, rapid environmental degradation ensued since there was no controlled access to resources and the openness was now allowing members in bordering communal areas to have unrestricted access to the formerly protected resources. Injudicious land use such as stream bank cultivation also became the norm.

Investigations by Chigumira, (2010) in three farms in Kadoma district revealed that because of the shrinkages in the economy, hyperinflation and reduced incomes from crop production, most households particularly those that are resource poor, communities resorted to off farm sources of income particularly through intensive utilisation of their natural environment. These included intensive sale of firewood which have consequently contributed to decreases in woodland and bush land and conversions to cultivation/ grassland at the three sampled farms.

Chigwenya, (2010) also observed that the unstable political environment that characterized much of this decade and lack of rule of law has contributed to unregulated and poor management systems in the resettlement areas.

MATERIALS AND METHODS

The study was carried out in Umzingwane district of Matabeleland South Province (20⁰ 15¹ 0' and 28⁰ 55¹ 0'). The district covers an area of about 2820 km² with a total population estimated at 58 569 people (Chenje *et al.*, 1998). The district lies in agro-ecological region IV, which is a zone of low agricultural potential due to low and erratic rainfall regimes ranging between 450 - 650 mm annual rainfall while the mean monthly temperatures are relatively high at between 23 – 30 °C (Chenje *et al.*, 1998). The area is dominated by soils of low fertility and are usually moderate to very shallow in nature and can be classified under the Armorphic order as lithosols (Nyamapfene, 1991). Vegetation physiognomic structure is tree bush savanna. The geology of the area is dominated by igneous rocks for example the granite rock. A mountain range called Malungwane stretches in the Nccema and Inyankuni catchments.

The research team used secondary data sources in the form of maps and published literature sources on land degradation in Zimbabwe. Primary sources were in the form of field reconnaissance on sampled A1 situated in the catchment area, interviews with beneficiaries and Bulawayo city council employees based at the Fernhill and Ncema Water Works/ pumping stations. The rate of soil erosion was determined using Whitlow, (1988) benchmarks based on population changes in different land use areas. Further, the amount of soil loss on croplands was calculated based on the 43 tonnes soil loss per hectare benchmark (Chenje *e tal.*, 1998). Key informant interviews were held with the provincial Land Committe and Ministry of Lands and Land reform officials. The use different research instruments ensured data triangulation, which in itself validates the information so derived.

RESULTS

Table 1 shows the extent of resettlement schemes in Bulawayo supply dam catchments.

Table 1: Smallholder resettlements in Bulawayo city supply dams

Name of Farm	Extent in ha	Total Number of H/holds	Total population Assuming Average H/hold of 6	Population Density	Area of Cropland at 12 acres per Family
Ashydown park	242.5916	17	102	42	204
Crocodile Valley	2353.9951	66	396	17	792
Lot 31A Komani/ Leaside	1072.89	37	222	20.7	444
Inyankuni Block	5157.000	120	720	24	1440
Spitzkop	2336.7300	120	720	30.8	1440
Remaining Extent (R/E) of Zimbile	7689.47	138	828	10.8	1656
Zimbile A	2871.2772	74	444	15.5	888
Zimbile B	2568.13101	74	444	17.3	888
Kondwayo	5942.149	120	720	12.1	~1440
	2564.4	126	756	29.5	1512
TOTAL	32798.633	892	5352	219,7	10704

The A1 schemes cover an area of 32798.633 ha (327.05 km²). Assuming an average cropland area of 12 acres per household, the cropping area has now risen from an estimated 96 acres in the pre land reform era to 10704 acres in the post land reform era. Additional land has been cleared for gardens as well as for homesteads. This translates to over 446 ha of land in these catchment areas. As part of the National Land and Agrarian Reform in Umzingwane district, a total of 892 households, translating to an estimated population of 5352 in ten A1 model farms in the said catchment areas were resettled.

There is obviously a strong relationship between increasing population density and increasing extent of soil erosion. While population density per se may not on its own, be conclusive enough as an indicator of the rate of erosion, other factors, chief of which is land tenure, play a major role. Arguably, the tragedy of the commons discussed by Hardin (1968) prevails in the A1 resettlement schemes. Hitherto the fast track resettlement programme, the catchments of Bulawayo city supply dams had a population density of less than eleven persons per square kilometre and lay in the general lands/ commercial farms (Whitlow, 1988). Table 2 shows mean total erosion in communal and commercial farming areas based on population density (Whitlow, 1988).

Table 2: Mean Total Erosion According to Population Density

Population Density	Communal Lands (%age)	General Lands (Commercial farms) %age
0	1.23	1.05
Under 11	4.47	1.78
11-20	7.32	2.04
21-30	10.86	2.21
31-40	12.76	2.50
Over	15.28	2.19
Average	8.43	1.77

Source: Whitlow (1988)

Table 3 indicates the mean erosion percentage estimation based on Whitlow (1988)'s benchmarks.

Table 3: Mean Estimated Erosion According to Population Density in the Concerned Farms

Name of Farm	Population Density (1988)	Population Mean Erosion (%age)	Density (2010)	Estimated Mean Erosion (%age)
Ashydown Park	<11	1.78	42	6.8%
Crocodile Valley	<11	1.78	17	2.8
Lot 31A Komani-Leeside		1.78	20.7	3.35
Inyankuni Block	<11	1.78	14	2.3
Spitzkop	<11	1.78	30.8	5
R/E of Zimbile	<11	1.78	10.8	1.75
Zimbile A	<11	1.78	15.5	2.51
Zimbile B	<11	1.78	17.3	2.8
Kondwayo	<11	1.78	21.1	2
Lots 70-79	<11	1.78	29.5	4.8
Averages	<11	1.78	22	3.13

Incidentally, farms that are within the catchment area of Bulawayo's major supply dams during Whitlow (1988)'s study had population densities of less than eleven people per square kilometre as the table above suggests. This was part of the area Whitlow (1988) termed General lands (commercial farms). As can be noted from the above table, population densities have increased tremendously due to the introduction of A1 resettlement schemes in the concerned farms in the year 2000. This resulted in the fragmentation of land and changes in land use. For example, in Ashydown Park the population density of less than 11 in 1988 has shot up to 42 people per square kilometre in 2010. At the same time a mean erosion figure of 1.78 in 1988 has been extrapolated to have increased to 6.8% in 2010. This is clear testimony that there is a very strong relationship between increasing population density and increasing extent of soil erosion. This

situation is further aggravated by recurrent drought droughts. Meanwhile the average erosion in these farms in 1988 was 1.78%. This figure has increased to 3.13%, indicating about 100% in the rate of soil erosion. This is also reflective of the increase in siltation of the supply dams. This will obviously have deleterious effects on the quality and quantity of the water in the major supply dams. It is symptomatic of the extent of catchment degradation.

Further, soil loss on croplands was determined using the 1993 benchmark for Zimbabwe of 43 tonnes soil loss per hectare (Chenje *e tal.*, 1998) and results are shown in table 4.

Table 4: Estimated soil loss on croplands (Based on the 43tonnes soil loss per ha 1993 benchmark).

Farm	Extent of cropland (ha)	Estimated Soil Loss
Ashydown Park	82.6	3551.8
Crocodile Valley	320,5	13781,5
Lot 31 A Leaside/Komani	179,7	7727,1
Inyakuni Block	582,8	25060,4
Spitzkop	582,8	25060,4
RIE of Zimbile	670,2	28818,6
Zimbile A	359,4	15454,2
Zimbile B	582,8	15454,2
Kondwayo	582,8	25060,4
Lots 70-79	611,9	26311,7
Total	4555.5	186280,3

In addition, an estimated 446 ha have been cleared for homesteads and gardens. Therefore soil loss in these areas is 19178 tonnes of soil per year. Therefore, total soil loss from arable land and homesteads is:

$186280.3 + 19178 = 205458.3$ tonnes per year (based on the 43 tonnes soil loss per ha 1993 benchmark).

Soil losses in the catchment areas is further compounded by rampant gold panning taking place as shown in table 5.

Table 5: Severity of gold panning in the catchment areas of supply dams

Catchment area	Degree of severity of gold panning	Comments
Inyankuni	Moderate	A1 Models in the area monitored by a live neighbourhood watch Committee. Likely to experience an influx because there is evidence of new gold panning sites being opened up.
Umzingwane	Very Severe	Surrounded by long established communal lands
Upper Ncema	Very severe	Close to Esiphezini communal lands. A1 resettlement model introduced in the year 2000 have contributed to an influx of home-based gold panners whose working is limited to daylight.
Lower Ncema	Severe	Close to the Umzingwane urban settlement of Habane Township. Most unemployed inhabitants of Habane spend most of their time panning for gold.
Insiza (Mayfair)	Severe	Surrounded by communal lands but run by National Parks and wild life. Park rangers have managed to reduce number of gold panners. Most panning done further upstream to avoid Parks rangers.

Related to the foregoing, changing water levels in dams necessitate changes in the water abstraction levels. This may mean that water is abstracted from the dams at a higher temperature threshold. This tends to increase purification costs and hence the price of water to the end user. This would compromise the accessibility of potable water to the most vulnerable in society.

The full capacities of the major supply dams at completion were as shown in table 6.

Table 6: Capacity of Bulawayo City's Supply Dams

Dam	Capacity m ³
Insiza (Mayfair)	173,491,000
Inyankuni	80,781,000
Lower Ncema	18,237,700
Umzingwane	44,663,500
Upper Ncema	45,458,500
Totals Operational Dams	362,631,700

Bulawayo city council is arguably facing the worst potable water deficits in living memory. It needs about 140 000m³ of water a day. Often Umzingwane, Inyankuni, Upper Lower Ncema dams are decommissioned between September and November. Ncema Water Works produce about 72000m³ per day of purified water if all dams are full. At the moment the works produce a daily average of 40 000m³ of purified water. The Water Works produce an average of 65 000m³ raw water pumped into the Fernhill Estate station, which is essentially a storage and pumping station for water en route to Bulawayo. BCC is also making frantic efforts to resuscitate the 78 boreholes sunk at the Nyamandlovu aquifer at the height of the 1992 drought. By 2010 council pumps a paltry 3000m³ of water from Nyamandlovu aquifer. When all the 78 boreholes are fully operational, council expects to pump 12000m³ of water a day.

However, with siltation that has been taking place in supply dams, their water holding capacities have been reduced. This is set to continue at a faster rate owing to the presence of A1 schemes. This means that the total volumes of dams would continue to decline even when they are said to be at full capacity.

DISCUSSION

The land reform was given a democratic face by devolving power to district land committees who in essence comprised a legion of stakeholders. This democratization of the process had its weaknesses as stakeholders wielded more power than technocrats with consequent deviation and flouting of policies. As a result, properties not be targeted were resettled and in some instances inappropriate models were used. The maintenance and development of the Matabeleland provinces' economy in general and Bulawayo in particular depends on judicious use of natural resources especially those that fall within the supply dam catchments. Siltation of rivers can reduce the storage capacity of rivers and ultimately the operational life of dams downstream. Results suggest a significant increase in the rate of soil erosion in the catchment area since the inception of the land reform. This is in conformity with findings by Chigwenya (2010) that after the adoption of the fast track land reform in Zimbabwe, relations with the international community were severed and consequently institutions of environmental management crumbled. This was followed by a trail of destruction on the environment (Chigwenya, 2010). Consequently, rapid environmental degradation ensued since there was no controlled access to resources and the openness was now allowing members in bordering communal areas to have unrestricted access to the formerly protected resources. Injudicious land use such as stream bank cultivation also became the norm.

The results are also consistent with findings by ENDA AND ZERO (1992) report which suggested that more than 50% of the country's dams were already more than 50% silted and that for some rivers it was no longer economic to construct new dams due to siltation (Chenje *et al.*, 1998). A badly degraded catchment also slows down the rate at which the river recharges and develops surface flow after precipitation.

Soil loss is estimated at 205458.3 tonnes per year in the catchments. The high erosion and siltation siltation rate can be explained by the fact that the beneficiaries have failed to maintain water pumping system for livestock. Consequently, livestock have to travel an overage of 10km to drinking points. In addition livestock are on free range without rotational grazing. For example, while Crocodile Valley farm has a total of 20 inherited paddocks, there is no rotational grazing- a farm management practice, which would ensure the recuperation of rangelands.

The land reform has opened up new areas resulting in a deluge of gold panners and development of permanent panners. Chemicals used in purifying gold such as mercury also contaminate the environment. Hitherto, illegal panners camped at

convenient points and their impacts were not as widespread as is the case currently. Owing to lack of potable sources some beneficiaries are vandalising water pipelines to access clean water.

Apart from threatening these dams with siltation and forcing city authorities to explore other means of exploiting other sources of clean water, the panners are also exposing Bulawayo residents and its environs to great danger by contaminating their water sources.

IMPLICATIONS TO ENVIRONMENTAL MANAGEMENT

Environmentally benign natural resources utilisation methods should be adopted in these catchment areas if Bulawayo has to remain as a vibrant city. Options available include turning all these A1 schemes to A2 schemes. This would mean population densities would be reduced substantially and so is the pressure on natural resources. This would inadvertently see a reduction in soil erosion and hence siltation of water bodies. Water holding capacities would improve and ensure a ready and steady supply of potable water to the city of Bulawayo. Nonetheless, there are logistical problems in implementing such a scheme. It should be noted that the settlers in the concerned farms were legally resettled in the year 2000. By logical extension, they can only be evicted provided they will be given land elsewhere and duly compensated for the development they have done so far. Nevertheless, in the light of the current economic melt-down, such compensation is a remote possibility. Such eviction without compensation is against local statutes and the International Covenant for Social and Economic Rights which Zimbabwe is part to. Integrated catchment management could also be adopted. A diverse group of stakeholders come together, share information and perspectives, foster mutual understanding and develops a collaborative approach to managing an environmental system. Case study successes stories are abound in Tanzania's Mafia Park (Government of Tanzania, 2000) and Australia's Queensland Region (Bellamy, 2002). This approach makes it prudent for service providers and NGOs to streamline their activities in such an area. Such a practice calls for, the revamping of extension packages so that they become more meaningful and responsive to the needs of the concerned people. New packages will call for a paradigm shift from the orthodox way doing things. This may include.

- The use of biogas for cooking lighting instead of wood fuel
- Improved wood stove technologies such a improved mud stoves developed by Scientific and Industrial Research and Documenting Centre (SIRDC) and *tsotso* stoves.
- Use of Bio diesel from tree such as *Jatropha*

Other initiatives could include sustainable land use through:

- Rehabilitation of catchment through tree planting and gully reclamation. Management of wooded areas and slope stabilization using vertiver grass
- Building more boreholes to avail more potable water. This could see a reduction in vandalizing the Bulawayo City Council pipelines
- Implementing sustainable agriculture methods that aim at reducing application of fertilizers and the maximum use of water and land space (e.g. encouraging intercropping, organic farming, zero tillage and agro – forest practices.
- Sustainable thatching grass harvesting and marketing. This can be done along the Communal Areas Management Programme For Indigenous Resources (CAMPFIRE) Concept

Alongside integrated catchment area management it will be prudent to undertake capacity building in order to impart skills and knowledge for sustainable development. Specific capacity building needs at a local level are:

- Skills to manage natural resources
- Skills for natural resources assessment, mapping and monitoring.
- Development of local indicators for changes in local environment
- Drought preparedness and management skills so as to engender more environmentally benign coping strategies
- Technology adaptation skills to suit local needs.
- Communication and public awareness.
- Financial resource mobilization to implement these projects.

Another option could be the education of people about the dangers of gold panning. This could result in supervised mining that is consistent with the country's legal statutes. This has often proved an uphill task given that the gold panners are an amorphous group that is difficult to mobilize. The camp mentality does not confine them to one location. Efforts to mobilize them have often been unsuccessful.

CONCLUSION

Smallholder resettlement has opened up areas and predisposed them to environmental degradation. Land reform policy failures have compromised judicious environmental management in Bulawayo supply dam catchments. Integrated catchment management will be critical in reducing environmental challenges caused by inappropriate resettlement models in the Bulawayo supply dams.

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