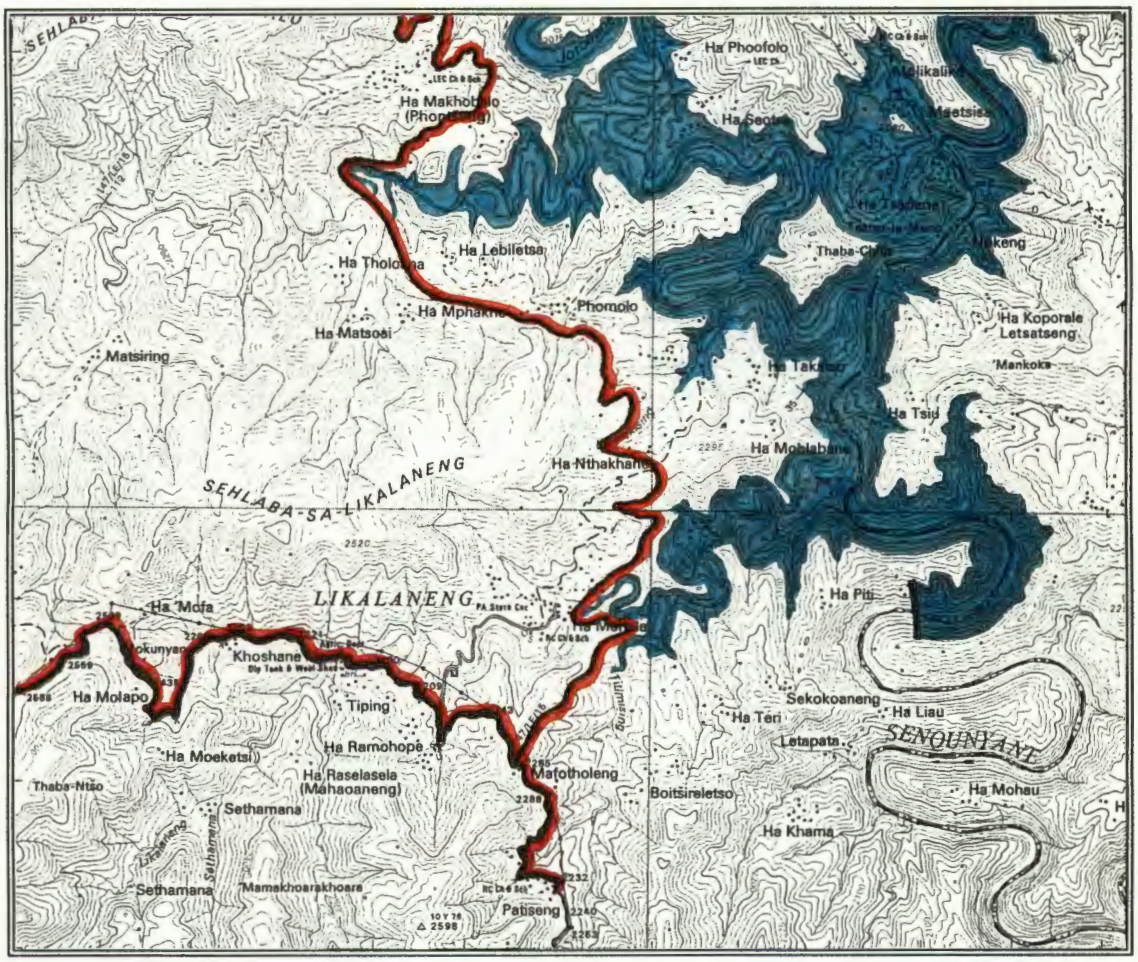
AN ENVIRONMENTAL IMPACT ASSESSMENT FOR THE ACCESS ROAD TO THE MOHALE DAM, LESOTHO: A COMPARATIVE ANALYSIS OF THE WESTERN ACCESS ROAD AND THE LEAST COST ALTERNATIVE ROUTE.



Submitted by Barbara Schreiner
in partial fulfillment of the requirements for
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AN ENVIRONMENTAL IMPACT ASSESSMENT OF THE ACCESS ROAD TO THE MOHALE DAM, LESOTHO: A COMPARATIVE ANALYSIS OF THE WESTERN ACCESS ROUTE AND THE LEAST COST ALTERNATIVE ROUTE.

SUMMARY OF FINDINGS

INTRODUCTION

The purpose of this dissertation is to compare the environmental impacts of the Least Cost Alternative Route (LCAR) and the Western Access Route (WAR) (see Map 1), and to recommend a preferred alternative for construction. It is couched in a theoretical framework with regard to the process, nature and function of IEM and the problems associated with implementation of the IEM process.

APPROACH AND METHODOLOGY

The two alternatives were assessed according to the criteria of sustainable development (including provision of basic human needs and preservation of ecological sustainability), equity and social justice, and cultural diversity and self-realisation. In order to facilitate decision-making, only the impacts of high significance after mitigation were considered.

THE NATURE OF INTEGRATED ENVIRONMENTAL MANAGEMENT AND THE LIMITATIONS OF THIS STUDY

Integrated Environmental Management (IEM) is intended to aid decision-making by providing objective information on the effect of actions, plans and projects on the bio-physical and social environments. In reality, however, severe constraints of time, money, availability of information, and the predictability of impacts make it hard to put IEM theory into practice. The constraints and limitations of this environmental impact assessment (EIA) include:

* the separation of the whole project into smaller units for EIAs, such as the separation of the dam and the access road. This is a very serious limitation, since the impacts arising from the dam construction were not considered, and any cumulative effects of dam and road impacts have thus not been predicted;

* different sections of the EIA being at different levels. Thus the LCAR and Maseru 'bypass' studies are initial impact assessments, while the WAR study is a final impact assessment;

* the limitations of any project-specific EIA, including the difficulties of predicting cumulative impacts;

* the difficulties of assigning ratings to impacts and the difficulty of calculating certainty of impact prediction, and

* the limitations set on the conceptualisation of the problem by the Terms of Reference,

However, within these limitations it has none-the-less been possible to compare the WAR with the LCAR, and recommend a preferred alternative.

SUSTAINABLE DEVELOPMENT

Integrated Environmental Management cannot, by itself, protect the environment. It is simply a tool that must be used within a broader context of environmental protection. In the long-term, environmental protection can only be guaranteed by the implementation of sustainable development and by the creation of global equity and social justice.

Thus, any decisions regarding the environmental impacts of a project must be taken with the aim of establishing equity, social justice, and sustainable development.

COMPARISON OF LCAR AND WAR

LCAR:

According to the above principles, the LCAR offers high benefits to the local community:

Fulfillment of basic human needs. including:

1) Increased agricultural productivity as a result of improved access to seed and agricultural inputs.

2) Improved access to emergency and health services.

3) Improved access to building materials.

4) Improved access to educational services.

5) Improved quality of drinking water.

The construction of the LCAR will also bring opportunities for self-realisation and for diversification of local life-styles, as well as contributing to the creation of equity in Lesotho. The creation of equity in Lesotho is particularly important because of the current wide discrepancy of income and access to facilities here.

The increased sediment load in the Jorodane river as a result of construction of the LCAR would pose a considerable risk to the Maluti minnow (*Pseudobarbus quathlambae*), as well as the restricted Aquatic River frog (*Rana vertebralis*), and thus endanger the ecological sustainability of the river ecosystem.

WAR:

The upgrading of the WAR offers no significant threat to local ecosystems.

Most of the benefits and opportunities that the LCAR would bring to the local communities are already to a large extent available to communities living along the WAR.

The WAR, although the safe option in terms of protection of the natural environment, does not offer the benefits for the establishment of equity that the LCAR offers. It does, however, offer the national benefit of the upgrading of part of the national road network.

Tables 1 and 2 present a summary of the high significance impacts of the LCAR and the WAR, as measured against the criteria of sustainable development.

Table 1:
Matrix of high significance impacts of LCAR measured against 4 criteria of sustainable development.

	Access to services, facilities, transport	promotion of planning objectives	threat to endangered and rare species	contrary to road plans; places stress on budget
basic human needs	+	+	o	o
preserves ecological integrity	o	o	-	o
creates equity & social justice	+	+	o	o
allows cultural diversity and self-realisation	+	+	o	o
Summary:	**Several significant positive benefits, but a significant negative impact with regard to ecological sustainability.**			

Key:	+ = impact has positive contribution towards sustainable development;
	o = impact has no significant contribution towards sustainable development;
	- = impact has negative contribution towards sustainable development;

Table 2:
Matrix of high significance impacts of WAR measured against 4 criteria of sustainable development.

	Reinforces national planning objectives	Relief of traffic congestion in Maseru	Displaces people along Maseru 'bypass'	Loss of buildings & infra-structure along Maseru' bypass'
basic human needs	+	o	o	o
preserves ecological integrity	o	o	o	o
creates equity & social justice	+	o	o	o
allows cultural diversity and self-realisation	o	o	-	o
Summary:	**Few significant positive benefits, but few significant negative impacts either.**			

Key:	+ = impact has positive contribution towards sustainable development;
	o = impact has no significant contribution towards sustainable development;
	- = impact has negative contribution towards sustainable development;

Table 3 provides a summary of the two alternatives as measured according to the criteria of sustainable development, showing that the LCAR will bring greater benefits, as well as greater risks, than the WAR.

Table 3:
Comparison of LCAR and WAR according to the four substantive principles for sustainable development [Gardner 1989].

	LCAR	WAR
provision of basic human needs: material:	significantly improved access to health and educational facilities; access to emergency services;	little or no improvement
non-material:	facilitates access to national political processes	little or no improvement except at project level
preservation of ecological integrity;	risk of extinction of Maluti minnow in this area and resultant destabilisation of river ecosystem.	impacts of low significance
equity and social justice;	increased development potential for a marginalised community	little change to existing social inequities
cultural diversity and self-realisation;	will provide opportunities for life-style diversification; creates potential for self-realisation of local communities and individuals; carries potential for negative changes to cultural patterns.	little change to current situation.

DIRECT FINANCIAL VS OTHER ENVIRONMENTAL COSTS AND BENEFITS

The construction costs of the LCAR have been estimated at M225 367 821, as opposed to only M171 455 286 for the upgrading of WAR, including the Maseru 'bypass' (see Appendix 2 of main report for Cost Comparison - LCAR and WAR). This means that the immediate financial costs of the LCAR outweigh those of the WAR by approximately M54 000 000 (a factor of nearly 25%).

Since the costs of building the road are to be borne by the South African government, according to current political practices it is very hard to argue that the extra money should be spent in order to develop equity and social justice in Lesotho. The financial factor, combined with the ecological risks of the LCAR, makes is inevitable that the WAR must be selected as the preferred alternative.

ROAD AS MITIGATION FOR DAM IMPACTS

However, the road is in fact only a small part of a much greater project. The construction of the Mohale dam is likely to cause far-reaching and serious impacts, such as loss of grazing and arable land, resettlement of communities, severance, and so on. The possibility that the construction of the LCAR could serve as partial mitigation for these impacts needs to be investigated.

CONCLUSIONS

The EIA for LHDA Contract No 1000 highlights several of the real problems associated with the practical implementation of environmental impact assessment. This report, like any other report that only focuses on one phase of a large development project, is limited in its scope. The scope of the EIA is further limited by its project specific nature. Thus the holistic effect of an integrated approach to impact assessment has not been achieved in this EIA, but it is none-the-less possible to reach the following conclusions:

* The option of the road should be seen in the broader context of the dam development project so that the separate and cumulative impacts of all development in the area can be considered simultaneously, and a decision be made on the basis of a holistic vision of development for this area;

* In future a more holistic approach should be required for projects of this nature;

* On the basis of currently available information, according to the criteria of meeting basic human needs, creating equity and social justice, and allowing cultural diversity and self-realisation, the LCAR is the preferred alternative. However, the LCAR also threatens ecological sustainability in the area;

* On the basis of currently available information, taking into account the extreme cost difference between the two alternatives, the high ecological risks associated with the LCAR, and the national benefits of upgrading the WAR, **the WAR is the preferred alternative**;

* The potential of a road through or into the Jorodane valley to serve as mitigation for negative impacts resulting from the Mohale Dam, should be thoroughly investigated;

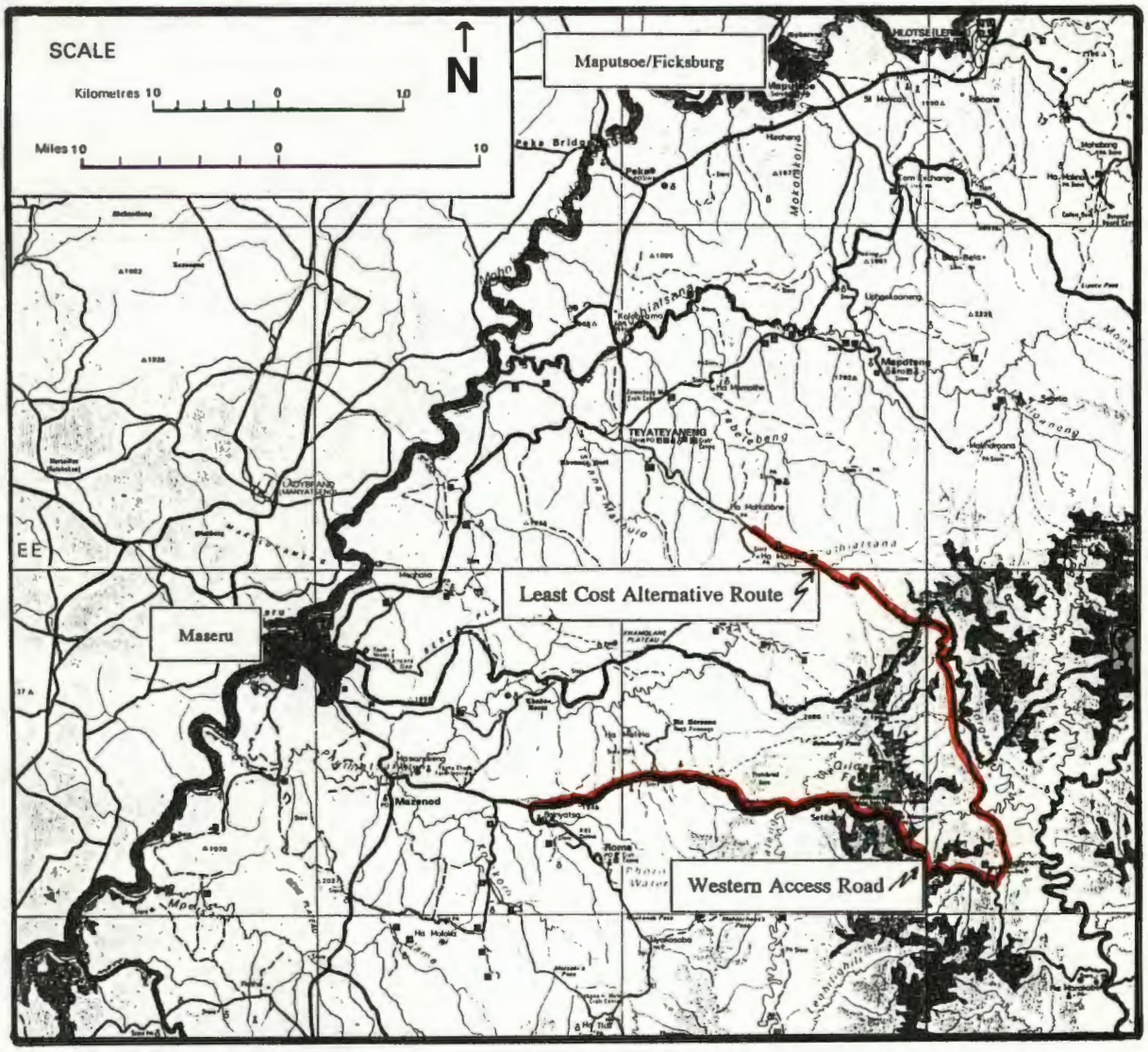
* A full environmental impact assessment should be conducted on the recommended alternatives for the Maseru 'bypass' (EEU/2/93/104a);

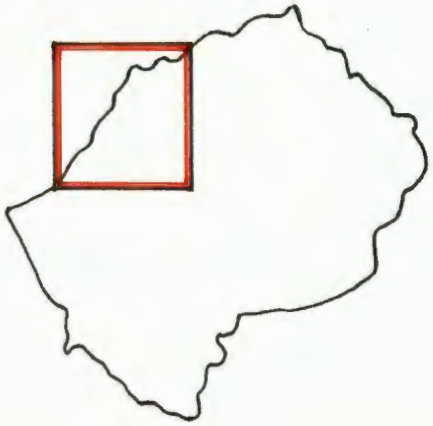
* A management and monitoring plan must be developed which covers all aspects of Phase 1B of the LHWP. This plan should involve the local community in all decisions affecting them, and should be established along the same guiding principles as the communicative catchment;

* All reports should be tabled at a central place and made accessible to researchers. Future research or EIA's commissioned for the LHWP, Phase 1B, should include in their Terms of Reference a clause requiring the study team to refer to all previous reports generated for this project, particularly EEU/2/93/104 a, b, c, d, and e, and

* Design of the road should be such as not to foreclose future development, optimisation and mitigation measures along the road that might not be affordable currently.

Map 1: Least Cost Alternative Route and Western Access Route. (for detailed alignment see EEU/2/93/104b and c)





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ABBREVIATIONS

EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EEU	Environmental Evaluation Unit (UCT)
GBJV	Gibbs-Bernard Joint Venture
IEM	Integrated Environmental Management
LCAR	Least Cost Alternative Route
LHDA	Lesotho Highlands Development Authority
LHWP	Lesotho Highlands Water Project
SIA	Social Impact Assessment
WAR	Western Access Route

ACKNOWLEDGEMENTS

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A scholarship from the Centre for Science and Development (CSD) which made this work possible, is gratefully acknowledged.

1. INTRODUCTION

1.1 THE PEASANT'S CONCERN IS WITH HIS FIELD

The peasant's concern is with his field
He looks after his cattle, pays taxes
Produces children, to save on labourers, and
Depends on the price of milk.
The townspeople speak of love for the soil
Of healthy peasant stock and
Call peasants the backbone of the nation.

The townspeople speak of love for the soil
Of healthy peasant stock
And call peasants the backbone of the nation.
The peasant's concern is with his field
He looks after his cattle, pays taxes
Produces children, to save on labourers, and
Depends on the price of milk.

Bertolt Brecht 1933

1.2 THE PURPOSE OF THIS REPORT

The purpose of this document is to set out a comparison of the environmental impacts of the two alternative access roads to the Mohale Dam, Lesotho: the Least Cost Alternative Route (LCAR) and the Western Access Route (WAR), and to recommend a preferred alternative for construction. The analysis and comparison is couched in a theoretical framework with regard to the process, nature and function of Integrated Environmental Management (IEM) and the problems associated with implementation of the IEM process.

In this report I[1] set out some of the limitations and problems associated with the EIA on the access road to the Mohale Dam (LHDA Contract No 1000). I then discuss the criteria on which a selection of a preferred alternative should be made, focussing on concepts of sustainability (including ecological sustainability),

1 Although it is not customary to use the first person pronoun in either professional reports or academic dissertations, I have elected to do so in order to avoid the false sense of objectivity conveyed by terms such as 'the author', or the lack of agency conveyed by the use of the passive voice. The opinions and ideas expressed in this document, although supported by the literature as cited, are the work of one individual. I have used the first person singular in order to stress the subjective element present in my (and any) argument.

provision of basic human needs, equity and social justice, and cultural diversity and self-realisation. Within the context framed by the limitations of this EIA, the report then compares the LCAR and the WAR, and makes recommendations with regard to a preferred alternative, based on this comparison.

The report also provides comments and discussion on a management and monitoring plan for Phase 1B of the Lesotho Highlands Water Project (LHWP).

2. BACKGROUND

2.1 THE LESOTHO HIGHLANDS WATER PROJECT

The Lesotho Highlands Water Project (LHWP) was ratified by Treaty between South Africa and Lesotho in 1986, and provides for the possible construction of up to 6 dams in the Lesotho Highlands. The water from these dams will be transported by pipeline to serve the Pretoria-Witwatersrand-Vereeniging area in the Transvaal.

The first dam, the Katse Dam (Phase 1A), is already under construction, and is scheduled for completion in 1995. A new road from Maputsoe to Thaba Tseka was constructed to facilitate the dam construction, and the border post at Ficksburg/Maputsoe was upgraded in order to handle the increased traffic carrying materials and personnel to the dam construction site.

Phase 1B involves the construction of the Mohale Dam (see Map 1) and the requisite infrastructure such as access roads, and construction and Resident Engineer's camps. Dam construction is scheduled to be completed by 2004.

Phase 2 of the project would involve the construction of the Mashai dam in south-east Lesotho (see Map 1). However, no definite decision has been taken on whether Phase 2 will proceed, or what the scheduling of construction will be. Current schedules suggest that the commissioning date for the Mashai dam is 2008.

LHDA Contract No 1000 is the contract concerned with the construction of a 'reliable but economic access rout[e] for materials and equipment emanating from the Republic of South Africa and consigned to their construction site at the Mohale Dam.' [GBJV 1992:1-1]

The terms of the Treaty state that 'the standard of living of all households affected by the project shall be maintained at a level not inferior to that pertaining prior to project implementation.' [LHDA 1989]

2.2 THE AFFECTED ENVIRONMENT

Lesotho is a small, predominantly rural country, bordered on all sides by South Africa. Lesotho's economy can, in macro-economic terms, be seen as peripheral to, and dependant on, the core economy of South African industrialisation. Only 36% of the population are employed, and 15% of the labour force are involved in migrant labour [Setplan 1991]. Lesotho has a limited natural resource base, with water and the western grasslands being its two major resources [Trollip 1981].

Lesotho can be divided into two major geographical areas: the lowlands, and the mountainous highlands area. Considerable socio-economic and biophysical differences pertain to these two regions. The lowlands are the most highly developed, and highly populated area of Lesotho.

While not an extremely poor country, Lesotho has a wide discrepancy of income across its population, leading to extensive relative poverty [Sechaba 1991]. This poverty is much more common in the mountain and remote rural areas than in urban areas, district headquarters and lowland villages.

The Sechaba survey on poverty in Lesotho lists the following as the five most important concerns facing the Basotho people (in order of importance):

* lack of food;
* lack of good water supply;
* unemployment;
* lack of roads and transport, and
* lack of money. [Sechaba 1991]

I will refer to the communities living along the LCAR as marginalised and impoverished on the basis of information that shows that:

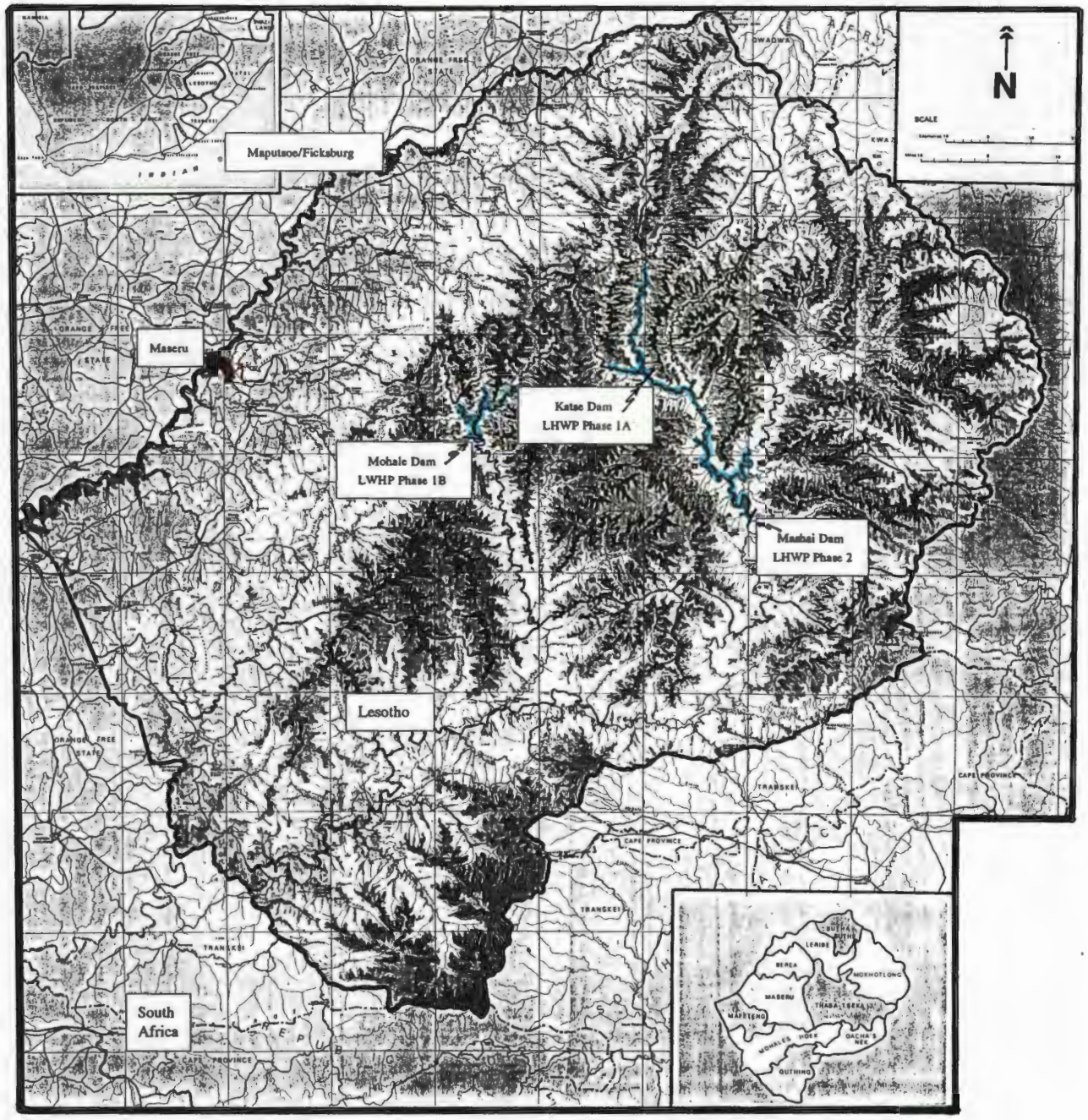
* the overwhelming concerns facing households in this valley are lack of food, clothing and money;

* the overwhelming concerns facing the villages are poor access to health care facilities, no transport or roads, poor water quality, lack of access to shops, and lack of food;

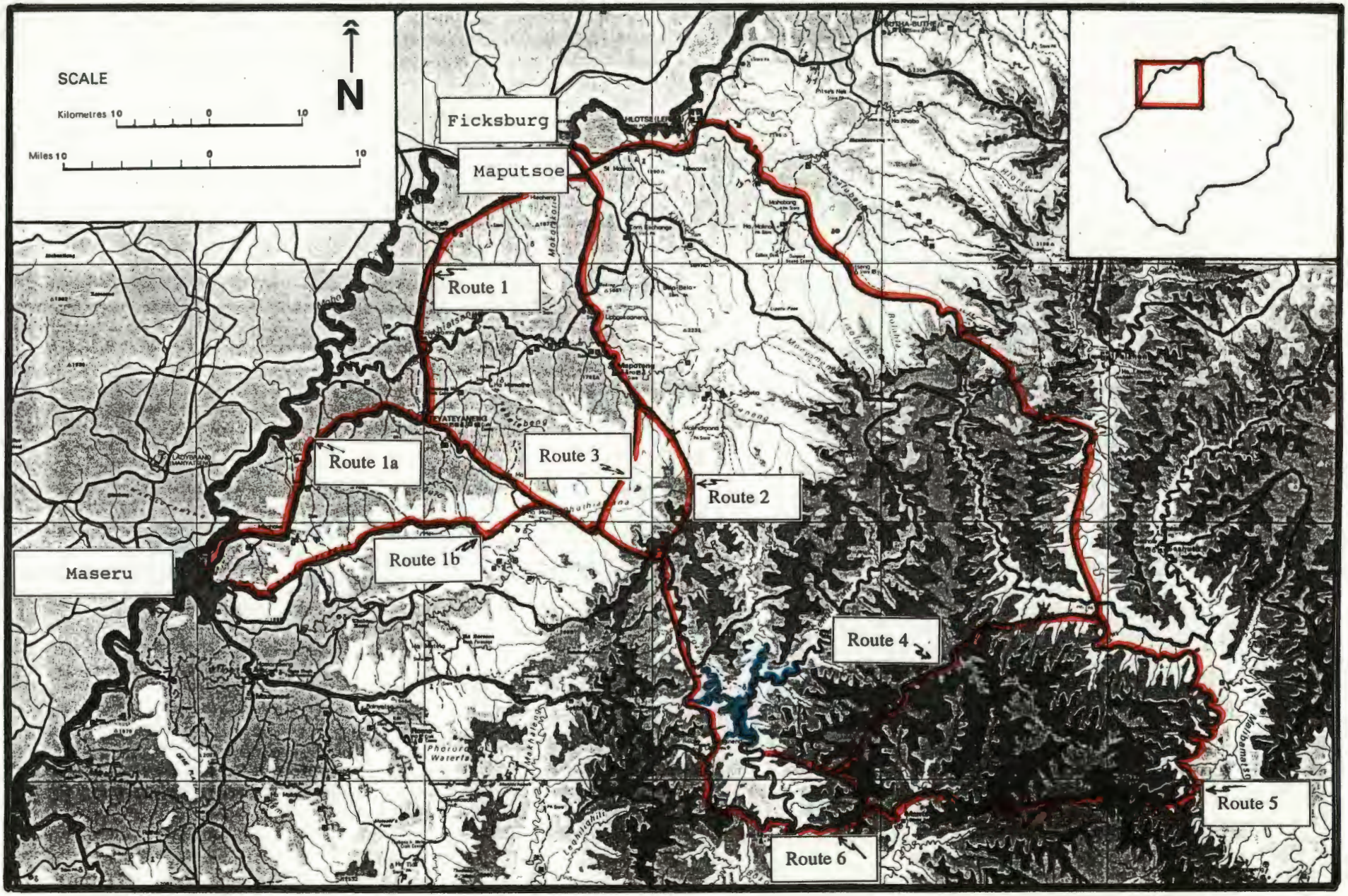
* the inaccessibility of the valley has meant that six months after applying for assistance, they have not yet received any drought aid while areas accessible to vehicles have received grain [EEU2/93/104e].

The social survey [EEU2/93/104e] shows that households along the WAR also experience hunger, lack of clothing and lack of employment as their major problems, in common with those along the LCAR. However, at a village level, a different set of concerns were raised, with stock theft and lack of potable water being the major concerns.

Residents living along the section of WAR from St Michael's to Patiseng, have access to a road and public transport, and consequently better access to medical and emergency facilities, to development and economic opportunities, and to educational facilities, than communities along the LCAR. Thus, although a rural, marginalised area in the national scale, the communities along the WAR are less marginalised than those along the LCAR.



Map 1: Lesotho Highlands Water Project, Phases 1A, 1B and 2



Map 2: 8 alternative routes in Stage 1 of the EIA for LHDA Contract No 1000

3. THE NATURE OF THE PROBLEM

3.1 EIA FOR LHDA CONTRACT NO 1000

The EIA for LHDA Contract No 1000 required an investigation into the environmental impacts of:

* alternative routes for an access road to the Mohale Dam site;
* Access 1, from the village of Patiseng, north east to the Mohale Dam site;
* Access 2, linking Access 1 to the gate shaft at Ha Koporale, and
* the siting of the resident engineer's camp.

3.2 THE STUDY SO FAR

The research for the EIA for LHDA Contract No 1000 was conducted, as far as practicable, according to the principles of Integrated Environmental Management.

Research was conducted by a team of 9 Environmental Science Masters students from the University of Cape Town, from January till early April, 1993, and involved 2 stages.

Stage 1 of the study consisted of a desk-top study which resulted in the selection of the LCAR as the preferred of 8 alternative access roads to the Mohale dam site (see Map 2). A report of this study is contained in Appendix 1 of EEU/2/93/104c.

Stage 2 of the EIA required initial impact assessments of the LCAR and Maseru 'bypass'

[2], and a full impact assessment of the WAR, and the comparison of the environmental impacts of constructing the LCAR to the upgrading of the WAR.

Stage 2 involved studies by two specialists, limited consultation with interested and affected parties (a list of whom is supplied in the Appendices to EEU/2/93/104 b and c), a social survey of the affected communities (excluding the Maseru

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2 I have referred to the Maseru 'bypass', rather than the Maseru bypass, as the routes under consideration do not, strictly speaking, bypass Maseru, but are in fact improved roads, largely within the urban system.

'bypass'), and intensive consultation of existing literature. It also involved several field-trips along both the LCAR and WAR.

A specialist study was conducted by Prof J. Parkington, Dept of Archaeology, UCT with regard to impacts on archaeological sites. R.Millard, of Environmental Impact Management Services, provided a specialist report on rehabilitation.

A social survey, consisting of individually administered questionnaires and informal interviews with key informants, was conducted by the UCT team in association with Frank Baffoe of Lesotho.

Details of the approach to the study, and results of the research which are relevant to this report are contained in the following documents:

LCAR:	EEU/2/93/104c
WAR:	EEU/2/93/104b
Maseru 'bypass':	EEU/2/93/104a
Social survey:	EEU/2/93/104e.

The reports EEU/2/93/104 a, b, and c will accompany this report. EEU/2/93/104e is available on request from the Environmental Evaluation Unit (EEU) at the University of Cape Town.

The EIAs of access roads 1 and 2, and the siting of the Resident Engineer's camp are presented in EEU/2/93/104d, available from the EEU on request.

3.3 TERMS OF REFERENCE FOR COMPARISON OF ROUTES

The Terms of Reference for LHDA Contract No 1000 require 'a detailed comparative study of the western access route and the most viable alternative access corridor identified in the first stage. The study is not to be limited to comparing capital costs but must take all factors into account including environmental considerations, social impact and other benefits - both objective and subjective - together with the disbenefits. At the conclusion of the second stage... a report has to be submitted, recommending which route corridor should be adopted for detailed design and the ramifications.' [GBJV 1992:1-3]

However, since this report is an academic document as well as an environmental impact report (EIR), the original Terms of Reference have been modified to include the demands of academic rigour and argument. This dissertation will, through the comparison of the LCAR and WAR, explore several theoretical concepts around IEM, such as:

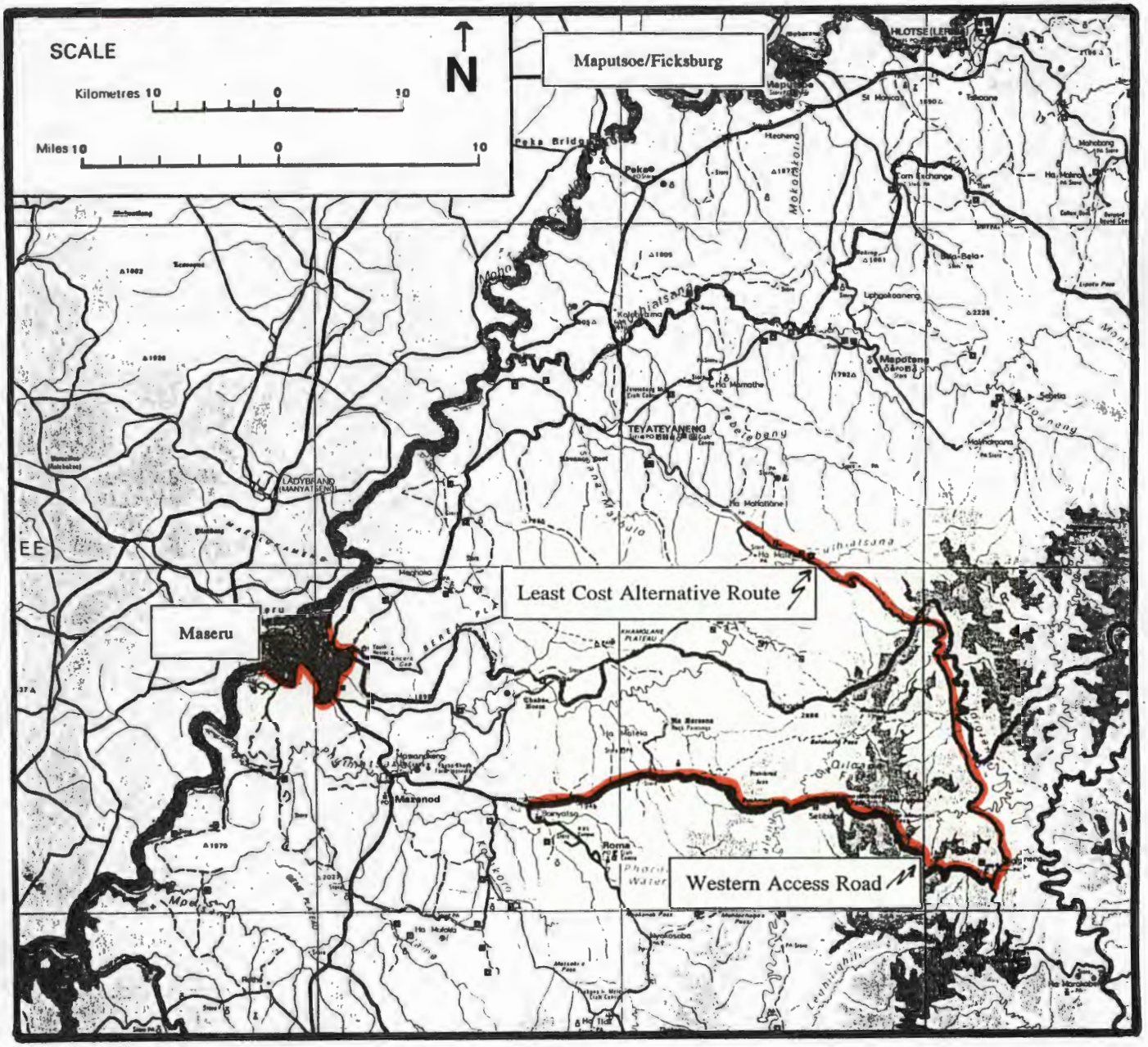
* the nature and practice of IEM;

* the development and application of criteria for comparison and evaluation of alternatives;

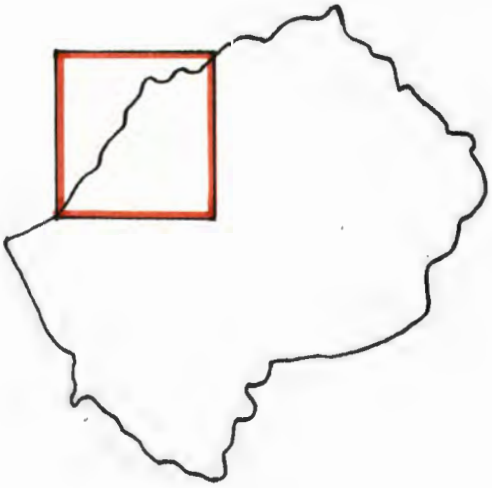
* issues around management and monitoring of projects, and

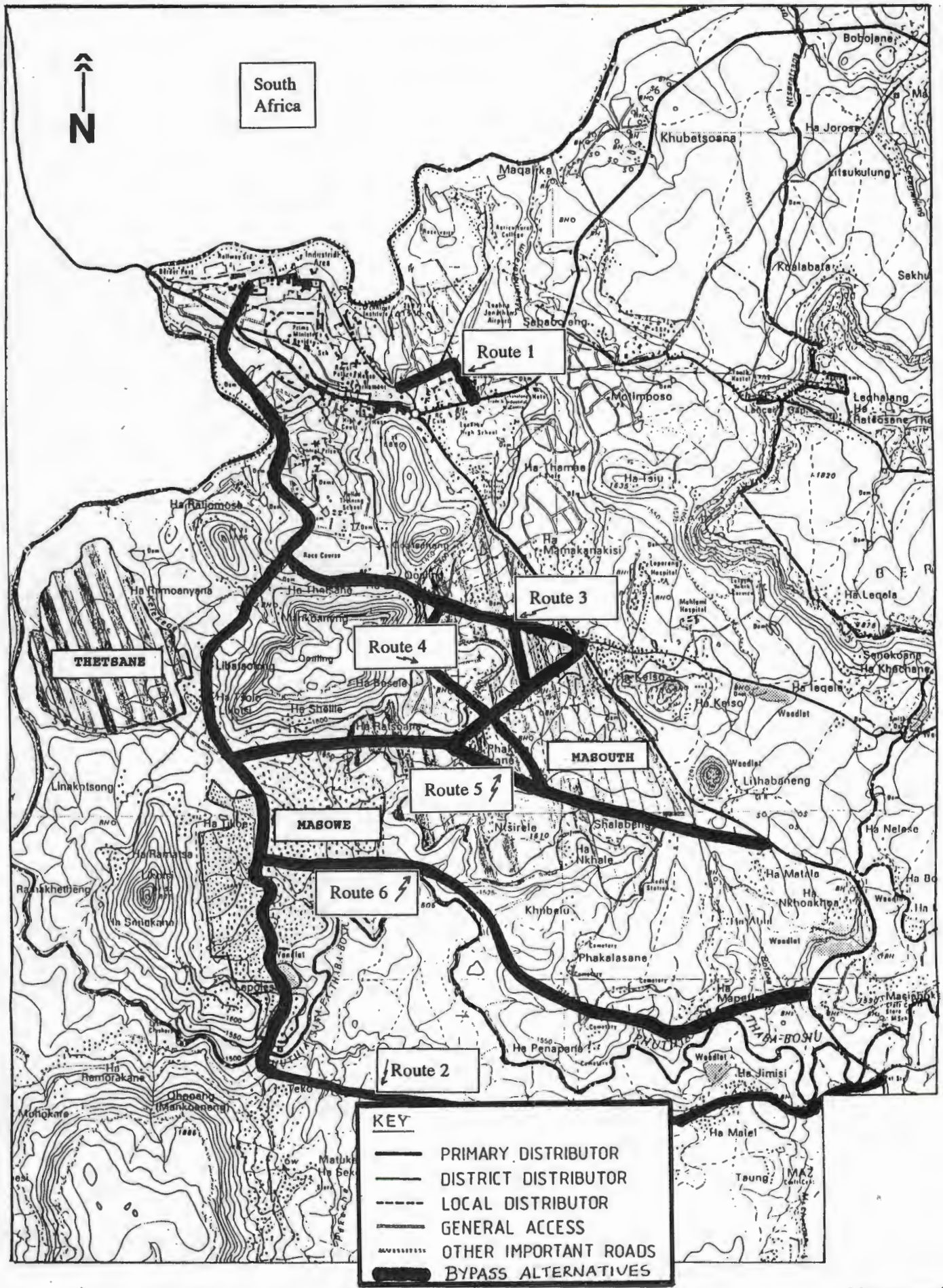
* the need to focus on the larger picture, and

* IEM and sustainable development.



Map 3: Least Cost Alternative Route and Western Access Road (for detailed alignment see EEU/2/93/104b and c)





Map 4: Maseru 'bypass' alternative routes

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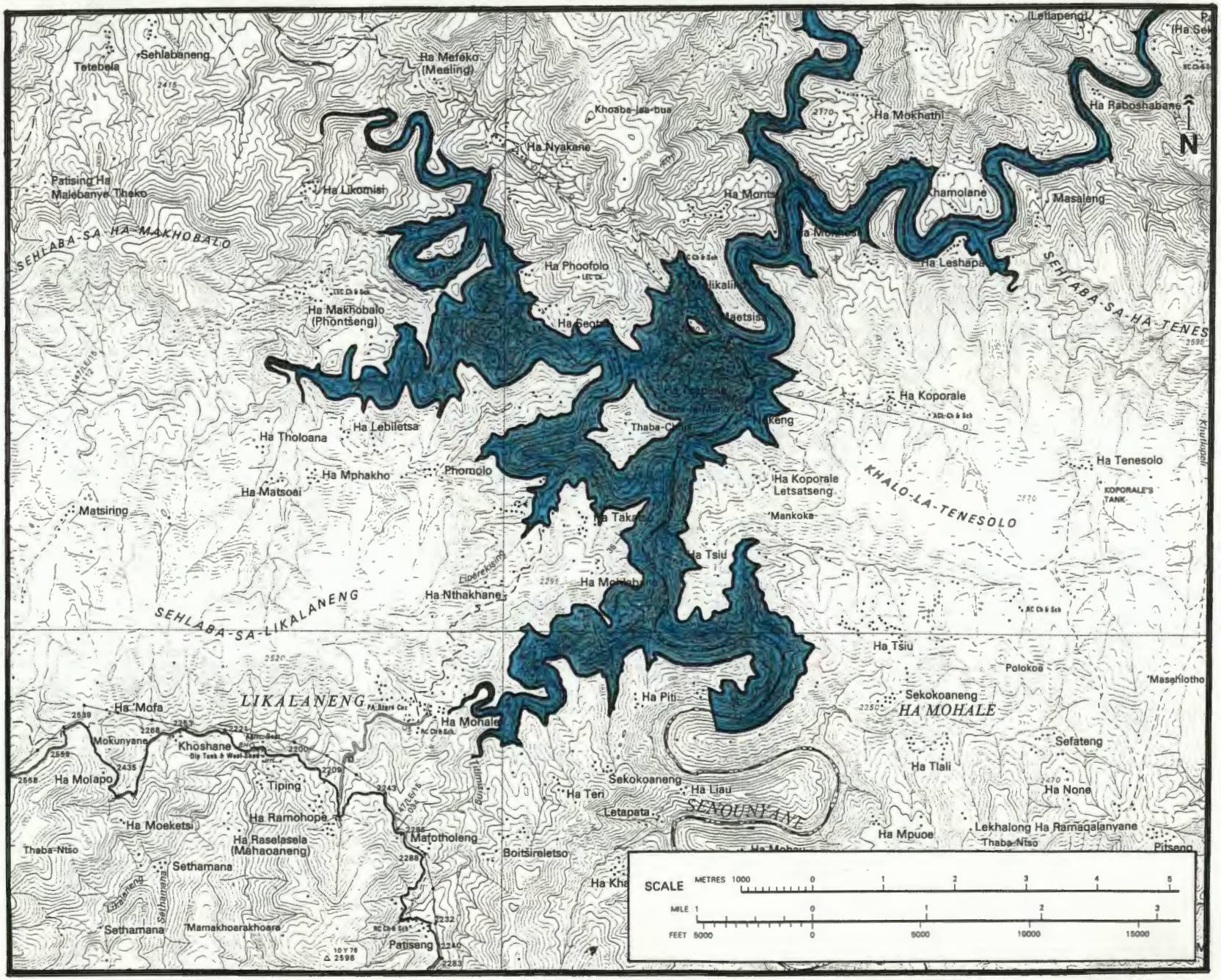

Map 5: Extent of Mohale Dam inundation when full

4. DISCUSSION ON THE FUNCTION AND NATURE OF THE IEM PROCESS WITH PARTICULAR REFERENCE TO THE COMPARISON OF THE LCAR AND WAR

4.1 IEM AS A HOLISTIC AND INTER-DISCIPLINARY STUDY: THE IDEAL VERSUS THE REAL

The practice of Integrated Environmental Management is still in its formative years in South Africa, and the definitive environmental impact assessment (EIA) has yet to be conducted. It is questionable as to whether the definitive EIA can ever be conducted, since it is, in practice, difficult to implement the theory of IEM to its fullest. The impact assessment for LHDA Contract No 1000 is a case in point.

The function of IEM is to 'ensure that the environmental consequences of developments are understood and adequately considered in the planning process.' [Fuggle and Rabie 1992:749] The process is based on the following principles:

'* informed decision-making;

* accountability for information on which decisions are taken;

* accountability for decisions taken;

* a broad meaning given to the term *environment* (ie. one that includes physical, biological, social, economic, cultural, historical and political components);

* an open, participatory approach in the planning of proposals;

* consultation with interested and affected parties;

* due consideration of alternative options;

* an attempt to mitigate negative impacts and enhance positive aspects of the proposals;

* an attempt to ensure that the 'social costs' of development proposals (those borne by society, rather than the developers) be outweighed by the 'social benefits' (benefits to society as a result of actions by the developers);

* democratic regard for individual rights and obligations;

* compliance with these principles during all stages of the planning, implementation and decommissioning of proposals (ie. from 'cradle to grave'), and

* the opportunity for public and specialist input in the decision-making process.' [DEA 1992]

However, in practice, the theory breaks down on the rocks of Terms of Reference constraints, limited budgets, limited time for research, and project phases which do not run concurrently, such as the road and dam developments in LHWP Phase 1B. There are also many obstacles and problems in the path of public participation within impoverished, marginalised communities[3].

The fundamental premise of any EIA is that it is possible to predict changes in natural and social systems as a result of certain actions. This presupposes both knowledge about the present state, and knowledge about the interactions that operate within the systems and their interdependence.

There are those who argue that the idea that impacts can be predicted with any accuracy is mechanistic, and that there will always be surprises. Berkes [1988] argues that the environment is in a state of uncertainty, discontinuity and non-equilibrium[4], and that impact prediction is thus generally unsuccessful. To substantiate this, in the James Bay Hydro project in Canada, 5 out of 6 significant impacts resulting from the project were not predicted in the impact assessment.

However, as Berkes says, although impacts may be intrinsically unpredictable, and we may never be able to make precise predictions, we may be able to learn enough about the workings of a system to minimise impacts. We have to do the best in practice with the limited tools available. Although, in practice, our knowledge is

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3 I do not have the space to go into detailed discussion of the problems encountered in public participation programmes in marginalised communities, but would like to mention the following issues that must be taken into consideration:

* illiteracy: the level of illiteracy (including visual illiteracy) tends to be high in marginalised communities, meaning that printed material or maps are not suitable media for communication;

* empowerment: marginalised communities are often not used to negotiating with other groupings, such as developers. Techniques have to be employed that will empower the community to express their demands clearly, and negotiate around them. The assistance of NGOs that have experience of working with disadvantaged communities might be useful in this regard;

* meetings must be scheduled at times appropriate to the community life-style, and must be focussed on the real concerns of the community.

4 Recent research by James Brown, in New Mexico, bears this out. His experiments in the Chihuahuan desert in Arizona have shown that equilibrium is seldom reached in an ecosystem, and that 'community composition varied continuously over time' [Beardsley 1992:18].

usually far from perfect, environmental impact assessment is, as yet, the best process for environmentally sensitive development and planning that has been developed. However, because of the uncertainty of successful impact prediction, particularly in the long-term, it is essential that any major project has an ongoing, flexible monitoring and management plan.

Within the impact assessment for LHDA Contract No 1000, there have been several factors that have placed limitations on the successful prediction of impacts arising from the project.

4.1.1 THE FRAGMENTED NATURE OF THE EIA

Segynola [1989] made the following comment with regard to the different elements, natural and man-made, affecting the lives of rural dwellers:

> '... as components of the system, the elements are interrelated and to some extent inter-dependent. Any major form of interference or disturbance of one part of the system will affect the entire system.'

This comment could equally well have been made in relation to any functioning ecosystem. Unfortunately, the Terms of Reference for LHDA Contract No 1000, based on the constraints of different project phases, do not take this holistic view, but lay the basis for a fragmented environmental impact assessment.

The EIA for LHDA Contract No. 1000 covers the major access road to the Mohale Dam (including the Maseru 'bypass'), minor access roads 1 and 2, and the siting of the Resident Engineer's camp, only. The impact assessment does not cover any impacts arising from the construction of the dam or other dam-related alterations to the environment, such as the resettlement of 9 villages, flooding and consequent destruction of habitat around and in a large portion of the Jorodane River; the influx of, and siting of residential camps for, workers for the dam construction; or the loss of arable and grazing land.

Because of this separation, and the lack of information on impacts arising from the dam, it is difficult to assess the cumulative impacts of the entire development in the sub-region. The dam development may significantly amplify impacts in the region that would otherwise be of low or moderate significance as a result of road construction alone[5]. On the other hand, an appropriate choice of route and road

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5 A good example of this is the case of the endangered Maluti minnow. The construction of the road might result in increased siltation in the river, altering the habitat beyond the tolerance level of the fish. On its own, this impact might be controlled through various mitigation measures, however, in conjunction with the fact that the dam will flood 86% of the Maluti minnow's habitat in the Jorodane River, it may be extremely difficult to ensure the future existence of the fish in this area [Rall *et al* 1993].

construction methods could serve to mitigate significant socio-economic impacts caused by the dam.

Furthermore, the construction of the Mashai dam (Phase 2) (see Map 1) will require infrastructure development, including an access road. Unfortunately, since the final decision on this dam has not yet been made, the construction of any roads to service the Phase 2 area is not to be considered at this point. Once again, the result of this is that the greater picture, set in a longer time-frame, is lost, and the possibility of an environmentally sensitive plan for the whole development is ruled out.

Finally, the routes under investigation for LHDA Contract No 1000 are themselves fragmented in nature. For example, the sections of the WAR to be dealt with in the EIA include the Maseru bypass and the stretch of road from St Michael's to Patiseng. The environmental impacts on the section of road between Maseru and St Michael's, even though this section will experience increased traffic loads and will require a certain amount of upgrading, were not included in the Terms of Reference. Similarly, for the LCAR, the section of road from Teyateyaneng to Maputsoe was not examined. Environmental implications of increased road and rail traffic on the South African side of the border were not considered for either alternative.

A possible method of alleviating the fractured nature of this EIA to some extent in the future would be to ensure that all reports are tabled at a central place and are available to researchers over a period of time. It is also crucial to ensure that researchers and managers involved in future impact assessment and monitoring around the project, refer to these reports. This is particularly important in an EIA on a project of the nature of the LHWP, which will take decades to complete.

4.1.2 CONCEPTUALISING THE PROBLEM

The definition of a problem defines and/or limits the scope of the study. A different set of premises and aims could result in a different solution. Thus the definition of the problem as:

* the cheapest way to transport materials from point A to point B,

could result in a different solution from:

* in what way could the need for a road to transport materials from point A to point B be incorporated into a rural development strategy and used to assist in the creation of sustainable development.

Within the Terms of Reference for the EIA for LHDA Contract No 1000, an underlying premise had already been accepted, namely that there was a need to build the Mohale Dam. Following on from this was a second premise, namely that a road was required to transport construction material and personnel to the dam site.

From these two assumptions, the problem was then defined in terms of finding the most suitable route for this road. Fundamental alternatives such as improved water management in the Pretoria-Witwatersrand-Vereeniging area, do not appear to have been explored. This is partly because of the fragmented nature of the EIA which has separated any investigation of the dam impacts from those of the road.

A further example of limitations of the scope of the problem is that the definition of the alternatives within the Maseru 'bypass' EIA as purely physical alternatives, ruled out the possibility of exploring other options such as alternative time scenarios. In other words, it might have been possible to use existing routes, but at different times, such as night periods, rather than creating or upgrading existing routes. However, the definition of the alternatives ruled this out.

It is important to note that the alternatives for this impact assessment were defined by GBJV in association with the EEU, and not by a process of public scoping. This may have limited the flexibility and creativeness of options explored.

4.1.3 CUMULATIVE IMPACTS

An environmental impact assessment, when done at a project level, rather than a policy or programme level, does not consider the cumulative impacts of several projects [Munn 1979].

According to Contant and Wiggins [1991], present management and assessment approaches have failed to predict and control cumulative impacts. They mention two categories of cumulative impacts:

* those arising from one project's relationship to other developments, and

* those arising from the project's presence within a set of many natural systems which may have a non-linear response to disturbance.

In the case of the EIA on LHDA Contract No 1000, it is almost certain that there will be cumulative impacts arising from the road and the dam together, but these have not been explored yet. The second category of cumulative impacts has not been explored in relation to the road construction either.

In order to make an EIA practically feasible, certain boundaries have to be established for the area of study. Thus, apparently minor impacts such as increased CO_2 production resulting from increased traffic, or the environmental impacts of lime quarries or cement manufacturing, are not considered by project level EIAs. Thus, minor but incremental impacts which may contribute to international problems such as global warming, are not, and cannot be, addressed by project-specific EIAs.

4.1.4 COMPARING APPLES AND PEARS? DIFFERENT LEVELS OF REPORT IN THE SAME SCALES

A balanced comparison of the alternative routes for LHDA Contract No 1000 is difficult to achieve since the reports EEU/2/93/104a, b and c are at different stages in the IEM process. The LCAR environmental impact assessment has taken place at the planning stage of the process, while the WAR and Maseru 'bypass' environmental impact assessments are linked to the preliminary design stage.

The LCAR report (EEU/2/93/104c) is, according to the Terms of Reference, supposed to be an initial environmental impact assessment report, while the WAR report (EEU/2/93/104b) is a final report. As it turned out, the LCAR report is, *de facto*, at much the same level as the WAR report, but the Maseru 'bypass' report (EEU/2/93/104a) is definitely an initial report, and lacks, amongst other things, consultation with interested and affected parties, and a detailed socio-economic analysis of the affected communities and their resultant resilience to change.

According to the guidelines issued by the Department of Environment Affairs [DEA 1992], if an Initial Impact Assessment concludes that the proposal will result in significant impacts, then an Impact Assessment must be undertaken. Within the Terms of Reference for LHDA Contract No 1000 this has been provided for by the stipulation that should the LCAR be selected as the preferred alternative, a full Impact Assessment must be conducted[6]. Since the EIA on the Maseru 'bypass' is also an Initial Impact Assessment, and since some high significance negative impacts have been identified, it is assumed that a full impact assessment will be conducted on this section, should the WAR be selected as the preferred alternative.

4.1.5 LIMITATIONS OF INFORMATION AVAILABILITY

Integrated environmental management is an iterative process enabling a project proposal to be reshaped and refined through the process of environmental impact assessment. The nature of this process, and the timing with which information is made available, can considerably alter the conceptualisation and approach to the impact assessment.

For example, for LHDA Contract No 1000, the initial information provided to the impact assessment team regarding the approximate costs of the two alternatives, was that the WAR was going to cost in the region of M10 000 000 more than the LCAR [Paul Curzon *pers comm*]. This meant that the LCAR was a distinctly feasible

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6 The assumptions on which the EIA was based, include the following clause regarding the environmental impact assessment of the LCAR:
'This is an initial environmental impact assessment. Should the LCAR be selected as the preferred alternative, further environmental investigations will be carried out regarding the most suitable alternative route'. [EEU2/93/104c:6]

alternative in terms of cost, and an extremely in depth study was planned and executed for this route. This included a detailed social survey of 75% of the population living in the villages close to the proposed route.

Subsequent to the completion of the research, and during the period of comparison of the two alternatives on the basis of this research, further costings of the roads were supplied to the impact assessment team. According to this information, the LCAR will cost 125% of the cost of the WAR, or approximately M54 000 000 more. These figures fundamentally alter the nature of the problem.

With such a weighting in terms of financial cost[7], the impact assessment team would have had to be able to prove either:

a) that the upgrading of the WAR would result in extreme environmental degradation, or

b) that the environmental benefits associated with the construction of the LCAR were sufficient to warrant the extra expenditure of M54 000 000 by the South African government, in Lesotho.

A far more superficial study may have been sufficient to ascertain that neither of these scenarios was probable.

The ramifications of the financial costs not having been made available earlier, are considerable. Firstly, larger amounts of time and money were spent on the environmental impact assessment than may have been, strictly-speaking, necessary. Secondly, and perhaps more importantly, the hopes of the residents of the Jorodane valley were raised as a result of what may have been an unnecessary social survey conducted in the valley. Although the social survey was conducted with as much responsibility as possible, and with the continual explanation to the local people that there was no guarantee that the LCAR would be built, it is unavoidable not to have raised hopes. On the basis of the financial information made available subsequent to this survey, the probability of the LCAR ever being built was extremely low.

This fact must necessarily raise several questions:

1) Is it ethically or professionally correct to conduct an environmental impact assessment when certain fundamental information, such as the financial costs of alternatives, is not available?

IEM is designed as an iterative process, so that environmental concerns can be incorporated into project development at all stages, but particularly from an early

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7 Although is it customary to use the term 'environment' in its broadest sense, to encompass 'physical, biological, social, economic, cultural, historical and political components' [Fuggle and Rabie 1992:749], I have separated the discussion of immediate financial costs related to the construction of the road, from other environmental costs. This division will facilitate the evaluation of the alternatives in Chapter 7.

stage. However, this very involvement from an early stage, when only limited information on project parameters is available, can cause limitations in the definition and execution of the EIA itself.

2) Are the engineer's who provide inadequate or incorrect information regarding financial costs in the early stages of an EIA aware of the seriousness of the implications of their actions?

The research required for an environmental impact assessment, particularly with regards the social impacts, has some effect on the communities being surveyed. It is the responsibility of the sociologist, anthropologist or environmental scientist concerned, to ensure that such research does not needlessly alter the aspirations and attitudes of the community. One should not raise false hopes. Similarly, it is the role of the client to understand that the information that they supply to the EIA team can affect the ability of the team to act responsibly in the long run.

4.1.6 FUNCTION, CERTAINTY AND SIGNIFICANCE OF IMPACT ASSESSMENT

<u>Social Impacts</u>

> 'the dynamics of social processes cannot be reduced to the quantifiable data typically generated by, for example, EIA matrixes' [Huggins and Boersma, undated:6].

Assigning significance to any impact is fraught with the kind of difficulty generally associated with crystal-ball gazing. With the prediction of social impacts there are particular dangers because of the remarkable ability of humans to adapt to new situations. This ability is difficult, if not impossible, to take into account when assigning significance to an impact, or even when predicting whether an impact will occur or not. As Quinlan and Zingel [1991:3] comment:

> 'the flooding of a valley by construction of a dam clearly will have a 'high' impact upon houses and fields of settlements in the valley. The intensity of the impact in such a situation upon the social structure of the residents, upon their economic livelihood is usually less easy to define as it is subject to the way residents react to the threat, and later, to mitigatory action by development agencies. *The communities may be torn apart or the threat and subsequent mitigation may serve as a catalyst to strengthen social networks.*' [my italics]

The assumption of a homogeneous population is 'in direct conflict with a substantive part of the literature' [Arntzen 1989:46] and socio-economic strata

within a population play a large part in how that population (and different strata within it) will respond to change:

> 'stratification increases the complexity of that adaptation mechanism, makes it less predictable and more diverse.' [Arntzen 1989:49]

The stratification present in the societies studied in Lesotho includes, amongst others, gender, class, age, and wealth divisions. These various sectors of society may well respond to change in different ways.

Thus, while certain significant socio-economic impacts have been predicted for both the LCAR and the WAR, the level of certainty of these impacts has not been established with any clarity, nor, according to the literature, is it truly possible to do so.

Biophysical Impacts

No rigorous processes for establishing certainty have been applied to the majority of biophysical impacts described in EEU/2/93/104 a, b or c.

4.1.7 RATING OF IMPACTS

In reports EEU/2/93/104 a, b, and c impact significance was assigned by individual 'specialists', not by the interdisciplinary team as a whole. Although criteria for significance were agreed on, it is difficult to formulate an accurate system of criteria that applies across the board of bio-physical and social impacts, and in all situations.

In many ways the real purpose of rating of impacts on a scale of low, moderate, or high (or any other scale for that matter) is to attempt to equate findings from different disciplines and different specialists. [cf. Quinlan 1992]

These rating scales are thus 'arbitrary constructs', providing a summary of predicted impacts of a development project. And the fact that rating is assigned by individual specialists, not by the interdisciplinary team as a whole, suggests that the ratings are possibly more arbitrary than they would appear to be when set out in a table of impacts.

In a similar vein, the ascription of positive or negative values to these impacts reflects not an absolute, but the criteria determined by the client and/or researcher, depending on how they perceive the notion of change. For example, the loss of the dagga industry in the Jorodane valley could be seen as negative by those who recognise that this would severely impact on the local, already impoverished community by removing a major source of income. On the other hand, there are those who would see this impact as a positive one since they would believe the destruction of an illegal, narcotics industry to be one that would benefit 'the

community at large' in the long-term. (See Chapter 7 for a more detailed discussion on the problems associated with the moral and legal aspects of compensation for illegal activities.) In this study, the criteria by which such judgements have been made are laid out in Chapter 5.

According to Quinlan [1992], most EIA practice results in compartmentalisation of impacts, which deals with them as separate factors/events, when change actually takes place in a matrix of interrelatedness. Once impacts have been seen as discrete, then mitigation can also be seen in this light, leading, frequently, to naïve and overly specific recommendations which do not clarify a course of action for the development agency, particularly with regard to socio-economic impacts [Quinlan 1992].

Quinlan recommends that social scientists shift their approach from the 'apparently concrete effects of a project proposal to the dynamics of how the effects occur.' [1992:5] The important question facing social scientists is how to manage the dialogue between proponent and affected parties so as to allow the 'progressive transformation of society and nature'.

While Quinlan's critique must be acknowledged, it is important to recognise that, although only a partial or limited exercise, the assigning of ratings is none-the-less a worthy and useful tool in the evaluation and comparison of alternatives. It is important for the EIA to recommend, on the basis of the rating of impacts, not only a process to follow, as Quinlan would recommend, but also a series of discrete steps for optimisation and mitigation of both scoio-economic and biophysical impacts.

4.1.8 COMPARING APPLES WITH UFOS? PROBLEMS ARISING FROM LACK OF INFORMATION

To date, no decision has been made regarding the type of construction to be used for the Mohale dam wall (ie. whether rockfill or cement), or what the source of cement will be if it is chosen as the preferred medium of construction.

This decision has important consequences for the comparison of the two routes. For example, should the construction material be cement, an accident on the LCAR could result in significant quantities of cement entering the upper reaches of the Jorodane river with potentially disastrous results for the river system (including the endangered Maluti minnow, *Pseudobarbus quathlambae*, and the rare Aquatic River frog, *Rana vertebralis*). However, should the dam be constructed according to the rockfill system, such risks would be minimised.

While this lack of information must be borne in mind, it is none-the-less possible to evaluate the potential impacts of the two routes on the basis of the available information.

4.1.9 WHO BEARS THE FINANCIAL COSTS?

There are complexities introduced into the selection of a preferred route by the fact that one nation is paying for a development inside another country. In other circumstances, it would be essential to see the road both as dam infrastructure and as a development opportunity in itself. However, since optimising the road's development potential could cost extra, it might be that SA will not be willing to pay for this. Since the Treaty binds SA and Lesotho to not leaving anyone worse off than before[8], one could possibly use this to argue the need to use the road as a development opportunity. However, since the road itself is going to result in social benefits to the community along its length, the South African government may well argue that they are not obliged to pay for such factors as larger bus stops to accommodate hawkers, improved water facilities, and access roads from the main road to the villages, etc.

If no funds can be raised now to ensure the creation of such services and facilities along the road, design and construction of the road must be of such a nature as not to foreclose future opportunities to develop these facilities.

Although I do not have the scope within this dissertation to enter into a full discussion on the role and responsibility of international funding organisations such as the World Bank, there are certain questions that I would like to pose around these issues. It is partially as a result of World Bank policy that EIAs are being conducted on large projects such as the LHWP, but the possibility needs to be explored that the role of such organisations in environmental protection should extend beyond project specific EIAs.

It should be the role of all international funding agencies to ensure that all projects which they fund contribute actively to the development of sustainability and international equity, and do not enhance or amplify current inequities. To this end, I would suggest that the role of international funding agencies should be more proactive with regards to development issues than is currently the case. Thus, in a situation such as the access road to the Mohale Dam, should the LCAR prove to be more expensive, but more valuable in terms of sustainable development, equity and social justice, the World Bank should strongly recommend that this route should be selected, and should be prepared to make this alternative financially feasible. However, these issues need to be explored more fully in another context.

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8 The aims of the LHWP include: 'to promote the general development of the remote and underdeveloped mountain regions, while ensuring that comprehensive measures are taken to prevent and avoid any adverse effects which the project might have on the local populations and their environment.' [LHDA, Signature of the Treaty, 1989, quoted in Makuta, 1991]

4.1.10 THE NO-GO ALTERNATIVE

For certain proposals 'the consideration of the no-go alternative should be examined in the impact assessment, but discretion needs to be applied before automatically including this option.' [Fuggle and Rabie 1992:756]. The purpose of the no-go alternative is to measure the development alternatives against the long-term, dynamic picture should the project development not take place. However, in this case, it is difficult to do this, since the socio-economic and biophysical environments in the Phase 1B area will be substantially altered by a separate development, namely the construction of the Mohale Dam. The impacts of this development have not yet been assessed, and are likely to be major, considering that the impoundment will cause severance problems, loss of grazing and agricultural land, and the resettlement of nine villages.

The purpose of comparing the alternative routes with a 'no-go alternative' would be to measure up whether the construction of the road would be beneficial development or not. Should it prove not to be, then it would be recommended that construction should not take place. However, in order to make such a recommendation in this case, one would need to be able to prove that the construction of this road, as well as the dam, would be detrimental to the environment, as neither project can or will exist without the other. Since no information currently exists on the environmental impacts of the dam, it is impossible to do this, and so the no-go alternative will be left out of the comparison of alternatives.

Furthermore, without adequate socio-economic baseline data and an accurate predictive model, the no-go alternative is almost impossible to determine with any certainty.

It must therefore be assumed, in this case, that the construction of the road is a *fait accompli*, dependent on the building of the dam, and the comparison of the two alternative routes, without a comparison against the no-go alternative will suffice to achieve the purposes of this report.

4.2 WHAT THIS EIA CAN ACHIEVE

Bearing in mind the limitations discussed above, this EIA has none-the-less succeeded in understanding the environmental consequences of both the LCAR and the WAR in sufficient detail to evaluate and compare the two alternative routes and to make several clear recommendations.

5. ESTABLISHING CRITERIA FOR EVALUATION

5.1 INTRODUCTION

It is essential to establish criteria against which the significant impacts from the LCAR and the WAR can be weighed in the process of the comparison of the two routes.

Various methods can be used to assign weighting, such as the Delphi or Hyper-AIA[9] methods. Both these methods utilise the skills and opinions of a panel to establish weighting of impacts.

According to the Department of Environmental Affairs, the method of evaluation of alternatives within the IEM process

> 'could be based on professional opinion alone, or it could involve a formal technique such as the Delphi technique, panel evaluation method or cost-benefit analysis.' [DEA 1992 Vol 3:14]

Bisset [1978] remarks accurately that:

> 'Those who choose the method of assessment are able to make a strategic choice which may give a tactical advantage when pursuing a particular outcome.'

Bisset's remark applies not only to the selection of method of assessment, but also to the selection of a weighting panel. For example, a weighting panel could be selected that consists only of specialists, or only of members of the public, or the weighting panel could have a majority of representatives from the most directly affected communities. All these differences could result in different weightings being assigned to the various impacts. There is no method, whether involving a panel, or an individual professional, by which an 'absolute' weighting of impacts can be obtained.

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9 The Delphi technique was developed by Olaf Helmer at RAND Corporation in order to obtain consensus from a panel of evaluators on issues 'which cannot be evaluated in a classical quantitative sense' [Fuggle 1983:496]. It involves a system of anonymous, written responses to an issue, which are edited by a facilitator, and fed back to the panelists. An iterative process is used to establish consensus.

The Hyper-AIA method of weighting, in which a graphic method is used by a panel to assign relative weightings to impacts, is described by Antunes and Camara [1992].

Vizayakumar and Mohaptra [1991] raise questions about the function of rating and weighting, suggesting that the use of these factors to evaluate alternatives is subjective in nature and static in time-frame, and does not

> 'consider the interrelations among the factors and the resultant changes. These weightings are, however, helpful in knowing the importance and magnitude of the impacts.'

Thus the weighting assigned to various impacts is of crucial importance when comparing the negative and positive environmental impacts associated with two or more alternatives (in this case, two alternative routes, the LCAR and the WAR) in order to decide on a preferred alternative. For example:

* should primacy be given to the preservation of a Red Data species, or to the socio-economic benefits that will accrue to a marginalised and impoverished community?

* should national benefits take preference over local ones?

Rather than assign specific weighting to the individual, highly significant impacts, I have elected to use the criteria of sustainability (including ecological sustainability), equity and social justice, cultural diversity and self-realisation, and provision of basic human needs, as the balance in which the impacts of the two roads will be weighed. Various arguments regarding these three factors are set out below.

5.2 SUSTAINABILITY

The concept of sustainable development as put forward by the Bruntland Report [WCED 1987], amongst many others, has been internationally accepted, although the interpretation of sustainable development has varied considerably (for further discussion on this topic see Rees [1988]). For the long-term protection of the environment, issues of sustainability must be taken into account, and the evaluation of any project must be in accordance with the principles of sustainable development[10].

Gardner [1989] suggests that if sustainable development is to be a basic driving principle of all planning decisions, then four substantive and four procedural principles need to be taken into account:

* provision of basic human needs;

* preservation of ecological integrity;

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10 Even the South African government claims to have embraced the concept of sustainable development [see CSIR 1992] although many criticisms have been levelled at their interpretation of the term [Lynn Jackson *Pers. Comm.*].

* equity and social justice;

* cultural diversity and self-realisation, and

* using a systems analysis approach;

* setting of goals;

* interactive processes;

* adaptive processes.

Trollip [1981] further divides basic needs into two categories:

* material, which includes the need for food, housing, education, safe drinking water, and primary health care, and

* non-material, which includes the need for effective involvement in decisions involving one, and local participation in development strategies.

Sachs [1989] takes a slightly different approach, and defines five dimensions of sustainability: ecological, economic, geographical, cultural, and social.

The four substantive principles will be applied when evaluating the relative merits and demerits of the alternative routes (cf. Chapter 7), but with a particular focus on the principles of provision of basic human needs and of equity and social justice.

In the underdeveloped regions of the Third World, such as the Lesotho Highlands the question of sustainable development takes on different overtones from those it carries in the highly industrialised First World.

In highly industrialised and over-developed countries, sustainability focuses, amongst other things, on the need to protect remaining greenbelts and natural areas. In the Third World, however, issues of economic growth and development opportunities are at least as important as the preservation of the natural environment. The Bruntland report acknowledges two aspects to sustainable development:

* meeting the basic needs of all, especially the world's poor, and

* acknowledging the limitations of the environment's ability to meet those needs. [Lebel and Kane 1990]

5.2.1 PROVISION OF BASIC HUMAN NEEDS

Material

It is essential to meet the basic material needs of all people, namely food, housing, safe drinking water, primary health care and education.

If basic material needs are not met, impoverished communities are forced to degrade the environment in search of resources [Redclift 1984]. In the Jorodane valley the growing of dagga has prevented extreme damage to the environment, but there are still problems of overgrazing and nutritionally impoverished soil.

The meeting of basic human needs improves the situation for the most marginalised sector of society, namely rural women, who are responsible for health care and the major provision of food for the family. The improvement of standards of living also results in a decrease in birth rate, which not only relieves the long-term pressure on the land, but also relieves the physical burden on women.

Non-Material: Public Participation and Sustainability

The involvement of communities and individuals in decisions that affect them is necessary to the fulfillment of non-material basic human needs [Trollip 1981], and hence to the development of sustainability.

The IEM procedure, if implemented in a progressive manner, can facilitate the involvement of affected communities in decisions regarding the project or development. This should be the function of the public participation programme, although in many cases the public participation programme falls far short of this, being aimed at placating the public rather than involving them in decision-making [Gariepy 1991].

There is a need for an ongoing public participation programme, active at all stages of the development project, not just for one or two public or community meetings. There are problems associated with public participation in disadvantaged communities, and a programme needs to be devised that can overcome these problems. A suggested framework for community participation is discussed in The Communicative Catchment, Chapter 9.

IEM cannot take care of the long-term provision of non-material needs, such as the creation of a national system of participatory democracy. However, the involvement of a community in an EIA and in the management of an area can empower that community, and enable them to become more active in determining and expressing their own needs and demands on a broader level in future.

5.2.2 EQUITY AND SOCIAL JUSTICE

The preferred alternative must be selected in accordance with the terms of the Treaty [LHDA 1989], namely that no one affected by the project will be left any worse off than they were before the project.

However, although the Government of Lesotho has stated that none of its people will be worse off as a result of the LHWP, it has not stated whether this is to be measured on a relative or an absolute scale. In other words, if the LHWP benefits those who are even slightly more privileged, and not those who are most marginalised and deprived, does this not leave the marginalised groups relatively worse off? Is this a contradiction of the spirit of the statement that no-one will be worse off than prior to the LHWP? It must be realised that the living conditions of any community or nation are not static, and any community must be seen as a part of a changing whole, not as a static, autonomous element.

If, on the other hand, the development benefits all the people of Lesotho equally, then it is, in fact, serving to entrench inequity. In order to enhance equity and social justice it is important that the development benefit the marginalised and deprived sectors of the community most.

5.2.3 APPROPRIATE ACTION FOR THE CREATION OF EQUITY

Chambers [1987] describes a situation which he calls 'the deprivation trap' in which poverty is interdependent with certain socio-economic characteristics which in turn perpetuate poverty:

* poverty results in the lack of means to use natural resources;
* weakness results in low productivity of resources;
* isolation results in the use of marginal resources, and
* lack of power results in insecure access to natural resources.

Once in this trap, households cannot escape on their own, and become dependent on intervention by external organisations such as governments or non-governmental organisations. The exploitation that results in communities falling into the poverty trap often emanates from urban areas, the industrial sector, or from the wealthy classes, with the most common "victims" being people in the rural areas, the agricultural sector, the working class and the poor in general. [Arntzen 1989:] Often, within these sectors, it is women who experience the worst exploitation and hardship.

Blaikie and Brookfield [1987], in the so-called political-ecological framework, discuss marginality as a central factor in the problem of land degradation, defined by three interrelated dimensions:

* economic marginality, which occurs when development options are beyond the economic capacity of households.

* ecological marginality, which relates to the suitability or unsuitability of the local environment for human activity. This marginality may change with time, and

* political-economic marginality, where poor households lack political power as well.

Economic development can result in influxes of people, increased survival rate of children, increased stress on the environment as a result of human activity, and increased extraction of production surpluses and natural resources from rural areas. All these factors increase pressure on resources. According to Blaikie and Brookfield, this increasing resource pressure may trigger off innovations, but they will only bring only short-term relief. 'In the longer run, increasing political-economic marginality prevails and leads to additional pressure on marginal environments, and to a reduction of options for the lower strata.' [Arntzen 1992]

This description would seem particularly true of the subsistence economy of the Jorodane valley. It is in order to attempt to escape the 'deprivation trap' that people have become migrant workers, and that residents are growing dagga.

According to Huggins and Boersma, 'the notion that primacy should be given to 'national interests' at the expense of local or subregional interests, seems, for the time being, to be relatively unshakeable.' [Huggins and Boersma, undated:6]

This sentiment seems borne out by the explanation given by the Department of Environmental Affairs of the function of the evaluation of alternatives:

> 'To weigh the information available and to determine which alternative is in the best interest of *the community at large*.' [DEA 1992 Vol 3:14] (my italics).

What must be put under the microscope here is the phrase 'the community at large'. Does this imply that national interests should, as a rule, be placed above regional or local interests? I would argue, that because of the uneven nature of development and wealth in Lesotho [cf. Trollip 1981, Sechaba 1991], to prioritise so-called 'national interests' may well amount to prioritising the interests of the already privileged, urbanised or commercially successful sectors of the population. On the contrary, in attempting to create a society based on concepts of equity, sustainability and justice, it might be necessary to prioritise local over national interests in order to assist marginalised and deprived communities to develop.

> 'Water demand patterns ... tend to reflect the interests of industry and organised agriculture. Planning options for resource and infrastructural development often favours [sic] the location of sites that are inhabited by the poorer sectors of the population. As a result 'development' of this nature impacts most forcefully on people who have only marginal influence in determining the direction of benefits accruing to such projects.' [Huggins and Boersma undated:8]

In order to achieve equity, a process of appropriate action, concentrating on local development, is necessary to redress the imbalances of many years of urban-centred development and the exploitation of human and other resources in rural areas.

5.3 CONCLUSIONS

The LCAR and WAR will be compared and evaluated according to the basic criteria of their contribution to sustainable development, including concepts of:

* provision of basic human needs, both material and non-material;
* preservation of ecological integrity;
* equity and social justice;
* cultural diversity and self-realisation.

6. METHODOLOGY

6.1 OUTLINE OF METHOD

I will begin by comparing the WAR and the LCAR according to the principles of sustainable development, excluding any discussion of the costs of construction, maintenance, transportation, rehabilitation or compensation for the alternative roads. This will be done on the basis of high significance impacts after mitigation, only. The comparison will include a discussion of the trade-offs on each route. This will then be followed by a comparison and discussion of the biophysical, socio-economic and direct financial costs[11] of both routes. At the end of this process a recommendation will be made regarding a preferred alternative.

6.2 CONSIDERATION OF LIMITED SECTIONS OF EACH ROUTE

For the purposes of comparison of the two alternatives, I will focus on those sections of the road where impacts are considered to be most significant.

For the LCAR the area that will be discussed in detail is what I have called the Jorodane valley, namely, the catchment area for the Jorodane river, north of the Mountain Road, and south of the Lekhalong-la-Likhaebaneng Pass. I will not discuss the section of road from Ha Mateka to the Lekhalong-la-Likhaebaneng Pass, as this area is very underpopulated, and the study did not show any high significance impacts in this area. The section of the LCAR from Ha Mateka to Maputsoe/Ficksburg will not give rise to any significant impacts, and is thus not discussed.

There are two sections of the WAR that need discussion: the Maseru 'bypass', which may have significant impacts on affected communities, and the section of road from St Michael's to Patiseng. The latter section has been identified as having highly significant impacts in relation to national planning objectives, but will also be used to compare the living conditions of residents along this section with those in the Jorodane valley.

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11 Any reference to direct financial costs covers capital, rehabilitation, compensation, transportation and maintenance costs.

6.3 CONSIDERATION OF HIGH SIGNIFICANCE IMPACTS ONLY

The level of significance of impacts has been assigned according to the degree to which the proposed action:

* affects or furthers national goals or local interests;
* involves impacts which are irreversible;
* will have effects over long time periods;
* affects public health or safety;
* affects the overall well-being of people, and the number of people affected;
* affects the availability or functioning of key resources;
* affects environmental qualities, goods or services which are of special or unique character, in limited supply, and/or essentially irreplaceable;
* may establish a precedent for future actions;
* results in cumulative or synergistic impacts, and/or
* has the potential to optimise existing conditions. [EEU/2/93/104 a, b, c]

The above criteria were applied to each impact identified by the study, and impacts were then assigned a positive or negative rating of high, moderate, or low significance.

According to UNEP [1988] 'it is important that an Environmental Impact Assessment does not try to cover too many topics in too much detail. ... the scope of the EIA should be limited to only the most likely and most serious of the possible environmental impacts.'

It is also important that the EIA should communicate to the decision-maker those impacts which will most significantly affect the decision. The impacts of moderate and low significance are not crucial to the decision-making process, but are, rather, essential to the development of an environmental monitoring and management plan for the project.

Thus, for the purposes of comparison of the two alternatives, and of decision-making, I will be considering only those impacts of high significance after mitigation.

The discussion of the alternatives is based on the assumption that mitigation, as suggested, is feasible, and will therefore be carried out. I am also working on the

assumption that the problems experienced with compensation payments in Phase 1A will be ironed out and an improved system will be used for Phase 1B. This is based on the understanding that the compensation policy is under constant review and modification by the Compensation Department of LHDA.

6.4 AGGREGATION AND DISAGGREGATION OF IMPACTS

The choice of whether to aggregate or disaggregate impacts is crucial to the evaluation of alternatives, lending differing weight to impacts that have been aggregated or disaggregated.

For example, the analysis of the WAR resulted in two separate national level impacts:

* 'accords with national road plans', and

* 'reinforces national planning objectives',

both of which have been accorded 'high' significance [cf. Summary Table of Impacts for WAR with mitigation and optimisation, Appendix 1]. If one adopts an integrated approach to national planning, then it is logical that the development of a national road network should fall under the umbrella of national planning, and both these impacts could therefore be subsumed under the same category of 'reinforcing national planning objectives.'

On the other side of the scale, the LCAR has been rated as having an impact of high positive significance in relation to 'improved access to goods, services and facilities for remote rural people.' This statement could well have been disaggregated into:

* improved access to emergency services such as drought relief;

* improved access to markets and shops, and

* improved access to state infrastructure such as health services, schools, and police.

Since what is currently one impact would then appear as several, discrete impacts, such disaggregation would appear to give more weight to this impact/groups of impacts.

6.5 MODIFICATION OF HIGH SIGNIFICANCE IMPACTS FOR WAR

The two tables, for impacts arising from the LCAR and WAR (with mitigation and optimisation [Appendix 1]) imply that there will be the same, high significance, positive impact from both routes in relation to 'improved access to goods, services and facilities for remote rural people.' However, the LCAR will provide access to an area that currently has no vehicular access, with the WAR only providing an upgraded facility where one already exists.

With regard to the criteria of equity and sustainability [cf. Chapter 5], this impact must be seen as being of a different order on the two routes. As a result of this, I have chosen to modify the tables so that this impact is given 'moderate significance' in relation to the construction of WAR, but 'high significance' in relation to the LCAR.

Tables 1 and 2 summarise the high significance impacts (and the affected groups) which will be discussed in Chapter 7.

Table 1: Modified high significance impacts for LCAR

	LCAR	Affected groups
+	Promotion of planning objectives of economic growth, democratisation and employment creation;	marginalised, rural communities;
+	Improved access to goods, services, and facilities;	marginalised, rural communities;
-	Possible extinction or threat to Red Data species Maluti Minnow (endangered) and Aquatic River Frog (restricted);	local ecosystem; on a human level it is hard to calculate who this will affect and over what time period;
-	Contradiction of existing road plans places an additional burden on the road maintenance budget.	Lesotho tax-payers and road-users.

Table 2: Modified high significance impacts for WAR		
	WAR	**Affected groups**
+	Reinforces national planning objectives. and development of road networks;	Intended to benefit the whole population of Lesotho over time[12];
+	Maseru bypass will relieve congestion;	Maseru residents and road users;
-	Displacement of people along 'bypass';	Maseru residents;
-	Loss of buildings and infrastructure in Maseru.	Maseru residents

6.6 CONCLUSIONS

In Chapter 7 I evaluate and compare the two alternatives according to the principles of sustainable development, and according to direct financial costs. Subsequent to this, in Chapter 8, I discuss the potential of a road through the Jorodane valley to mitigate negative impacts from the dam, and present an argument for selecting a preferred alternative.

Chapter 9 deals with issues and concepts around a management and monitoring plan. This is followed by conclusions and recommendations in Chapter 10.

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12 Although is it customary to assume that the national planning objectives of a country will benefit the country as a whole, it would in fact be incorrect to assume this without analysing the planning objectives according to the principles of equity, sustainability and social justice. For example, a country with a focus on furthering development in the urban areas, and which neglects development in the rural areas, may well be contributing to the development of inequity, and consequently to the relative impoverishment and marginalisation of one sector of the population.

The Five Year Plan of Lesotho is geared towards rural development, relief of povery, and equity and social justice [Appendix 7, EEU/2/93/104c], and consequently, if implemented correctly, should benefit the marginalised sectors of the population.

7. EVALUATION AND COMPARISON OF LCAR AND WAR

7.1 INTRODUCTION

The impacts of high significance on the two routes, as determined according to the criteria mentioned in Chapter 5, are summarised in Tables 1 and 2. I will summarise these impacts here briefly, before going on to discuss the trade-offs on the two routes and the evaluation of the routes according to the principles of sustainability, equity and social justice.

7.1.1 SUMMARY OF HIGH SIGNIFICANCE IMPACTS

LCAR:

The highly significant negative impacts on the LCAR are:

* That it contradicts existing road plans and places an additional burden on the road maintenance budget. This is of particular concern in a country such as Lesotho which has a very low national income[13] and consequently little money to spend on maintenance or development of road infrastructure, and

* That it poses a threat to the survival of two Red Data book species: the endangered Maluti minnow and the restricted Aquatic River frog.

On the other hand, the positive impacts of the LCAR are:

* That it promotes of planning objectives of economic growth, democratisation and employment creation, and

* That it will result in considerably improved access to goods, services and facilities for remote rural communities. This includes access to health and education services, as well as to emergency services such as drought relief and ambulances.

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13 The GDP of Lesotho for 1990 was M1 504.7 million, and the GNP, M2 606.5 million. Government expenditure in 1990 was M234.6 million [Bureau of Statistics 1993]. The GNP includes wages earned by migrant workers in South African mines and cities.

WAR:

The highly significant negative impacts of the WAR are:

* The displacement of people for the Maseru 'bypass' along routes 3, 4, and 5. Numbers of people affected by these routes have not been calculated with any accuracy, and

* The loss of between 80-100 buildings and some infrastructural services along Maseru 'bypass' routes 3, 4, and 5.

On the other hand, the highly significant positive impacts are:

* That it accords with national road plans and reinforces national planning objectives, and

* That the Maseru 'bypass' will relieve traffic congestion in Maseru.

In looking at the high significance impacts for the two alternatives, a simplistic analysis would make it appear as though the two routes are equally balanced in high significance negative and positive impacts, with two each. At this stage, in order to select a preferred alternative, it is necessary to weigh the two routes against each other, in a scale determined by the Gardner's four criteria of sustainability as determined by provision of basic needs (both material and non-material, as defined by Trollip [1981]), ecological sustainability, equity and social justice, and cultural diversity and self-realisation.

7.2 COMPARISON OF LCAR AND WAR ACCORDING TO THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT

7.2.1 PROVISION OF BASIC HUMAN NEEDS

LCAR:

Material:

The basic, material human needs include adequate food, safe drinking water, housing, health care and educational services [Trollip 1981].

The construction of a road through the Jorodane valley would considerably improve the ability to meet material human needs in the area in several ways, including:

1) **Increased agricultural productivity as a result of improved access to seed and agricultural inputs.**

Current agricultural practices in the Jorodane valley have not resulted in much erosion. However, lack of organic or artificial inputs has rendered some soil too nutritionally poor to grow crops. While access to improved seed and agricultural inputs such as fertiliser and pesticides would improve crop production, it might also result in associated environmental problems such as eutrophication of rivers, and pollution of water sources.

While an improved transport infrastructure is not enough to guarantee improved agricultural output, it is a necessary condition for improved productivity [Appendix 7 EEU/2/93/104c]. However, the valley has fertile soils [Appendix 7 EEU/2/93/104c]] as well as some entrepreneurial element, as demonstrated by the successful dagga trade operating in the region, and increased agricultural productivity is a real possibility.

2) **Improved access to emergency and health services.**

The LCAR would result in considerably improved access to services such as food supplied by drought relief agencies, clinics, ambulances and mortuaries. The current situation results in sick people being carried on horse-back for up to 6 hours in order to reach the nearest health care centre. After a death in the valley, the corpse is carried on horseback, also sometimes for several hours, to the nearest busstop, and from there to Maseru, to a mortuary. When the funeral arrangements have been made, the process is reversed [EEU/2/93/104e].

3) **Improved access to building materials.**

Although the traditional Basotho huts are well-designed for the climatic extremes of the highlands, the local residents expressed a strong need for modern building materials [EEU/2/93/104e] such as cement, doors, windows and corrugated iron. At present, such materials must be carried into the valley on foot or on pack animals. The use of cement to plaster walls and cover floors would ease the burden on women who are responsible for the upkeep of the present mud and dung walls and floors.

4) **Improved access to educational services.**

Although there are a fair number of primary schools in the Jorodane valley, access to these schools is limited by climate. Children do not attend school when the rivers are full, or during winter when the snow is heavy. The presence of a road, and of bridges across some of the tributaries to the Jorodane, as is envisaged in the proposed route, would facilitate school attendance.

5) Improved quality of drinking water.

The LCAR would improve access to the area by groups such as the Village Water Project, and thus increase knowledge and skills around protecting water sources in the area. It would also enable easier access to materials such as cement which are used to construct protective walls around drinking water sources. It is also possible, if the design of the LCAR is done according to guidelines supplied by the EEU [EEU/2/93/104c] that improved water facilities would be created in those villages where the road traverses the drinking water streams. However, it must be borne in mind that this did not happen with the construction of the Katse Road, and that it would need to be part of the terms of the contract for the road construction, and would require monitoring to ensure that it took place.

All the above factors would open up the options for improvement in the material quality of life of the residents of the Jorodane valley. The results from the social survey along the Katse road show that the road materially improved their lives in the following ways:

* improved access to transport;
* improved access to clinics;
* improved ability to transport goods, including building materials;
* improved access to schools;
* use of the road as a market to sell crafts and other goods, and
* access to drought relief.

Similar improvements could be expected along the LCAR.

Non-Material:

The basic, non-material human needs such as effective involvement for local people in decisions affecting them with regard to the road development, and participation in development strategies, can be provided by the process of

a) the EIA and

b) the ongoing management and monitoring plan for Phase 1B (cf. Chapter 9).

However, on a broader scale, although the presence of a road will facilitate access to the national political processes for local residents, the provision of such infrastructure cannot ensure the development of participatory democracy or the empowerment of local residents in the political process. But the experience of public participation in the EIA can empower people and thus enable them to take part in national, regional and local political processes with more confidence.

WAR:

The existence of the WAR, as well as a regular public transport system operating along this route, has already brought the some access to the fulfillment of basic material human needs to the communities along the WAR. This has occurred through access to primary health care, educational facilities, shops, and small business and hawking opportunities along the road. It must be noted, however, that hunger and lack of potable water were still cited by residents as major problems [EEU/2/93/104b]. The upgrading of the WAR could result in improvements to water collection points, similar to those discussed in relation to the LCAR. However, it upgrading of the WAR is unlikely to bring many other substantial improvements with regard to fulfillment of the basic human needs.

7.2.2 ECOLOGICAL SUSTAINABILITY

One of the concepts of sustainable development as outlined by Gardner [1989] and Sachs [1989] is the need to preserve ecological integrity, or ecological sustainability.

Ecosystems rely on a series of complex, intertwined and interlinked relationships. Removal of one species from an ecosystem can result in 'cascading effects that take years to play out' [Beardsley 1992:18]. The long-term prediction of these effects is not possible with any great degree of accuracy or certainty. Thus the possible threat to the Maluti minnow from increased sediment load in the river poses an unmeasurable threat to the ecosystem that the minnow is part of.

It is also important to note, however, that the impacts of the dam on this habitat may be so severe as to destroy the current ecological integrity, no matter which road is built.

The risk of damage to ecological sustainability through the construction of the LCAR is great. If the decision is taken, on the basis of sustainability and equity, that the LCAR should be constructed, then considerable effort and finance will have to be put into mitigation, monitoring and management plans, to avoid the destruction of the Maluti minnow and the Aquatic River frog in this location, and consequent impacts on ecological sustainability.

7.2.3 ILLEGAL ACTIVITIES AND SUSTAINABLE AGRICULTURE

There are several moral and legal questions around the issue of compensation for a group of people whose economic base may be damaged, when that economic base rests on the trade of illegal substances. The Treaty states that no one may be left worse off than before, but the reality is that no one in the Jorodane valley will be compensated for their income from dagga, which is considerably higher than any

possible income from a legal agricultural replacement. Consequently, if the LCAR interferes with the cultivation of dagga by allowing the police better access to this area, the residents of the Jorodane valley might, *de facto*, be worse off than before.

The social survey showed that by far the majority of people in the Jorodane valley are dependant on the dagga trade as a source of income [EEU/2/93/104e]. It has already been decided by the study team that the disruption of the dagga trade would therefore constitute a moderately significant negative impact.

The people in this valley grow dagga in order to meet their basic human needs because of lack of access to other alternatives. It can be seen as an agricultural adaptation to increased pressure on resources as a result on land degradation and increased population. The dagga crop is very suitable for this area, being relatively drought and pest resistant, and bringing high economic returns. Replacement of the dagga crop with food crops could result in less sustainable agricultural practices in an attempt to achieve artificially high yields to maintain income standards.

7.2.4 EQUITY AND SOCIAL JUSTICE

A study of poverty by Sechaba Consultants [Sechaba 1991], in Lesotho, showed that poverty is far more common in the mountain and other remote rural areas than in the urban areas, district headquarters, and lowland areas. The study recommends that the improvement of the road network to remote areas should receive priority, as it would facilitate the extension of services to these areas.

The fulfillment of basic human needs, or provision of access to the services to fulfill them, is one step in the creation of equity and social justice. Social justice is measured, not by the national average standard of living, but by the relative deviation from this norm by the richest and the poorest. The closing of this gap between rich and poor, both inter- and intra-nationally, is part of what constitutes equity. But an equally important element of equity is *equality of access to resources*. The construction of the LCAR would contribute far more in terms of access to resources for the local population, than would the WAR.

While the construction of the LCAR cannot guarantee improved living conditions for local residents, it will improve access to resources, and thus open up the opportunities for improved quality of life.

7.2.5 CULTURAL DIVERSITY AND SELF-REALISATION

The underlying aim of all development should be the improvement of the quality of human life. This implies not only the material quality of life, but also the psychological and cultural quality of life, and the realisation of human potential of communities and individuals. The right and access to choice are important factors in

the realisation of human potential, the right to choose whether to be a peasant farmer or a factory worker, the right to choose where to live, the right to choose what language to speak, the right to choose who to vote for, or whether to vote at all. In the modern world, these choices are enormous, but the isolation of areas such as the Jorodane valley makes it difficult for people to exercise these choices. The potential for self-realisation is thus constrained by infrastructural limits. Many people who have chosen a non-subsistence farming way of life have had to leave the valley, and the difficulties of travelling to the valley have consequently damaged kinship and family ties.

The residents of the Jorodane valley are isolated in many respects, but they are firmly linked into the modern, cash economy, and many of them have aspirations that are linked to the modern economy - desires for TVs and lounge suites, and corrugated-iron roofs, as well as better education and jobs [EEU/2/93/104e]. The LCAR would open up opportunities for self-realisation to these communities.

The opportunities that the LCAR would bring to these people are to a large extent available already to the communities living along the WAR.

It is important to reiterate that the communities living along the WAR are also impoverished and marginalised, but that the LCAR will bring relatively greater rewards to the local residents than will the upgrading of the WAR.

Table 3:
Comparison of LCAR and WAR according to the four substantive principles of sustainable development [Gardner 1989].

	LCAR	WAR
provision of basic human needs:		
material:	significantly improved access to health and educational facilities; access to emergency services;	little or no improvement
non-material:	facilitates access to national political processes	little or no improvement except at project level
preservation of ecological integrity;	risk of extinction of Maluti minnow in this area and resultant destabilisation of ecosystem.	impacts of low significance
equity and social justice;	increased development potential for a marginalised community	little change to existing social inequities
cultural diversity and self-realisation;	will provide opportunities for life-style diversification; creates potential for self-realisation of local communities and individuals; carries potential for negative changes to cultural patterns.	little change to current situation.

7.3 THE TRADE-OFFS

7.3.1 PRIORITISING NATIONAL VS REGIONAL AND/OR LOCAL DEVELOPMENT

One of the positive impacts of the WAR is that it accords with the planned national road network, and this is seen as being of significant value for national development. However, LHDA Contract No 1000 will only upgrade the Mountain Road as far as Patiseng. Thus the national objectives of an improved road system from Maseru to Thaba Tseka, linking in with the new Katse Road, will only be partially served by this development. The section of the Maseru-Thaba Tseka road beyond Patiseng is in a bad state of disrepair, being narrow, potholed, and untarred for most of its length. This section will not be upgraded by this project. Thus, although the upgrading of the Western Access Route will go some way towards achieving the national objectives in terms of a road network, it still leaves a large section of the road to Thaba Tseka requiring major upgrading at the expense of the Lesotho government.

While it is the responsibility of the Government of Lesotho to upgrade the rest of the road to Thaba Tseka, the institutional capacity of the government, and their financial situation, must be taken into account when considering whether this is likely to occur or not.

The LCAR, on the other hand, although it does not accord with the current national road network plans, will serve to create a ring road in the western section of Lesotho, which will facilitate tourist development as well as an alternative route from the north to the centre of Lesotho.

Any community that it not provided with the means to fulfill the basic human needs, and to develop economically, cannot contribute to national development and growth, and often creates a drain on national resources. Thus the improvement of the basic quality of life of the people in the Jorodane valley, and the provision of access to services and opportunities for economic development, would contribute towards the establishment of sustainable development nationally, and to the general quality of life in Lesotho. Thus the prioritising of local interests, through the construction of the LCAR would result in long-term benefits for the country as a whole.

7.3.2 MINNOWS OR *MENSE?*

The presence of the endangered Maluti minnow in the Jorodane River raises serious questions as to the prioritising of interests of affected parties. The cautionary principle suggests that in order to safeguard intergenerational and international

environmental rights we should be doing everything in our power to avoid the extinction of a species in this area, particularly because of the current rate of anthropogenic extinction of species. This accords with the current emphasis on the need for the preservation of biodiversity.

However, the issue raises a series of questions:

1) **How does one attach value to a species such as the minnow?**

It is widely acknowledged that economic measurements of value break down on questions such as this [see, for example Stauth 1980; Gregory 1989; Green and Tunstall 1991]. There is no known way of measuring the value of any species to the world. Gregory [1989], discussing the economic value of endangered species, raises the point that the value of extinction of a species must be considered of a higher order than extinction of individuals. Thus the geographic distribution of the species under consideration is crucial to the debate on its value. However, also of crucial importance to Gregory, is the geographical extent and distribution of people who care about that species. Gregory sees value as being linked to how much people are prepared to trade or give up in order to preserve that species. It has been established that the majority of people in Africa do not yet have a living standard sufficient to make them willing to give up anything in exchange for the survival of an endangered species [Daniels 1991]. Thus, in Gregory's measurements, the value of the Maluti minnow is very low.

There are, however, those who would argue that the survival of any species is beyond economic value. Norton, for example, suggests that:

> 'The value of biodiversity is that value of everything there is. It is the summed value of all the GNPs of all countries from now until the end of the world... One thing we know: if we lose enough species we will be sorry. The guessing game is really Russian roulette. Each species lost without serious consequences has been a blank in the chamber. But how can we know before we pull the trigger?' [Norton 1988]

2) **How does one calculate the risk attached to damaging this habitat, without considering the long-term prospects of the other 5 known local habitats and 6 other international localities?**

The Maluti minnow is currently found in 6 rivers in Lesotho. The possibility exists that it is present in other rivers that have not yet been studied. If the LCAR is not built on the basis that it endangers the minnow, it may well penalise the local population's need for a road unfairly should the survival of the minnow be guaranteed in at least some of the other areas, both locally and internationally.

Conversely, if the other habitats are going to be lost anyway within the next 10 years, and if the dam is going to flood 86% of this habitat (which it is) then perhaps one is trying to stave off the inevitable unnecessarily, at the expense of an already marginalised and impoverished community. In other words, a reduction of habitat

of the order resulting from the dam impoundment may force the species into extinction locally anyway.

There is a lack of evidence that the Maluti minnow will manage to survive in the 14% of habitat that will be left once the dam is full. It is possible that its survival will be further threatened by predators such as trout which may be introduced into this area. It has been suggested that to mitigate against the effect of the impoundment on the minnow's habitat, it should be relocated into the section of the river above the Pampiri waterfall [Rall *et al* 1993]. The waterfall would protect the minnow from predators lower down the river. Although there is as yet little concrete evidence that it is possible to translocate the minnow into this new area, or that the minnow will survive in the long-term in this new habitat, this possibility requires serious exploration.

While the stress imposed on the minnow's habitat by the impoundment will be so severe that any further even relatively minor stress as a result of increased siltation from road construction could cross the threshold of tolerance very easily and push the minnow into extinction in this part of Lesotho, there is no certainty that the minnow will necessarily continue to survive in this river subsequent to dam construction.

7.4 SUMMARY OF BIOPHYSICAL AND SOCIO-ECONOMIC TRADE-OFFS

According to Gardner's four principles, the LCAR offers much higher benefits to the local community than the WAR (see Tables 4 and 5 for a summary of the high significance impacts of both alternatives, as measured against the scale of sustainable development). In the light of Lesotho's high disparity of wealth and access to services, this is an important step in the move towards equity and sustainable development. Unfortunately, the LCAR also carries with it much greater threats to ecological sustainability than does the WAR.

The WAR, although the safe option in terms of protection of the natural environment, does not offer the benefits for the establishment of equity that the LCAR offers. It does, however, offer the national benefit of the upgrading of part of the national road network.

Table 4:
Matrix of high significance impacts of LCAR measured against 4 criteria of sustainable development.

	Access to services, facilities, transport	Promotion of planning objectives	Threat to endangered and rare species	Contrary to road plans; places stress on roads budget
basic human needs	+	+	o	o
preserves ecological integrity	o	o	-	o
creates equity & social justice	+	+	o	o
allows cultural diversity and self-realisation	+	+	o	o
Summary:	**Several significant positive benefits, but a significant negative impact with regard to ecological sustainability.**			

Key:	+ = impact has positive contribution towards sustainable development;
	o = impact has no significant contribution towards sustainable development;
	- = impact has negative contribution towards sustainable development;

Table 5:
Matrix of high significance impacts of WAR measured against 4 criteria of sustainable development.

	Reinforces national planning objectives	Relief of traffic congestion in Maseru	Displaces people along Maseru 'bypass'	Loss of buildings and infra-structure along Maseru 'bypass'
basic human needs	+	0	0	0
preserves ecological integrity	0	0	0	0
creates equity & social justice	+	0	0	0
allows cultural diversity and self-realisation	0	0	-	0
Summary:	**Few significant positive benefits, but few significant negative impacts either.**			

Key:	+ = impact has positive contribution towards sustainable development;
	0 = impact has no significant contribution towards sustainable development;
	- = impact has negative contribution towards sustainable development;

7.5 IMMEDIATE FINANCIAL COSTS VS OTHER ENVIRONMENTAL COSTS AND BENEFITS

There is one more step that needs to be taken in the comparison of the two routes. The direct financial costs (capital outlay and maintenance costs) of constructing the two alternatives need to be weighed against the other environmental costs and benefits.

The construction costs of the LCAR have been estimated at M225 367 821, as opposed to only M171 455 286 for the upgrading of WAR, including the Maseru 'bypass' (see Appendix 2 for Cost Comparison - LCAR and WAR). This means that the financial costs of the LCAR outweigh those of the WAR by approximately M54 000 000 (a factor of nearly 25%).

It has already been shown that the LCAR will offer better benefits to a very marginalised community, within the framework of sustainable development and the creation of equity and social justice. However, the construction of the LCAR also carries with it the threat to the endangered Maluti minnow and the rare aquatic river frog.

As has been mentioned, the financial costs for the construction of the road will be borne by the South African government, while any development benefits from the road will accrue on the Lesotho side of the border. Thus, while one might argue that according to global concepts of sustainability, equity and social justice, it is more important to construct the LCAR, this decision conflicts with the reality of national borders and national interests.

The separation of the South African and Basotho nations, and the positioning of the borders, however arbitrary they may be[14], are none-the-less historically and politically real. The nature of national government is that allegiance is owed to the citizens of that nation-state, rather than to a global population. Although environmental issues have stretched across national boundaries throughout the world, and have, in certain areas, resulted in cross-border co-operation, this has not yet stretched to cross-border development work in the Southern African context. Thus the South African government is committed to advancing the interests of the people of South, as opposed to Southern Africa, and this includes making water available to the industrial and residential areas of South Africa at the least cost to the tax-payer.

Although Lebel and Kane [1990] argue that the fostering of sustainable development at an international level 'demands changes in the domestic and international policies of every nation', this is not yet the reality.

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14 The borders of modern Lesotho were established in 1868 when King Moshoeshoe asked the British for protection from the Boers. The British agreed to assist him, but signed a Treaty with the Boers that gave the Boers the entire western Caledon valley, previously owned by the Basotho [Parsons 1983]. Thus the borders of Lesotho are a purely colonial construct.

In real terms, however, the financial cost difference between the LCAR and WAR is so large that it would be difficult to argue to any Third World government that the LCAR should be the preferred alternative, even if the issues of cross-border responsibility did not come into play. In order to put the costs into perspective, one should note that the cost difference between the LCAR and the WAR amounts to approximately 25% of the yearly expenditure of the Government of Lesotho [Bureau of Statistics 1993]. The South African government is unlikely to be willing to pay this extra amount, especially since the environmental scenario of upgrading the WAR carries few significant negative impacts, and it is unlikely that the Government of Lesotho could afford to pay the extra amount in the interests of rural and sustainable development.

However, the possibility that the LCAR should be constructed in order to mitigate the negative impacts from the dam needs to be considered (see chapter 8). If the road is considered as a part of the project as a whole, it is possible that the financial difference will not seem so great in relation to the total amount being spent on the Phase 1B construction.

7.6 CONCLUSIONS

Although, from the point of view of sustainability and the creation of equity and social justice, the LCAR is the preferred alternative, it also carries with it greater threats to ecological sustainability, especially with regard to the river system and the continued existence of the Maluti minnow and the aquatic river frog.

The financial costs of construction of the LCAR are in the region of 25% higher than those for the WAR. This fact, in conjunction with the threat to ecological sustainability, implies that the WAR should, on the basis of current information, be selected as the route to construct.

Ideally, however, the selected of a preferred alternative should not be made until the impacts from the dam have been investigated, and the decision can be made on the basis of more complete information about project impacts.

7.7 RECOMMENDATIONS

The possibility of the access road serving as mitigation for negative impacts caused by the dam needs to be explored within the context of the project as a whole.

Although the construction of the WAR will not impact on the Jorodane river, the construction of the dam will, and consequently the translocation of the Maluti minnow to the upper reaches of the river and the creation of a sanctuary in this area requires further exploration.

8. THE ROAD AS DEVELOPMENT OPTION AND MITIGATION FOR DAM IMPACTS.

8.1 INTRODUCTION

The construction of either the LCAR or the WAR will cause minimal impacts compared to the Mohale Dam which is the major part of the development of Phase 1B of the LHWP. The impacts associated with the construction of a large dam are almost inevitably greater than those associated with the construction of a road. Bearing this fact in mind, it is essential to consider whether the choice of which road to build should not be seen within the context of the dam impacts, and as a possible mitigatory factor with respect to such.

8.2 DISCUSSION

Boserup [1981:150-151, in Arntzen 1989] describes the situation facing the rural areas of many developing countries as:

> '... caught in a vicious circle, or even a downward spiral. Because of the low population density and the high degree of subsistence production, it is uneconomic to supply these areas with a road network. On the other hand, without a road network, there are no major possibilities for any major change from subsistence production and exodus of labour.'

Lesotho, like many developing countries, has a pattern of low economic but high population growth[15]. This fact, combined with the resettlement of villages and the loss of arable and grazing land because of the Mohale Dam, will put increased pressure on resources in and around the Phase 1B area. As it is, the highlands of Lesotho already suffer from inadequate infrastructural facilities and depleted natural resources[16].

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15 According to the latest figures, Lesotho has a population growth rate of 2.63% per annum, while their economic growth rate over the period of 1985-86 was only 2%. [Bureau of Statistics 1993])

16 The highlands of Lesotho,suffer from problems of overgrazing, as noted by local residents during the social survey, several of whom commented on there not being sufficient grazing for their own cattle as well as the cattle from the lowlands which are sent up to graze in the area. Similarly, informal interviews in the Jorodane valley revealed that agricultural lands are no longer fertile because of shortened fallow periods, and the lack of organic or artificial input. Cattle dung, which was once used to fertilise fields, is now used for fuel.

Scott and Diab [1989], discussing the Inanda dam in Natal, describe social impacts that include:

* feelings of insecurity and hostility resulting from bad decision-making procedures and lack of consultation and negotiation, and lack of information about the need for the dam, and dates of construction and relocation;

* increased population density, lack of farming land, and increased proletarianisation and dependence on cash income as a result of relocation and loss of land to the dam. Lack of employment coupled with lack of farming land resulted in a less nutritious diet and malnutrition;

* problems associated with lump-sum payments of compensation to people without savings accounts or a culture of savings;

* severance of social and kinship networks and loss of support networks, and

* disruption of social and political unity.

While the impact assessment for the Mohale Dam has not yet been conducted, it is safe to assume that some similar impacts may be experienced.

The increased social and physical pressures will be felt most severely by residents surrounding the area directly affected by dam impoundment, but are likely to impact on a larger area over a period of time.

Residents in the Lesotho highlands already face a situation where increased population pressure has shortened fallow periods until soil fertility has been destroyed or reduced; where field sizes have been slowly but surely reduced; and where adverse climatic conditions such as the recent drought have further damaged their subsistence capabilities[17]. The choice facing these people is emigration or agricultural adaptation[18]. With the South African mines retrenching workers[19], and a severe world-wide recession, emigration is not a viable option for large numbers of people, and so agricultural adaptation remains the only option. But 'the transformation towards modern agriculture requires a reasonably developed infrastructure and adequate price incentives' [Arntzen 1989:44].

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17 In Ha Mokhabalo, for example, I interviewed three women who had no labour to assist them to plough their fields, no oxen, and who, finally, because of the severe drought, had been forced to eat their seed in order to survive. They had no money to buy new seed [EEU/2/93/104e].

18 The growing of dagga in this valley may be seen as a form of agricutural adaptation, but not in the sense of improving crop productivity in a way that will contribute to food independence for Lesotho.

19 Informal interviews along the LCAR and WAR show that migrant workers from the area are returning home as a result of retrenchments on the South African mines [EEU/2/93/104e].

For Malthus [1970] and Erlich [1970], overpopulation is a direct cause of environmental degradation. For other authors [eg. Wilkinson 1973; Boserup 1981; and Arntzen 1989] the link between population, development and natural resources is complicated and many-faceted. Boserup argues that increased population pressure leads to technological innovation. Such innovation would, in the case of the Jorodane valley, be considerably facilitated by the presence of a road, and the concomitant access to transport opportunities both into and out of the valley. This would allow the inflow of new technology, and the outflow of agricultural produce to wider markets.

The other side of this argument is that satisfaction of basic needs, improved access to education and primary health care, and improved standards of living, as could result from the construction of the LCAR, result in a decrease in the birth rate [Lebel and Kane 1987], which would, in the long-term, reduce the rate of increase of pressure on the land.

8.3 CONCLUSIONS AND RECOMMENDATIONS

The potential of a road through the Jorodane valley to serve as mitigation for negative impacts resulting from the Mohale Dam, should be thoroughly investigated.

If the LCAR is not selected as the preferred alternative, then the possibility of a feeder road into the valley, to serve as mitigation for dam impacts, should be investigated. The completion of the partially constructed gravel road from Thaba Putsoa to Sehlabaneng should be investigated as a possible option in this regard.

The selection of a route for a feeder road should arise from the EIA on the dam, but the information gathered in the social survey for this impact assessment (EEU/2/93/104e) might be of use in this regard.

9. MANAGEMENT AND MONITORING PLAN

9.1 INTRODUCTION

An EIA is not complete until the results from monitoring are known [Beanlands and Duinker 1983]. The development of a flexible, but rigorous monitoring and management plan for any major project is essential for the long-term protection of the environment, and for creating the conditions for sustainable development.

9.2 DISCUSSION

In order to achieve any long-term success in environmental protection in the Phase 1B area, any management and monitoring plan must take into account the impacts of the entire project, including the dam and the road, and not just one or the other.

With this in mind, and considering that it is difficult to draw up a precise management and monitoring plan before the final decision has been taken on which route to construct, and which method of dam construction to use, and before an EIA has been done on the dam, what follows will be a discussion on the conceptual framework within which any management and monitoring plan should be structured, rather than a list of specific actions. Recommendations for specific mitigation and optimisation measures have been made in EEU/2/93/104 a, b, and c. Further than this it is expected that monitoring and management plans will follow the guidelines set out by the Department of Environmental Affairs [DEA 1992].

Regardless of which route is selected for construction, a management plan must be drawn up for the period of detailed planning, construction, and the early period of implementation[20].

Although guidelines for mitigation and optimisation have been included in reports EEU/2/93/104 a, b, and c, there is a need for clear guidelines for a framework of action for the development agency, with respect to socio-economic impacts in particular, not just a list of individual actions each related to an individual impact. [Quinlan 1992]

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20 The management plan must extend into the first period of use of the road to ensure that problems encountered post-construction are dealt with properly. For example, on the Katse road, residents have found problems with claiming compensation for rocks that rolled down into their fields after construction was completed. [EEU/2/93/104e]

According to Martin [1991],

> 'problems involving interactions among economic, social and ecological systems present a considerable challenge to traditional problem-solving and management approaches... these problems possess characteristics of abrupt change and irreversible non-deterministic evolution and uncertainty, along with the usual systems properties' [Martin 1991:776]

Therefore, more practical than trying to prepare a rigid management and monitoring blueprint for any project, is to develop a process that allows for flexible and dynamic management and monitoring. This requires an emphasis on community involvement as well as 'a fundamental shift in how we view the world from prediction, simplicity, and recipes, to uncertainties, complexity, and ever-changing ways of dealing with problems.' [Martin 1991:781]

A process serving these ends would require:

* using a systems analysis approach;
* setting goals;
* developing interactive processes;
* developing adaptive processes. [Gardner 1989]
* using action research[21], and
* constant development and review of the processes. [Martin 1991]

The focus must be on planning for a changing system: not on problem-solving only, but on problem-identification and understanding.

9.3 SETTING GOALS

While I do not wish to go into detail on the specific goals that should be set with regard to this project, there are certain points regarding the process of setting goals, that should be made.

While it is tempting to assume that the setting of goals for the protection of the minnow, and for water quality standards, for example, should be set by experts, research has shown in several situations that such projects will have more success in attaining goals if the local people are involved in the process from the start [Martin 1991]. While much of the documented community involvement has taken place in

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21 Action research is a cyclical process taking into account the impossibility of 'accurate long-term planning' [Martin 1991:778]

First World countries, it is, none-the-less possible to involve disadvantaged, Third World communities in projects of this nature.

Certainly, in terms of goals with regard to monitoring and mitigation of socio-economic impacts, it is essential that the local people are involved in, and, as much as possible, in control of the process.

The ideal is to develop an integrated approach where bio-physical and socio-economic factors are inter-linked, and where the local people are involved in the process. The local people can be involved on many levels, such as:

* making decisions, and assisting in setting goals, and

* assisting with monitoring procedures such as taking water samples, or keeping an eye on spiral aloe populations. This may require environmental education and some skills training, but would empower the local communities to take charge of their own environment.

If the local community are involved in the process by which the goals have been determined, they will be much more likely to be active in achieving those goals, than if the process is a top-down one [Martin 1991].

With international funders, as well as two participating countries, who are committed to concepts of sustainable development, (and to rural development in the case of the Lesotho government), it is crucial that mitigation, optimisation and compensation measures should have a direct development input. In other words, the developers should accept responsibility for at least initiating a sustainable development input into the targeted areas, and optimisation should be considered equally as important as mitigation, if not more so. The design of projects, and this includes the ongoing management of the project area, should ensure 'minimum negative impact, as well as maximum (local and regional) positive spin-offs for the more impoverished sectors of society.' [Huggins and Boersma undated:7]

Monitoring of the project area needs to check whether optimisation of positive impacts is being carried out as intended, and as fully as possible, not only whether negative impacts are being successfully mitigated against. The monitoring plan should also be flexible enough to recognise changes in the system, and to propose improved methods of optimisation where the possibility occurs.

9.4 MITIGATION AND COMPENSATION AS DEVELOPMENT INPUT

9.4.1 DEVELOPMENT PROJECTS AND THE PROTECTION OF THE ENVIRONMENT

Whatever development strategies are employed as mitigatory measures for the dam and the road, should not despoil or further damage the rural environment. Segynola [1989] comments that although 'the large primary industrial establishments in the rural areas' (such as stone quarrying) 'are contributing to the national income, a common impact of such establishments is their active role in the despoliation of the rural environment.'

One of the functions of the monitoring plan must be to ensure that mitigatory and optimisation measures, such as construction of compensation houses, or development of the local tourist industry, do not result in cumulative environmental damage. It is possible, for example, that the encouraging of a local craft industry, with stopping places along the road for sales to tourists, could also lead to increased sales of protected plants such as *Aloe polyphylla* [EEU/2/93/104c]. Monitoring of the project area could allow for timeous action to prevent significant impacts from such actions. In this case, environmental education programmes, as well as the creation of alternative sources of income might help to solve the problem.

9.4.2 FUNDING FOR DEVELOPMENT ACTIVITIES

Funding for development activities should come from the royalties paid for the water from the dam, but since this will take some time to be available, bridging finance must be found either from the two governments concerned, or from international financial institutions involved with this project.

9.5 INSTITUTIONAL CAPACITY

The institutional capacity of the Lesotho government. like that of many Third World governments, is extremely limited. These limitations have been exacerbated by the drain of many experienced governments officials to LHDA [George Kosky. *Pers comm*].

The LHWP is an extremely large project, and it is unlikely that the Lesotho government and the LHDA will be able to take care of the full needs of mitigation, optimisation and development, in all areas. For this reason, as well as those mentioned above, community participation is essential [Martin 1991].

Community participation can be through local structures, but can also be facilitated by NGOs such as the Highlands Church Action Group who have been active in the Phase 1A area. They can play a monitoring and negotiating role, concerning themselves with 'resolution of conflicts and the realization of community development opportunities' [Barker and Selman 1990].

9.6 INVOLVEMENT OF AFFECTED PARTIES IN MONITORING AND MANAGEMENT

9.6.1 THE COMMUNICATIVE CATCHMENT

One approach to the development of interactive and adaptive processes, which could be adapted for management and monitoring of a project such as the LHWP Phase 1B, is the 'communicative catchment'.

The communicative catchment is a vision for environmental care with community involvement and collaboration, developed by Peter Martin at the Faculty of Agriculture and Rural Development at the University of Western Sydney in Australia. The communicative catchment was proposed as an alternative model to models such as the reduced, mechanised or evolving catchments, in which the managerial structures (or so-called experts) remain essentially outside the system of people and natural resources which they are managing (see figures 1-4) [Martin 1991].

In the communicative catchment environmental issues are dealt with in a way that emphasises community responsibility and participation, supported by resources, technical information, support and effective co-ordination. The intention is that this would replace the traditional governmental 'grand design' planning process.

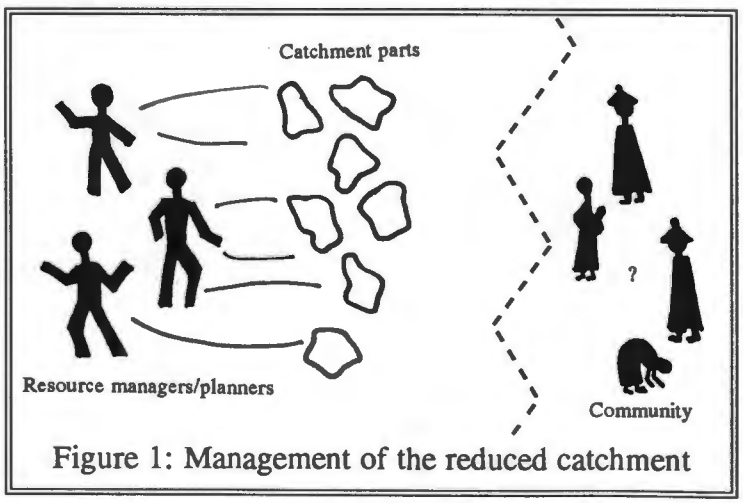

Figure 1: Management of the reduced catchment

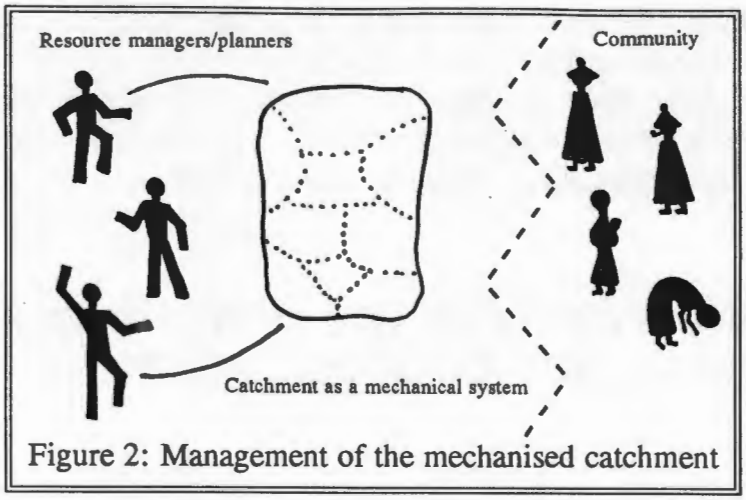

Figure 2: Management of the mechanised catchment

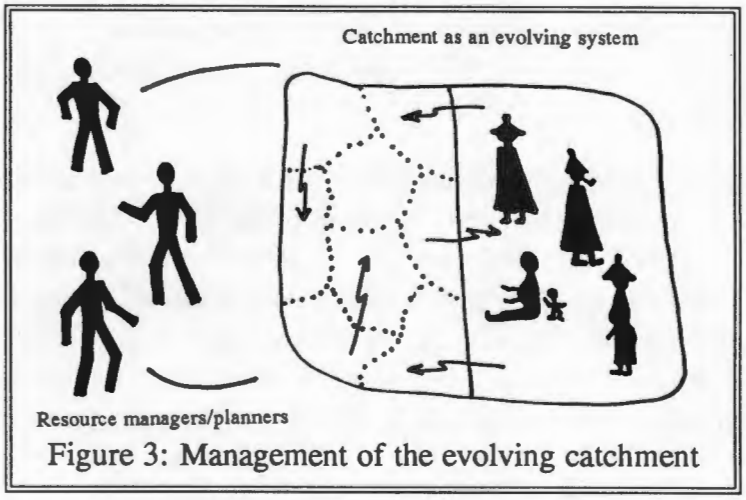

Figure 3: Management of the evolving catchment

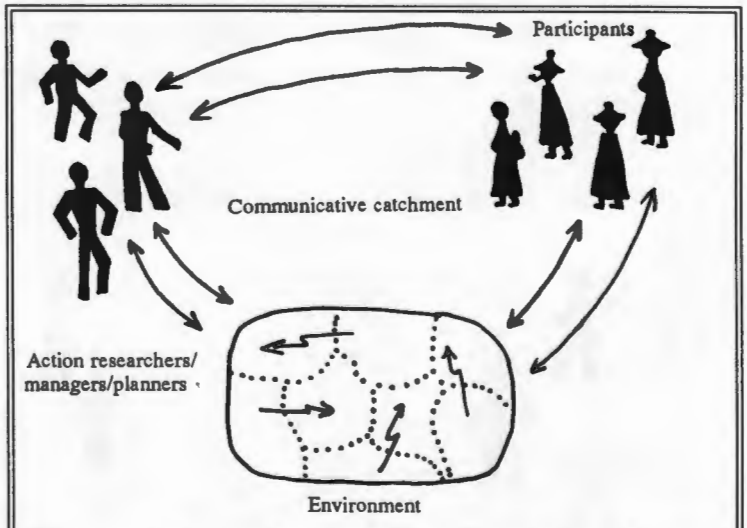

Figure 4: Caring for the communicative catchment

[Figures 1-4 after Martin 1991]

In the communicative catchment, one is concerned not only with the environmental 'facts', but also with the way that people perceive them. For example, in the Jorodane valley, one would be concerned not only with the issue of 'factual' impacts resulting from the construction of a road, but also with the way that the local people perceive the construction of a road and its consequences.

Furthermore, the communicative catchment requires the involvement of the community in, and the responsibility of the community for, the process of management of the catchment area. However, this requires 'the parallel change of our social institutions from the government level down to the community. The communicative catchment will not develop if government agencies do not refocus their roles away from centralised planning and control towards coordination and facilitation of community action. Similarly, the devolvement of power to people requires the community to be empowered and responsible for their actions.' [Martin 1991:782] The LHDA is an extremely powerful body in Lesotho, and should be capable of initiating some move away from centralised planning in LWHP areas.

The essential methodology of the communicative catchment is that of taking a variety of decisions *at the community level*, rather than trying to develop a comprehensive 'grand plan' [Martin 1991]. This builds in a cyclical, iterative process, which takes into account the uncertainty and impossibility of precise long-term planning, and which requires ongoing interaction between the developer and the relevant community structures.

9.6.2 SELECTED DEVELOPMENT AREAS (SDA) AND AUTHORITY STRUCTURES

Rural development strategies must examine whether the necessary environmental conditions are present for the success of the strategies, as well as the adverse environmental effects of the strategies, such as pollution of rivers. The necessary environmental conditions include the optimum institutional structures to implement the decisions over a long period of time.

In Phase 1A of the LHWP, in order to facilitate development and compensation, selected development areas (SDAs), were declared. Management committees were set up in these areas, consisting of local chiefs, the District Secretary, the Commissioner of Lands, LHDA representatives, and representatives of NGOs [Setplan 1991]. The establishment of these structures changed local authority structures, especially the power of chiefs, and changed the procedures of allocation of land and control of residential rights in the area, removing such authority from the chiefs. These changes resulted in some resentment, and caused, amongst other things:

* illegal allocation of land by chiefs, including backdating of leases;

* lack of control over influx of newcomers to villages, previously controlled by chiefs, and

* bribery and profiteering. [Makuta 1991]

Furthermore, along the Katse road the marginalisation of the local people in the decision-making process denied them 'the opportunity to participate fully in the implementation and the construction of the water project' [Thoahlane 1990]. The SDAs did not facilitate this, but rather served to remove authority from local structures. The management plan for Phase 1B of the LHWP needs to ensure that the local people are not marginalised in this way.

Most development projects increase state/local links, with the result that local level units may not preserve their integrity in the process. Although the creation of new structures at local level by the state can bring benefits such as improved health care, it can also cause substantial exploitation, particularly through loss of autonomy. According to Derman and Whiteford [1985], in order to avoid this, policy-makers and change agents need to respect and work through the institutions of the vital community.

Although developments that involve the affected parties in the decision-making process are rare[22], this is an important step both in the empowerment of communities, and in the success of a development process. Meaningful participation necessarily implies a redistribution of power [Gariepy 1991]. Within the context of the marginalised rural areas of Lesotho, and the periphery-core status of Lesotho and industrialised South Africa, it is necessary to recognise the importance of empowering those communities that are economically, ecologically and politically marginalised, as are the residents affected by both the LCAR and the WAR.

For this reason it is essential that affected parties are involved in the decision-making process with particular reference to such factors as:

* design and nature of development projects for mitigation of dam impacts;

* relocation of villages;

* design and siting of compensation houses;

* setting up of appropriate negotiation structures and channels;

* positioning of bus-stops;

* rehabilitation of land used for quarries, borrow-pits and temporary access roads;

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22 Even in projects on which an EIA is undertaken, the commonest form of public involvement is in so-called 'consultation', which enables the public to air their views, but not necessarily to influence the decision-making in any concrete way. [cf. Gariepy 1991]

* design and positioning of water outlets where appropriate;

* design and siting of live-stock ramps;

* etc.

That is, there should be involvement of affected parties

> 'from the formulation of possibilities to the design of postoperational reclamation or abandonment.' [Goldenberg and Frideres 1986:274]

9.6.3 GENDER SENSITIVITY

Although Derman and Whiteford [1985] recommend working through and with the institutions of the affected community, it is necessary to investigate whether the system represents the interests of women and minority interests.

At this point, social scientists are faced with something of a dilemma, namely, whether one has the right to interfere with the existing social structures of a society in order to 'impose' a different set of values, such as gender sensitivity. It is important to recognise that change does not occur suddenly, within a hitherto static community, but rather, within a context of ongoing change. The rural communities of Lesotho have already been exposed to urban, westernised values through the migrant labour system.

The question of equity must concern itself with intra- and well as inter-community relations. Women are an important factor in rural Basotho society, for a number of reasons. Firstly, there is the traditional role of women in food production and health care. Secondly, migrant labour has increased the number of *de facto* female-headed households in rural areas in Lesotho. In the Katse/'Muella area around 50% of households are headed by women [Tshabalala 1992]. Thirdly, and unusually, in the rural areas of Lesotho women tend to be more highly educated than the men, who leave school earlier in order to tend to the livestock.

Thus, it is essential for the success of any activities involving local residents, that the negotiating or decision-making structures enable the voice of the women to be heard, and taken into account. This may require adjustments such as scheduling meetings at particular times that don't exclude women[23], or, if necessary, holding separate meetings with groups of women. Some research will need to be done to investigate the most suitable methods for involvement of, and communication with, the women, in a way that does not cause antagonism or division within the community.

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23 From my experience of working in marginalised communities, women will often not attend meetings that are held at a time when they are preparing the evening meal. This time is often determined by sunset, in areas where artificial lighting is limited.

9.6.4 REPORT-BACK WORKSHOPS TO SURVEYED COMMUNITIES

According to Quinlan [1992], the function of a social impact assessment should be threefold:

* to provide information to the decision-maker about the affected community;

* to provide information to the affected community about the project, the possible impacts, and their own community, and

* to 'draw proponents and affected parties into a dialogue to work out an appropriate path to take.' [Quinlan 1992:9]

This is supported by Huggins and Boersma who feel that:

> 'the primary objective of SIA [social impact assessment] should be the promotion of integrated and sustainable development. Firstly, this entails not only producing information about and from the affected population but also for them.' [Huggins and Boersma undated:8]

The social surveys along the LCAR, WAR and Katse road, have initiated a process which requires completion. This requires a series of report-back meetings with communities in which the social survey for this EIA was conducted, including the villages along the Katse road. These meetings should feedback to the community:

* the result of the decision on which road to build, and the reasons for the decision, and

* the information about the community that was gathered during the survey, and how it was used in the survey.

It is recommended that these workshops be run by members of the original EIA team who are familiar with the work done in the social survey, and the EIA as a whole.

9.7 GUIDELINES FOR COURSE OF ACTION

As a very general set of guidelines, the course of action recommended for LHDA for Contract No 1000 should include details on:

* environmental monitoring, both biophysical and social, including the factors to be monitored, the methods used and the place(s) of monitoring;

* the personnel and/or organisation/s responsible for monitoring;

* land restoration plans, and responsibility for their implementation;

* development of resettlements;

* general development plans for the region, and

* the mode of funding for the management plan.

[after Vizayakumar and Mohaptra 1991]

Although some suggestions can be made for some of these points, final details of any management and monitoring plan can only be decided on once the decision has been made on which road to build, and once the cumulative impacts of the dam and road construction have been seriously considered.

It is essential that the monitoring and management plan for this area deal jointly with the dam and the road, and not with the two as separate developments.

10. CONCLUSIONS

The EIA for LHDA Contract No 1000 has highlighted several of the real problems associated with the practical implementation of environmental impact assessment. This report, like any other report that only focuses on one phase of a large development project, is limited in its scope. The scope of the EIA is further limited by its project specific nature. Thus the holistic effect of an integrated approach to impact assessment has not been achieved in this EIA, but it is none-the-less possible to reach the following conclusions:

* The option of the road should be seen in the broader context of the dam development project so that the separate and cumulative impacts of all development in the area can be considered simultaneously, and a decision be made on the basis of a holistic vision of development for this area;

* In future a more holistic approach should be required for projects of this nature;

* On the basis of currently available information, according to the criteria of meeting basic human needs, creating equity and social justice, and allowing cultural diversity and self-realisation, the LCAR is the preferred alternative. However, the LCAR also threatens ecological sustainability in the area;

* On the basis of currently available information, taking into account the extreme cost difference between the two alternatives, the high ecological risks associated with the LCAR, and the national benefits of upgrading the WAR, **the WAR is the preferred alternative**;

* The potential of a road through or into the Jorodane valley to serve as mitigation for negative impacts resulting from the Mohale Dam, should be thoroughly investigated;

* A full environmental impact assessment should be conducted on the recommended alternatives for the Maseru 'bypass' (EEU/2/93/104a);

* A management and monitoring plan must be developed which covers all aspects of Phase 1B of the LHWP. This plan should involve the local community in all decisions affecting them, and should be established along the same guiding principles as the communicative catchment;

* All reports should be tabled at a central place and made accessible to researchers. Future research or EIA's commissioned for the LHWP, Phase 1B, should include in their Terms of Reference a clause requiring the study team to refer to all previous reports generated for this project, particularly EEU/2/93/104 a, b, c, d, and e, and

* Design of the road should be such as not to foreclose future development, optimisation and mitigation measures along the road that might not be affordable currently.

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APPENDICES

APPENDIX 1:

LCAR: Summary table of impacts with mitigation and optimisation

LCAR: Summary table of impacts without mitigation and optimisation

WAR: Summary table of impacts with mitigation and optimisation

WAR: Summary table of impacts without mitigation and optimisation

Maseru 'bypass': Summary table of impacts

APPENDIX 2:

Cost Comparison - LCAR and WAR

Cost Comparison - Least Cost Alternative Route and Western Access Route

(costs in Malotis; figures supplied by GBJV and corrected with assistance from J.Avis)

Least Cost Alternative Route

LCAR Element	Distance (kms)	Capital costs	Rehabilitation costs	Compensation costs	Transportation costs	Maintenance costs	Total costs
Ficksburg Station	0.0	0	0	0	15 055 000	0	15 055 000
Ficksburg - TY	45.0	0	2 261 650	0	27 818 504	186 300	30 266 454
TY - Ha Mateka	18.5	0	2 743 120	0	11 436 496	76 590	14 256 206
TY bypass	0.0	6 808 000	0	0	0	0	6 808 000
Ha Mateka - Patiseng	60.0	113 553 000	0	973 761	44 207 000	248 400	158 982 161
Total	123.5	120 361 000	5 004 770	973 761	98 517 000	511 290	225 367 821

Western Access Route

WAR element	Distance (kms)	Capital costs	Rehabilitation costs	Compensation costs	Transportation costs	Maintenance costs	Total costs
Maseru station	0.0	5 818 000	0	0	17 990 000	0	23 808 000
Maseru 'bypass'	21.0	16 403 142	0	1 130 000	9 964 957	86 940	27 585 039
Mazenod - St Michael's	13.5	0	599 174	0	6 406 043	55 890	7 061 107
St Michael's - Patiseng	60.0	69 813 966	0	654 774	42 284 000	248 400	113 001 140
Total	94.5	92 035 108	599 174	1 729 174	76 645 000	391 230	171 455 286

APPENDIX 3:

Requirements for a comprehensive EIA

LCAR: Summary table of impacts with mitigation and optimisation

	Significance	Negative impact	Significance	Positive impact
National / Regional	High	• Contradicts existing road plans and places additional burden on road maintenance budget	High	• Promotion of planning objectives of economic growth, democratisation and employment creation
			Moderate	• Creation of new transport linkages
	Moderate	• Impact on existing tourist facilities	Moderate	• Promotion of tourism
			Moderate-Low	• Promotion of decentralisation
Socio-economic			High	• Improved access to goods, services and facilities for remote rural people
	Moderate	• Disruption of local economy		
	Low	• Interference with access to or destruction of potable water supplies		
	Low	• Traffic congestion & increased accidents	Moderate	• Increased employment opportunities
	Low	• Increased crime		
	Low	• Increased risk/danger to livestock		
	Low	• Disturbance of burial sites		
	Low	• Social disruption of local communities		
	Low	• Noise disturbance from blasting		
	Low	• Rockfall on fields		
	Low	• Scarring of landscape and loss of rural	Low	• Increased opportunities to market goods
Biophysical	High	• Impacts on SA Red Data Book species: Maluti Minnow (endangered) and Aquatic River Frog (restricted)		No significant impacts
	Moderate	• Loss of spiral aloe populations		
	Moderate-Low	• Increased siltation of water courses		
	Moderate-Low	• Destruction of wetlands		
	Low	• Loss of *Leucosidea* woodland		
	Low	• Clogging of river courses with rockfall		
	Low	• Altered drainage through culverts and bridges		
	Low	• Loss of future options for conservation		
Archaeology		No significant impacts		No significant impacts

LCAR: Summary table of impacts without mitigation and optimisation

	Significance	Negative impact	Significance	Positive impact
National / Regional	High	• Not in accordance with existing road plans & places additional burden on maintenance budget	Moderate	• Could promote exploitation of motorist tourist opportunities
	Moderate	• Contradicts settlement planning & may detract from growth of identified rural centres	Low	• Promotion of national planning objectives, economic growth, employment creation & democratisation
	Moderate	• Negative impact on existing tourist facilities	Low	• Limited reinforcement of plans for Leribe district
Socio-economic	High	• Impacts on resources requiring compensation	High	• Improved access to facilities, goods and services for rural, remote areas
	High	• Disruption of local economy		
	High	• Interference with access to or destruction of potable water supplies		
	Moderate	• Increased crime		
	Moderate	• Increased risk/dangers to livestock		
	Moderate	• Rockfall on cultivated land		
	Moderate	• Disturbance of burial sites		
	Moderate	• Social disruption of local communities		
	Moderate	• Increased traffic congestion Maputsoe to Ha Mateka		
	Moderate	• Noise disturbance from blasting		
	Low	• Scarring of landscape and loss of rural character	Low	• Increased opportunities to market goods
			Low	• Increased employment opportunities
Biophysical	High	• Increased siltation of watercourses		No significant impacts
	High	• Impact on SA Red Data species: Maluti Minnow (endangered) and Aquatic River Frog (restricted)		
	High	• Loss of *Leucosidea* woodland		
	High-moderate	• Clogging of watercourses with rocks		
	High-moderate	• Destruction of wetlands		
	Moderate	• Altered drainage through culverts & bridges		
	Moderate	• Loss of future options for conservation		
	Moderate	• Loss of spiral aloe populations		
Archaeology		• Loss of known and unknown sites of archaeological interest		No significant impacts

WAR: Summary table of impacts with mitigation and optimisation

	Significance	Negative impacts	Significance	Positive impacts
National / Regional		No significant impacts	High High Moderate Low Low	• Reinforces national road network plans • Maseru bypass will alleviate congestion • Promotes national planning objectives • Promotes the objectives of the National Settlement Policy • Promotes tourism
Socio-economic	High High High High Moderate Moderate Moderate	• Interference with potable water supplies • Loss of houses, businesses & facilities • Social disruption • Loss of agricultural resources • Inconvenience and increased risk to people and livestock • Increased cost of living • Aesthetic impacts	High Moderate Moderate Low	• Improved transport and access to facilities, goods and services • Reduced dust and mud • Increased business and employment opportunities • Improved speed & safety of travel
Biophysical	Moderate Moderate Moderate Moderate Moderate Moderate Low	• Clogging of watercourses with rocks • Loss of marsh areas • Destruction of spiral aloe populations • Destruction of *Leucosidea* shrubland • Increased siltation of watercourses • Disturbance/death of faunal elements due to construction and improved access • Destruction of *Erica alopecurus* habitat		No significant impacts
Archaeology	Low	• Loss of archaeological materials		No significant impacts

WAR: Summary table of impacts without mitigation and optimisation

	Significance	Negative impacts	Significance	Positive impacts
National / Regional		No significant impacts	High High High	• Accords with national road plans • Reinforces national planning objectives • Maseru bypass will relieve congestion
			Moderate	• Reinforces objectives of the National Settlement Policy
			Low	• Promotes tourism
Socio-economic			High	• Improved transport and access to facilities, goods and services
	Moderate Moderate Moderate Moderate Moderate	• Loss of agricultural resources • Social disruption • Interference with potable water supplies • Inconvenience and increased risk to people and livestock • Loss of houses, businesses & facilities	Moderate Moderate Moderate	• Increased business and employment opportunities • Reduced dust and mud • Improved speed & safety of travel
	Low Low	• Aesthetic impacts • Increased cost of living		
Biophysical	Low Low Low Low Low Low Low	• Increased siltation of watercourses • Clogging of watercourses with rocks • Loss of marsh areas • Destruction of spiral aloe populations • Loss of faunal elements • Loss of *Leucosidea* shrubland • Loss of other vegetation		No significant impacts
Archaeology	Low	• Impact on archaeological materials		No significant impacts

Maseru 'bypass': Summary table of impacts

	No go option	Route 1	Route 2	Route 3	Route 4	Route 5	Route 6
Displacement of people	No displacement	No displacement	Low	High	High	High	Low
Loss of buildings and infrastructure	No loss	Low	Low	High	High	High	Low
Loss of arable land	No loss	No loss	Low	Low	Low	Low	High
Danger to health & safety	Increased danger	Increased danger	Increased danger	Increased danger	Increased danger	Increased danger	Low
Division of cohesive communities	No division	Low	Significant division in rural villages	High as no road exists presently	Division already exists to a lesser extent due to road	High where no road presently exists	Low
Soil erosion	No effect	No effect	Increase during construction	Low	Low	Low	High during construction
Reinforcing of Maseru urban planning initiatives	No reinforcing	No reinforcing	Reinforces but no plans exist south of Phuth. River	Little reinforcing	Little reinforcing	Reinforces present and future plans	Reinforces future plans
Provision of access to existing development areas	No improved access	No improved access	Improves access Few people	Improves access Many people	Improves access Many people	Improves access Many people	Improves access Few people
Relief of traffic congestion in the CBD	Increases congestion	No relief	Relief low 200-400 vehicles/day	Relief high 1000-2000 vehicles/day	Relief high 1000-2000 vehicles/day	Relief high 1000-2000 vehicles/day	Relief high but junction far south
Relief of traffic congestion on other arterial roads	Increases congestion	No relief Worsen	Relief low 200-400 vehicles/day	Relief but feeds traffic close to CBD	Relief high 1000-2000 vehicles/day	Relief high 1000-2000 vehicles/day	Relief high 1000-2000v/d
Facilitates the efficient transport of materials to dam	No	No Interrupted traffic flow	Yes Uninterrupted traffic flow	No Interrupted traffic flow	Possible Uninterrupted traffic flow	Possible Uninterrupted traffic flow	Yes Uninterrupted traffic flow
Compensation required Land: Buildings:	Nothing	Low	Land: +/- 8 ha Buildings: <20	Land: +/- 11 ha Buildings: +/- 30	Land: +/- 16 ha Buildings: +/- 100	Land: +/- 17 ha Buildings: +/- 80	Land: +/- 18 ha Buildings: <30