AN IMPACT ASSESSMENT OF ALTERNATIVE ACCESS ROADS TO THE MOHALE DAM, LESOTHO

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Heather Mackinnon
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EXECUTIVE SUMMARY

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Purpose of Impact Assessments The purpose of Impact Assessments (IAs) is to reconcile society's needs for development with its need to conserve the environment. IA aims to assist planners to devise solutions that are sustainable and equitable, but still efficient.

IA falls short In practice, the influence of IA on the planning process has been called into question: its recommendations are not always implemented, and some of its mitigatory measures have been narrow and naïve. The gap between IA principles and IA praxis needs to be bridged by more effective procedures.

Faulty problem formulation In this dissertation it is mooted that conventional IA procedures, including the 1992 Integrated Environmental Management procedure, pay inadequate attention to the formulation of problems. There is a danger that IAs may focus on the wrong problem, or may misconstrue the right problem. Weak problem conception may then give birth to less than optimal solutions.

Flawed solutions
Following the IA for Contract 1000 (access roads to the Mohale Dam), only two alternative solutions were presented to the decision-maker for consideration. Of these, the LCAR is likely to be rejected because it is associated with high risks to the integrity of the biophysical environment, and because it costs M47 million (Malotis) more to construct than does the WAR. By default, the WAR is likely to become the preferred alternative; however it is unable to address some of the fundamental problems in the project area. Selection of the WAR as the access route for transporting materials to the Mohale Dam site "creates" groups of winners and losers in the affected society. In addition, failure to build the LCAR is equivalent to a lost opportunity (ie it represents an opportunity cost) for certain other groups of "losers" [see Table S1]. The WAR, the best solution that conventional IA could generate, is manifestly a less-than-optimal solution.

A problem-solving approach
Analyses of the actual procedure followed during the IA for Contract 1000, and of the conventional approach to IA (according to the literature) point to the failure of IA procedures to recognise certain crucial features of environmental problems. IA procedures are not adapted to the dynamism or the complexity of environmental problems, and are not adequately designed to take into account interrrelationships (linkages) among either affected environments or among particular problems. IA is also in danger of becoming divorced from its political ("real world") context.

In an attempt to address these failings of IA, a problem-solving approach to IA is developed. The new approach to IA is based on the 1992 IEM procedure, but is supplemented by elements of the natural human problem-solving process [after Miller

1985], and is also informed by Hill and Fuggle's [1990] classification of types and levels of alternatives [figs S1, S2].

Skills needed

The problem-solving approach to IA depends for its success on the competences of the IA professionals implementing it. IA professionals will need to play several crucial roles: they will need to manage both information and multidisciplinary teams effectively. IA professionals will also have to play stronger environmental advocacy roles than before, and will need particular competences in the fields of communication and management.

Some methodologies

Multidisciplinary site visits at the early stages of a project are potentially efficient problem formulation methodologies. Facilitated multidisciplinary and multi-party meetings are also recommended to improve the accurate formulation of problems and the generation of realistic alternatives. Brainstorming and negotiation are activities that could take place at these meetings, as well as the establishment of inter-institutional working groups (problem-solving units) to address particular problem areas.

Problem-solving IA applied

Three basic problems of the project area are delimited: lack of access (specifically lack of motor access to the Mohale Dam site, but also general lack of access to facilities and services); (economic) underdevelopment, and the risks of project-enhanced degradation of the environment. It is argued that specific problems identified by the IA for Contract 1000 can be analysed in the context of these basic problem areas. Then, the problem-solving approach is applied stepwise to data from the IA for Contract 1000 to generate a hypothetical solution which can be compared with the solution generated by the actual (conventional) approach to IA.

Comparison of conventional and problem-solving solutions

The two solutions are evaluated in terms of Stauth's criteria for resource use (efficiency, equity, and sustainability) and in terms of the implications for six different "user groups". These groups are: the proponent (LHDA), the national government of Lesotho (GoL), residents along the Western Access Route and along the Least Cost Alternative Route, conservationists, and business- and tourist travellers. The new approach addresses problems which were left unresolved by the conventional approach [Table S2], specifically the underdevelopment of the region inhabited by the LCAR residents. It is argued that a "solution" that fails to address this problem is inequitable, and probably unsustainable.

Conclusions

People-oriented and change-focused IA that takes account of political realities is able to address problems in a more integrated and pragmatic way. Through improved problem formulation, and by deliberately generating a wide range of potential solutions, "problem-solving IA" can generate solutions to environment-development conflicts that are more sustainable and equitable, but no less efficient than the solutions generated up to now by conventional IA.

TABLE S1 LOSER GROUPS

LEAST COST ALTERNATIVE ROUTE

	Positive impact
National / Regional	• Promotion of planning objectives (economic growth, democratisation and employment creation) • *Creation of new transport linkages* • *Promotion of new tourist activities* • Promotion of decentralisation
Socio-economic	• Improved access to goods, services and facilities for remote rural people • *Increased employment opportunities* • Increased opportunities to market goods
Biophysical	No significant impacts
Archaeology	No significant impacts

GoL

TRAVELLERS

LCAR RESIDENTS

Key to significance of impacts:-

- High
- Moderate
- Low

WESTERN ACCESS ROUTE

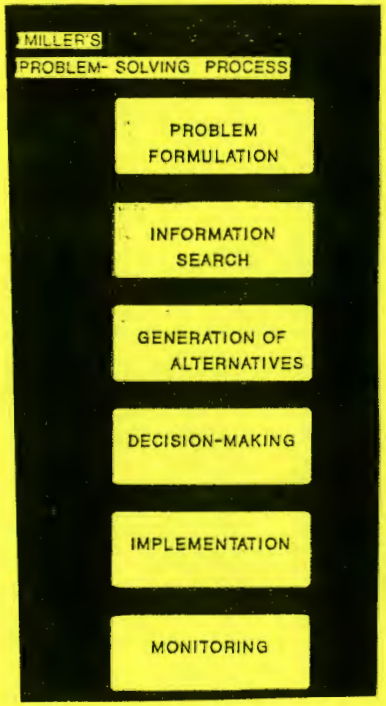
Socio-economic	• *Loss of agricultural resources* • *Social disruption* • *Interference with potable water supplies* • *Inconvenience and increased risk to people and livestock* • *Loss of houses, businesses & facilities* • Impact on archaeological materials • Aesthetic impacts • Increased cost of living
Biophysical	• 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
Financial	M 178 229 243

WAR RESIDENTS

CONSERVATIO -NISTS

Key to significance of impacts:-

- Moderate
- Low



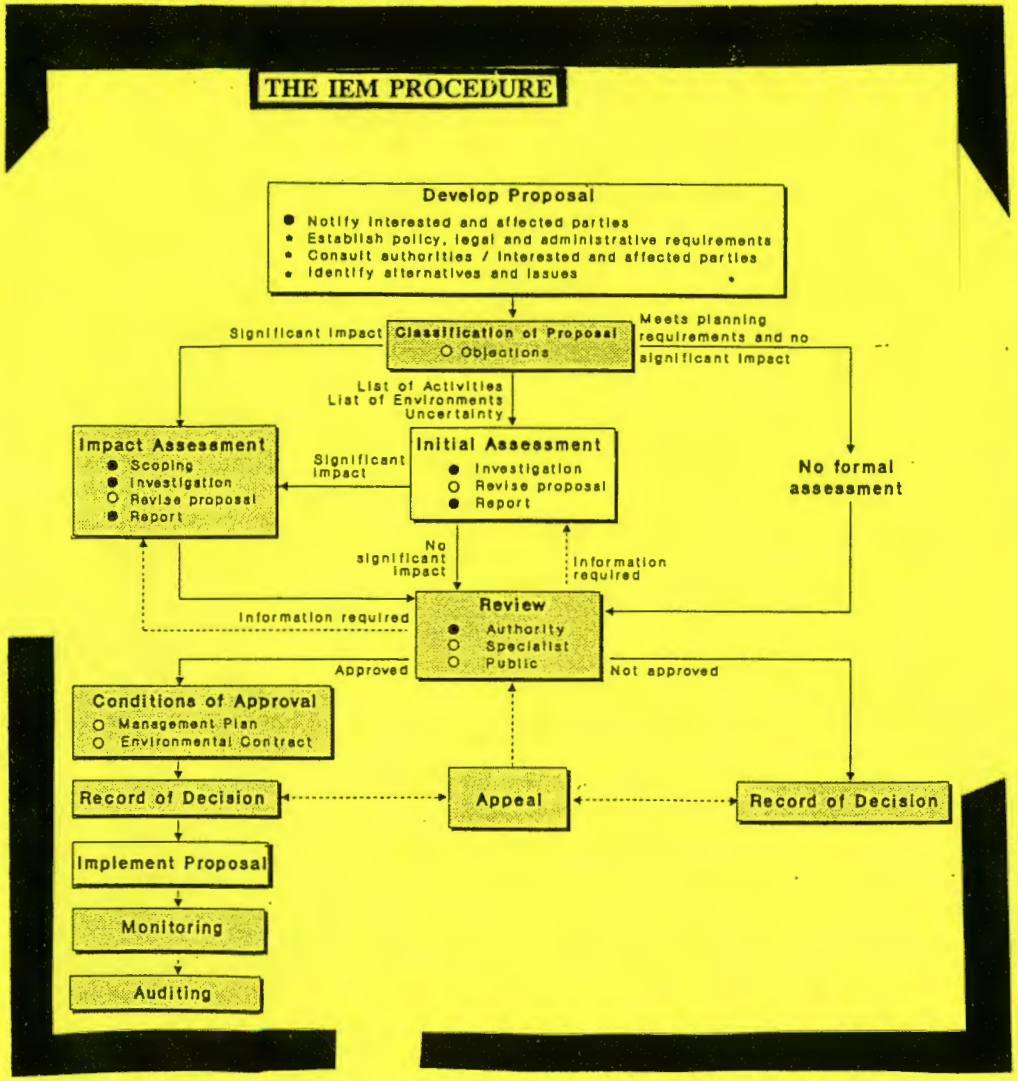


FIG S1 Miller's Problem-solving Process, the IEM procedure and Hill & Fuggle's Types and Levels of Alternatives

(sources of the "problem-solving" approach to IA)

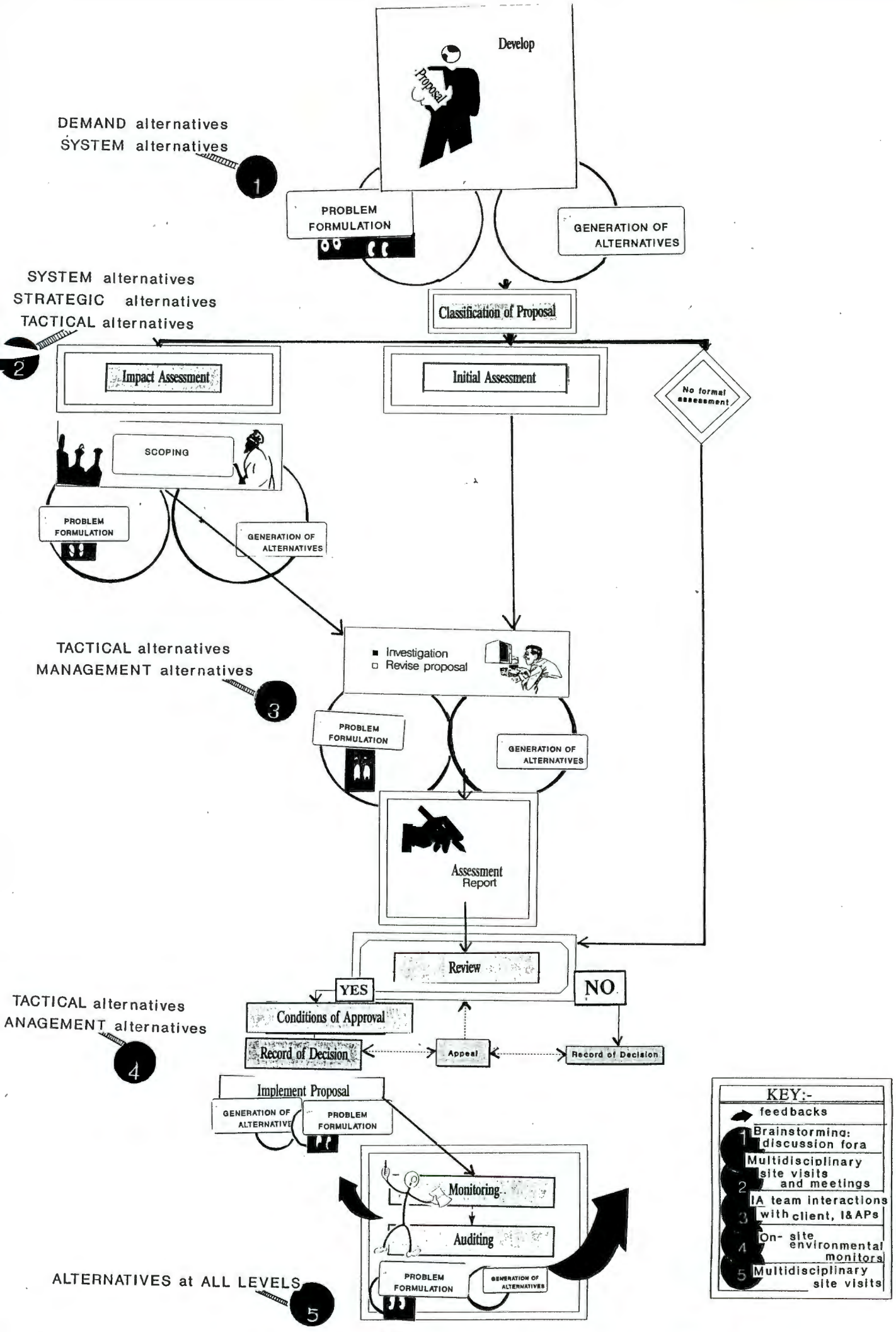
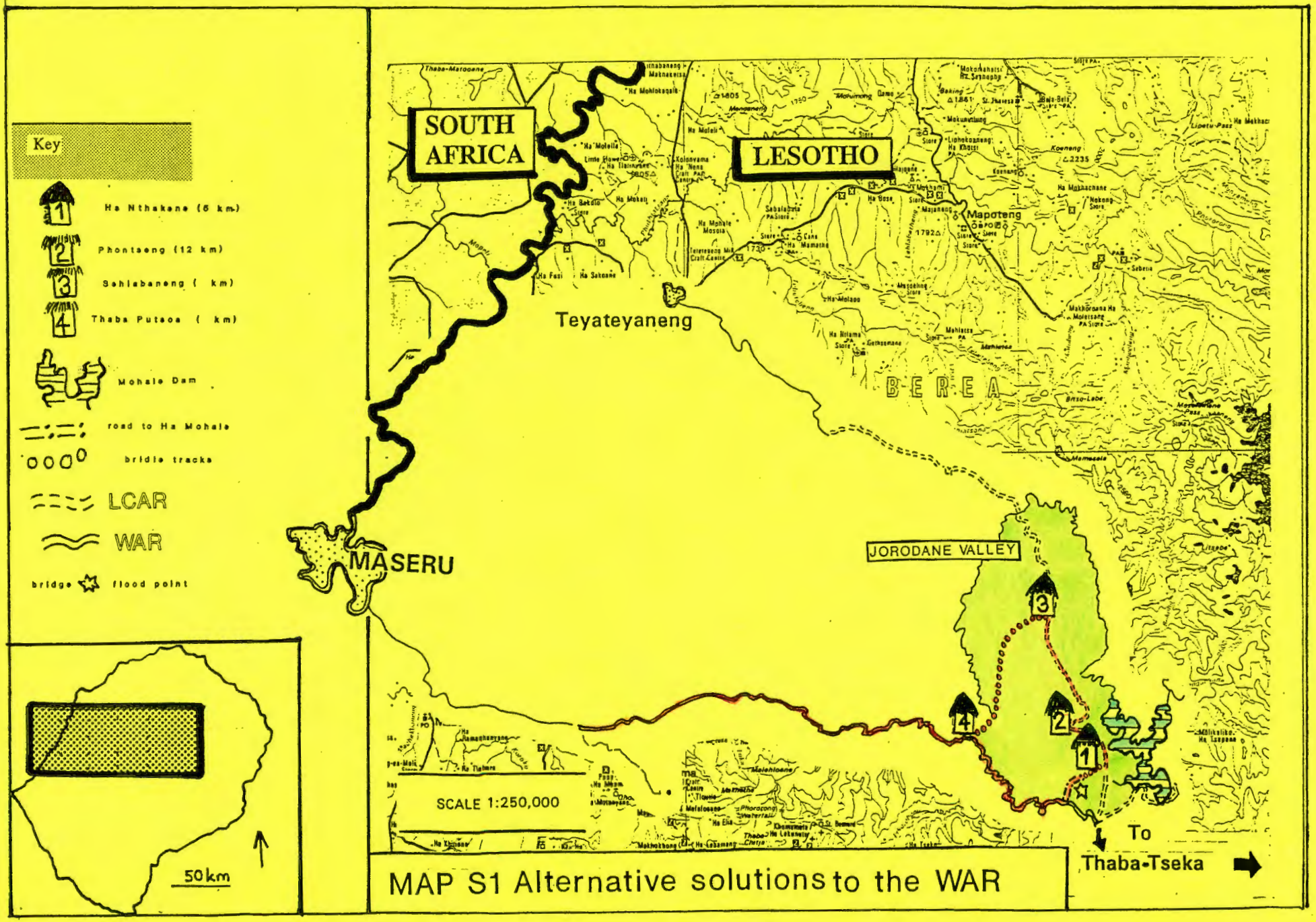


FIG S2 Flow diagram of the "problem-solving" IA procedure



MAP S1 Alternative solutions to the WAR

TABLE S2 Framework comparison of the WAR and the "problem-solving" solution

USER GROUP	WAR	"NEW"
PROPONENTS	* provides efficient access to Dam site	
		* ring road provides alternative access to Dam site * minor, temporary administrative inconvenience
GoL	* savings in national road maintenance and transport development budgets * provision of temporary employment for Basotho	
		* economic development and service provision in the highlands * wide range of temporary and permanent jobs and business opportunities
CONSERVATIO-NIST	* localised biophysical impacts	* enhanced possibilities for declaring a wilderness sanctuary * (indirect) reduction in soil erosion * controlled future development of the Jorodane Valley * preservation of cultural and architectural heritage
WAR RESIDENTS	* possible improved availability of public transport * temporary construction jobs for some residents	
		* additional temporary and permanent job and business opportunities * increased availability of fresh vegetables
LCAR RESIDENTS	* no benefits or costs	* wide variety of business and employment opportunities * retention of cultural heritage (skills and vernacular architecture), community cohesion * conservation of natural resource base * opportunities to develop new skills * improved access to services, goods and facilities
TRAVELLERS	* temporary disruption of traffic during the 18 months of road construction * Maseru Bypass relieves congestion * faster and safer travel along 63 km mid-section of the Mountain Road * provision of some Dam-related tourist facilities	
		* new opportunities for motor tourism (mountain scenery, traditional villages and lifestyles, Dam-related facilities) * protection of existing "unspoilt" area, and enhanced opportunities for adventure- and eco-tourism

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ACKNOWLEDGEMENTS

If any of you lacks wisdom, let him ask of God,
who gives to all liberally and without reproach,
and it will be given to him.

(James 1:5)

If there is any wisdom in this dissertation, the glory rightly belongs to God; any flaws are mine, and mine alone. In the course of my attempts over the past eighteen months to fulfill the requirements for the degree Master of Philosophy in Environmental Science, I have been grateful primarily to God my Father on whom I depend utterly, not only for daily wisdom and strength, but for my very being (Colossians 1:16-17). Because of Him, eternal gratitude is not just a high-sounding phrase, but a reality, for God has given us eternal life and this life is in His Son (1 John 5:11).

In His special providence, the God of Abraham, Isaac, and me (!) has placed me in the care of a group of people who know and love Him, and who have been to me a constant encouragement, both in their prayers and in their practical application of the Word. Faith Baptist Church of Pinelands, it would have been much less meaningful and much less enjoyable if I hadn't known you all. Especial thanks to the Jacksons for their support, for their willing ears and for frequently adopting me into their home.

Thanks are also due to ENGEO in general for fostering a spirit of excellence, and in particular to Richard Hill for his fine example and excellent teaching throughout the Course.

The EEU deserves thanks for being brave enough to allow student researchers to rush off to the Lesotho Highlands when they knew that even angels would need to tread lightly. In particular, Shirley Grindley deserves a medal for maintaining her cool in the face of seeming chaos.

My experience of the Course has been much-enriched by knowing the other eight "student researchers". These have been some of the most hilarious and stimulating months of my life. I am also grateful for the highly skilled and professional input of each team member into this project.

For financial support, I am grateful to the CSD and, finally, I am grateful to my family - for not disowning me (yet), and for always being there when the need arises.

LIST OF ABBREVIATIONS

Contract 1000	Contract for construction of the access roads to the Mohale Dam, Lesotho
DEA	Department of Environment Affairs, RSA
EEU	Environmental Evaluation Unit, University of Cape Town
GBJV	Gibbs-Bergmann Joint Venture
GoL	Government of Lesotho
I&APS	Interested and Affected Parties
IA	Impact Assessment
IAs	Impact Assessments
IEM	Integrated Environmental Management
km	kilometres
LCAR	Least Cost Alternative Route
LHDA	Lesotho Highlands Development Authority
LHWP	Lesotho Highlands Water Project
PWV	Pretoria - Witwatersrand-Vaal industrial region
RSA	Republic of South Africa
SDA	Selected Development Area
SIA	Social Impact Assessment
WAR	Western Access Route

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INTRODUCTION

i Motivation

One of the primary purposes of environmental evaluations is **to propose solutions to problems** that may arise through interactions between the environment and project actions of development proposals [Fuggle 1992:762].

The initial descriptions of South Africa's Integrated Environmental Management procedure spoke of harmonising (resolving) the conflicting interests of Development and Conservation [DEA 1989:4]. Even earlier, it was asserted that, by definition, environmental impact assessments (EIAs) identify and predict the impact on mankind's health and well-being of legislative proposals, policies, programmes, projects and operational procedures, and interpret and communicate information about the impacts [Munn 1979]. Presumably, this information is to be used; it has been gathered and processed in order to improve the resolution of environmental problems. "Environmental Impact Assessment", writes Boggs [1991:2] "aims to make knowledge useful, and used ..."

Environmental problems are both complex and ill-structured in space and time; they may be ambiguous indirect or diffuse and often involve a profusion of low-probability events [Miller 1983:134, Miller 1985:232, Fuggle 1992:764]. Recent psychological literature holds that their resolution involves a human thought process which is also complex. Miller points out that this thought process is not a simple linear progression through discrete stages [Miller 1983:134]. It would seem logical that any problem-solving procedure, including IEM, ought to be able to accommodate the necessary complex thinking. At the very least, the procedure should not obstruct the normal human problem-solving process. Admittedly, there is little agreement about the exact nature of this process, but it has been recognised that it involves "a continuous shifting back and forth" [Miller 1983:134]; in other words it is iterative. To some extent, the 1992 IEM procedure has made provision for this: at various stages there are feedback loops and opportunities for review and appeal [fig 1].

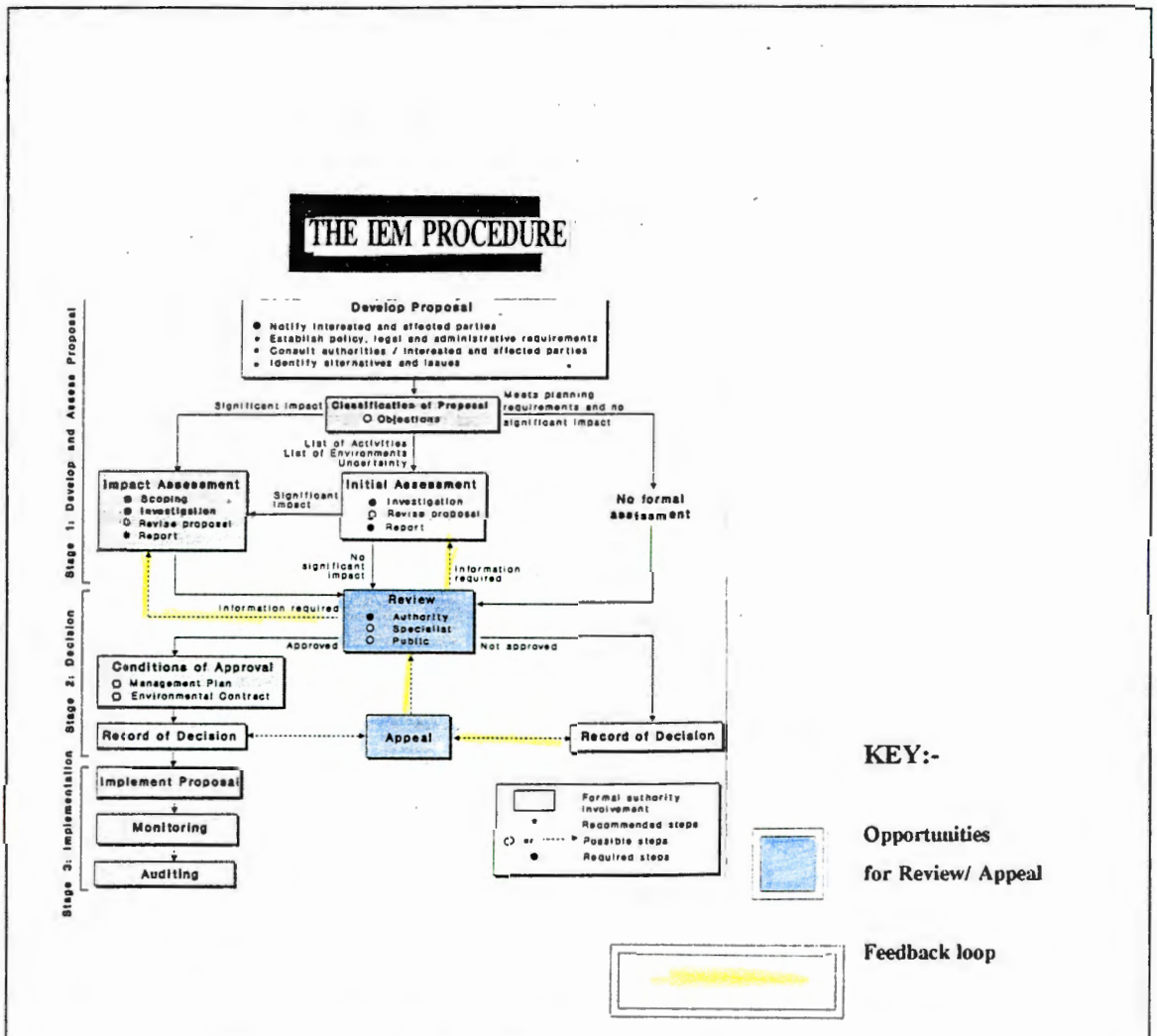


Figure 1 Provision in the IEM procedure for iterative problem-solving

ii Objectives and Approach

> ... it is always convenient (and academically respectable) to order one's concepts in a neat epistemological framework
>
> [Hurst 1974:6]

In order to evaluate the adequacy of the IA procedure followed under the terms of LHDA Contract 1000, and to assess the procedure's potential for generating implementable solutions which satisfy the criteria of efficiency, equity and sustainability [after Stauth 1992:32], use has been made of Miller's simplified description of the problem-solving process [Miller 1983:134 - see also Chapter 1]. Hill

and Fuggle's classification [1990] of levels and types of alternative solutions [Chapter 3] is also drawn upon to inform the discussion.

According to Miller [1983:134], problem-solving entails the following activities:-

1) problem recognition and formulation;

2) information search;

3) generation of alternative solutions;

4) choice between alternatives (decision-making);

5) implementation of solutions, and

6) evaluation of consequences (monitoring).

It is beyond the scope of this dissertation to explore in detail **all** of the above activities as they pertain to the set of environmental problems under discussion (ie Contract 1000 - the access roads to the Mohale Dam). Nor is any attempt made to analyse their sequence or prevalence in the problem-solving process, as these issues are still controversial even among theoreticians [Elstein 1978:134]. Miller's categorisation of activities is accepted simply as a convenient analytical tool.

The IA itself - incorporating the **procedures** adopted during the execution of Contract 1000 and the **resultant findings** [reports EEU/ 1992/104b-e] - is treated as a case study.

The chosen analytical tool (Miller's list of activities) is applied to the IA to develop the hypothesis that there are feasible ways to improve the contribution of (E)IAs to the formulation of workable solutions to environmental problems.

A modified process which could profitably have been applied to the IA for Contract 1000 is proposed. This modified process does not purport to be a Grand Theory; rather, it is a tentative framework, the functionality of which can only be tested empirically in actual, future IAs.

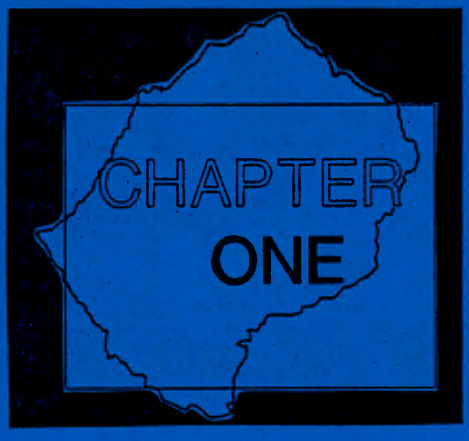
A "new" solution, which was not identified by the "nonideal" manifestation of the IEM procedure during the IA for Contract 1000, but which **could have** been generated by the proposed modified process, is evaluated against an "old" alternative solution.

iii Structure of this Report

In the first part of this report (Part A) a problem-solving approach to IA is developed, and in Part B (Chapters 6 -11), this approach is applied to the actual IA for Contract 1000.

In Chapter 1 of Part A, Miller's theoretical problem-solving activities are correlated with the set of activities that comprised Contract 1000 (fig 2), and both are related to the standard (1992) IEM procedure. Thereafter, in Chapters 2 and 3 respectively, particular attention is given to activity 1 (problem recognition and formulation) and to activity 3 (the generation of alternative solutions). In somewhat less depth, Chapter 4 examines the political realities governing the implementation of solutions (activity 5). The final Chapter of Part A (Chapter 5) assesses briefly the role of the IA and, more specifically, the capacity of the IA report to facilitate the choice between alternatives (activity 4).

The theoretical constructs developed in Part A are used in Chapters 6 to 9 to investigate the inadequacies of the IA for Contract 1000. Chapter 6 applies the concepts of "Problem recognition and Formulation" developed in Chapter 2, to the IA for Contract 1000. Chapter 7 explores impact subjectivity and then apportions significances among various different groups of parties (I&APs) interested in and potentially affected by Contract 1000. Theoretical considerations are combined with the information available in the IA reports [EEU/2/93/104b-e] to select a preferred alternative route for the access road to the Mohale Dam site (Chapter 8). The issues and problems left unresolved by this chosen alternative are highlighted in Chapter 9. Finally, Chapters 10 and 11 develop an alternative conceptualisation of the existing and potential "environmental" problems associated with Contract 1000, and derive some alternative potential solutions. These solutions are compared in Chapter 11 with the alternative generated by the actual (conventional) IA for Contract 1000. The conclusions to Part A are presented in the form of a modified flow diagram of the ideal (1992) IEM process. The section, "Conclusions to Part B", highlights the main criticisms of the IA for Contract 1000 in terms of the problem-solving approach to IA, and summarises the points made in the comparative evaluation of the actual "old" solutions (generated by conventional IA) and hypothetical "new" solutions (generated by a problem-solving approach to IA).



Comparison of Miller's Problem-solving Process with the IEM Procedure, and with the actual IA for Contract 1000

PART A Developing a Problem-solving Approach to IA

CHAPTER ONE Comparison of Miller's Problem-solving approach, the IEM procedure, and the IA for Contract 1000

In figure 2, the steps in Miller's problem-solving process are juxtaposed with the 1992 IEM procedure. "Problem-solving" steps in the IEM procedure are highlighted. Similarly, the problem-solving steps of the actual IA for Contract 1000 are presented (a more complete diagram of the process followed in the IA for Contract 1000 is presented in figure 8 of Chapter 6).

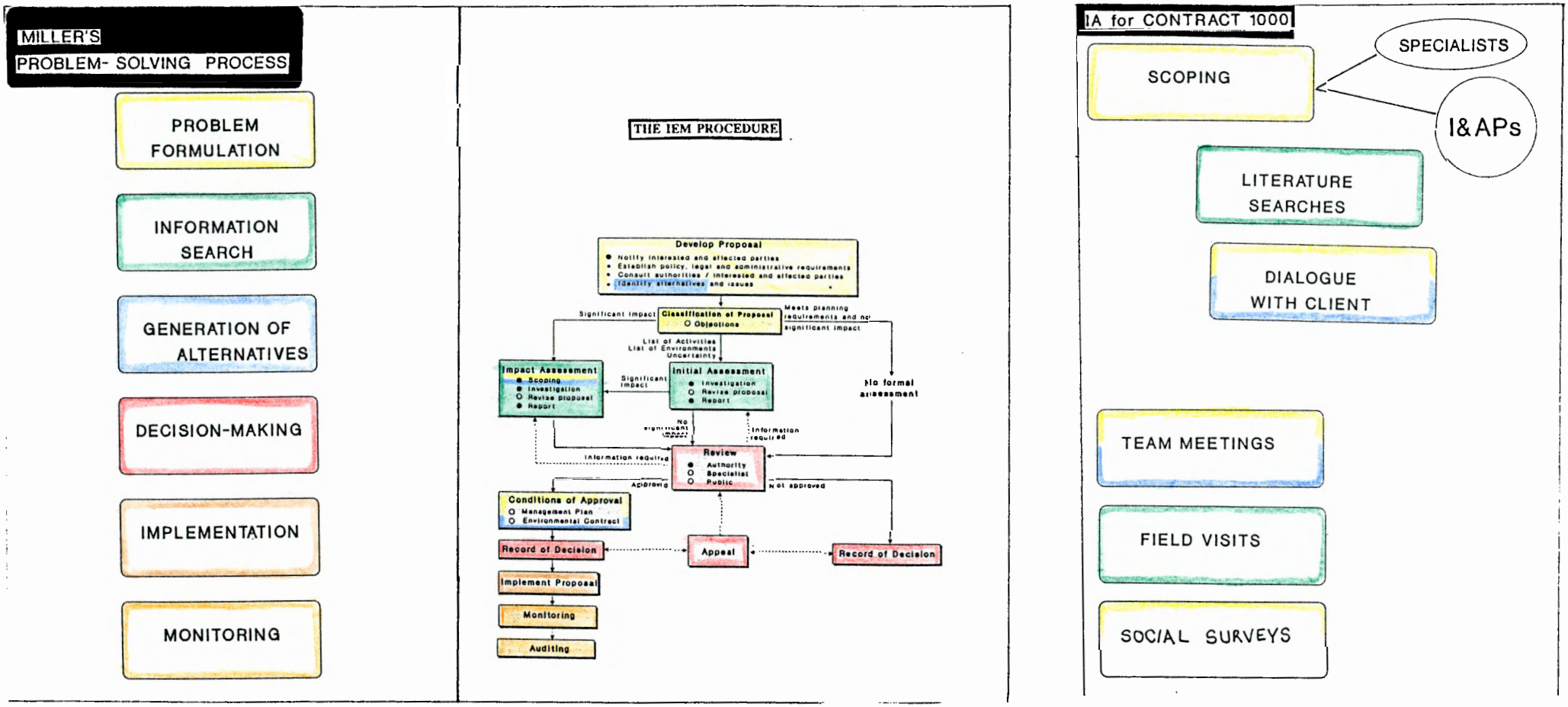
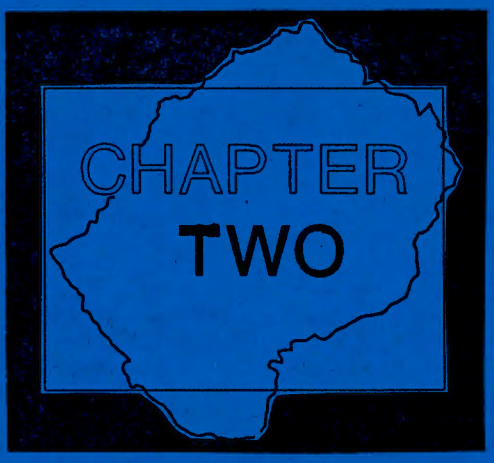


FIGURE 2 **Comparison of Miller's Problem-solving process, the IEM procedure, and the IA for Contract 1000**



Problem recognition and Formulation

PART A Developing a Problem-solving Approach to IA

CHAPTER 2 Problem recognition and formulation

> But it's always interesting when one
> doesn't see, she said. If you don't see
> what a thing means you must be looking at it
> the wrong way round.
>
> (Agatha Christie).

Unfortunately, environmental problems do not come readily organised and clearly delimited; they have to be formulated by those attempting to resolve them [Miller 1985:239]. Often, upon examination, the "problem" turns out to be a good deal more complicated than initially thought, and its identification can vary depending upon who does the defining [Wolf 1983].

For the purposes of this discussion, a distinction must be made between **existing**, or prevailing, environmental problems (including those which the development or project proposal sets out to solve) and the **new problems** which result from the implementation of the project. Within the Impact Assessment of a particular project (or plan, or policy) is usually an implicit goal: to determine how "well" the project addresses the initial prevailing (set of) environmental problems. Criteria of efficiency, sustainability and equity (after Stauth 1992:31) have been proposed to assist in the evaluation of project performance (how "well" a project solves the initial existing problems). In practice, however, Impact Assessments (IAs) have often been limited in their focus to the minimisation and attenuation of the **new problems** which the project itself induces. This has drawn criticism from various quarters [see, eg Berkes 1988, Quinlan 1991] that impact assessments have limited relevance to "real-world" environmental problems. In this dissertation, it is contended that the source of this limitation is **faulty problem formulation** throughout various stages of the IA, but particularly in the initial stages, when, for example, the terms of reference of the study are being written.

Problem definition is an ongoing and iterative process.

It is helpful to recognize that problem definition occurs at various levels and at various stages during project planning, implementation and even afterwards (eg during monitoring). Most obviously, this is because new information becomes available to facilitate progressively more refined understanding, but it is also linked to the uncertainties and inherent dynamism of projects.

If problems are to be addressed effectively, they need to be defined at appropriate levels of management, or, in terms of **management or problem-solving units** (see 2.2.4, below, and also Chapter 5).

2.1 Problem recognition: The first stage

At the first, primary level, a project proposal is born out of a particular understanding of some **need**. The Cape Provincial Administration (CPA), for example, classes road projects into six stages, the first of which is a consideration of need [Box 1].

BOX 1	STAGES OF A ROAD PROJECT (CPA)
1)	Determine Need
2)	Plan Network
3)	Identify Corridor
4)	Plan Route
5)	Design Road (Preliminary)
6)	Design Road (Detailed)

Within particular affected environments, there is a multiplicity of needs. The point is trivial in logic, but the practical implications are not. In practice, the proponent, based on his/her **perceptions** of needs in a particular affected environment, will initiate a proposal. In the absence of adequate planning policies for the environment in question, the needs perceived by other interested and affected parties are seldom considered at this level and stage of planning. Even "ideal" IEM makes no explicit provision for the revision of proposals following a consideration of **other** needs (scoping); IEM suggests only that revision of proposals is appropriate after IAs have been completed (fig 3). Nevertheless, the **principles** of IEM (*inter alia*, open participatory planning, consultation with interested and affected parties, accountability for decision-making, and democratic regard for individual rights and obligations) are to be applied "during **all stages** of the **planning**, implementation and decommissioning of proposals" [DEA1 1992:5]. For the purposes of this discussion, this amounts to an endorsement of participatory problem formulation [see also DEA2 1992:8]. In the ideal case, the key players need to be involved, in **some** capacity, right from the start (ie during the initial planning of proposals). In practice, however, the principal decisions have usually been taken by the time "affected people" are drawn into discussions regarding the project. Thoahlane [1991:339] has shown this to be true in the case of Phase 1a of the LHWP. He has raised the issue of possible "selfish" actions by the state at the expense of the masses [Thoahlane 1991:332], and has shown that the relative phasings of consultation (with affected publics) and decision-making are at variance with one another. **Participatory problem formulation** has not taken place, and the perceived need for the project, as presented to the IA team in its terms of reference, may well be a distortion of reality.

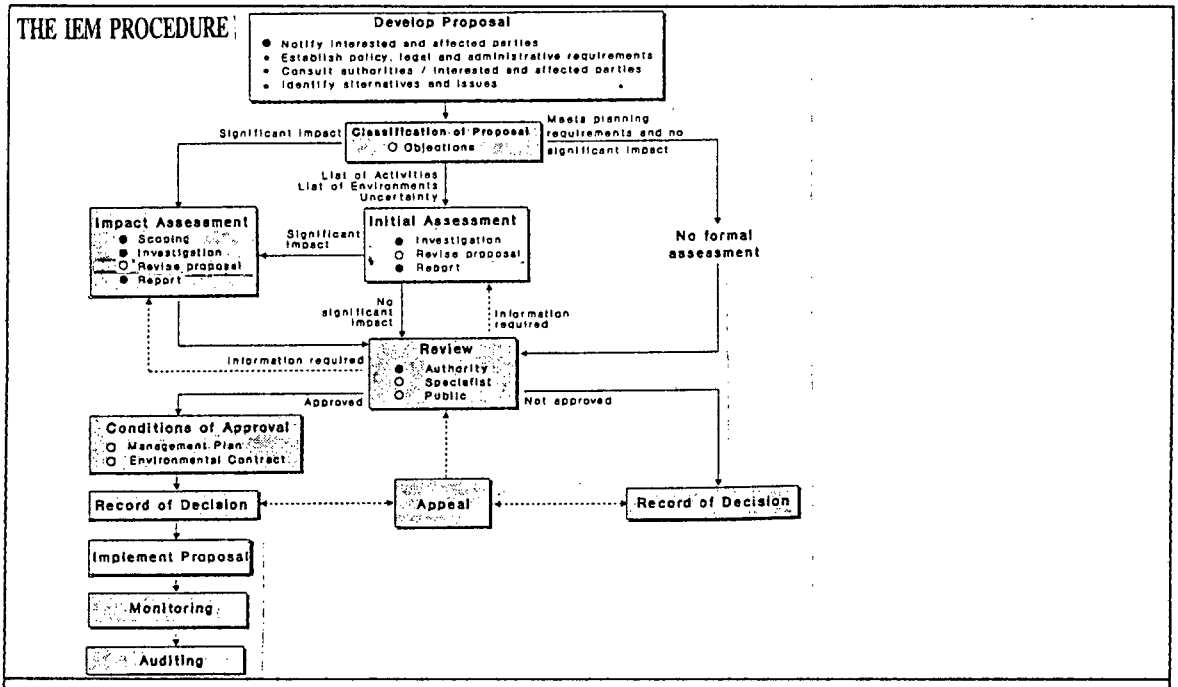


Fig 3 Provision in the IEM procedure for the Revision of proposals

2.2 Problem formulation: Subsequent phases

Environmental problems have multiple dimensions and contexts. Furthermore, problem areas are linked in complex and ever-changing (dynamic) ways. Linkages and interactions occur at various spatial and temporal scales, at various levels, and with a wide range of effects. Some of these interlinked effects are divergent; others mutually reinforce one another (feedback is positive); others mitigate or even counteract one another (feedback is negative). Feedbacks among problem areas are discussed, and illustrated graphically, in Chapter 10, Part B. Like environmental problems, IA teams are also complex, and dynamic; there are interactions internally, among team members, and also with the external environment. Problem recognition and formulation are coloured by the team's own ideological perspectives: even the best IA team can never have perfect knowledge, nor can it be perfectly objective. Team dynamics, as well as the inherent complexity, dynamism and multiple co-existing scales of real-world environmental problems, need to be taken into account by would-be environmental problem-solvers.

2.2.1 The influence of ideological perspective on problem formulation

There is a long-standing tradition, based on the colonial heritage of both the social sciences and "development projects" that "what needs to be changed are the poor, the powerless, the minorities, and the small communities, not the rich, the powerful, the

urban, or the élites" [Derman 1985:5]. On the whole, scientific disciplines that have challenged this traditional viewpoint are drawn from the social science end of the spectrum rather than the engineering and life sciences end. An IA team comprised of professionals from a range of disciplines with different prevailing ideologies (individuals, of course, may not conform to disciplinary stereotypes) is more likely to be aware of, and critical of the implicit ideological stance in its terms of reference or in its approach to the IA study. Skilled management of such an IA team by the IA manager will be necessary to facilitate constructive debate on ideological issues: an expanded view of environmental problems has the potential to improve impact prediction [see 2.2.3, and also Chapter 5, below].

2.2.2 Complexity of the affected environments: The need to recognise linkages

The **interrelationships** among social, economic, and environmental variables constitute a critical dimension of development planning and analysis [Derman 1985:5]. Because of the **complex linkages** between species in ecosystems, the effects of change are often indirect ... and sometimes more important than more obvious direct influences [Orians 1986:4].

In the past, IA has been guilty of neglecting linkages both within and between systems, and these both within and beyond the immediate spatial and temporal bounds of the project [see,eg, Berkes]. Figure 4 illustrates conceptually the difference between integrated problem formulation that recognizes interrelationships *ab initio*, and fragmented problem formulation that does not. As yet, IA has no proven track record of addressing the cumulative effects resulting from either multiple projects or from the multiple facets of "mega-projects" such as the Lesotho Highlands Water Project. Ecologists on IA teams have come in for criticism for allowing themselves to be bullied into focusing on only **one** of the roles that a species can play while neglecting other interactions; this can cause management interactions to fail or produce unwanted side-effects [Orians 1986:38]. Some practitioners have recognized this to be true and have responded by developing principles of "ecological EIA" [eg Roberts 1984], but it will be some time before these principles are incorporated fully into IA praxis. A recent and pertinent example of the consequences of ignoring inter-environment and inter-project linkages has been mentioned by Grindley [1992:1]:

> The continued pollution of the Malibamatso River by the upstream Kao Diamond Mine **negates efforts** by the Lesotho Highlands Development Authority to **control water pollution** and may **detrimentally affect** the quality of water to be delivered to the RSA **in the future.**

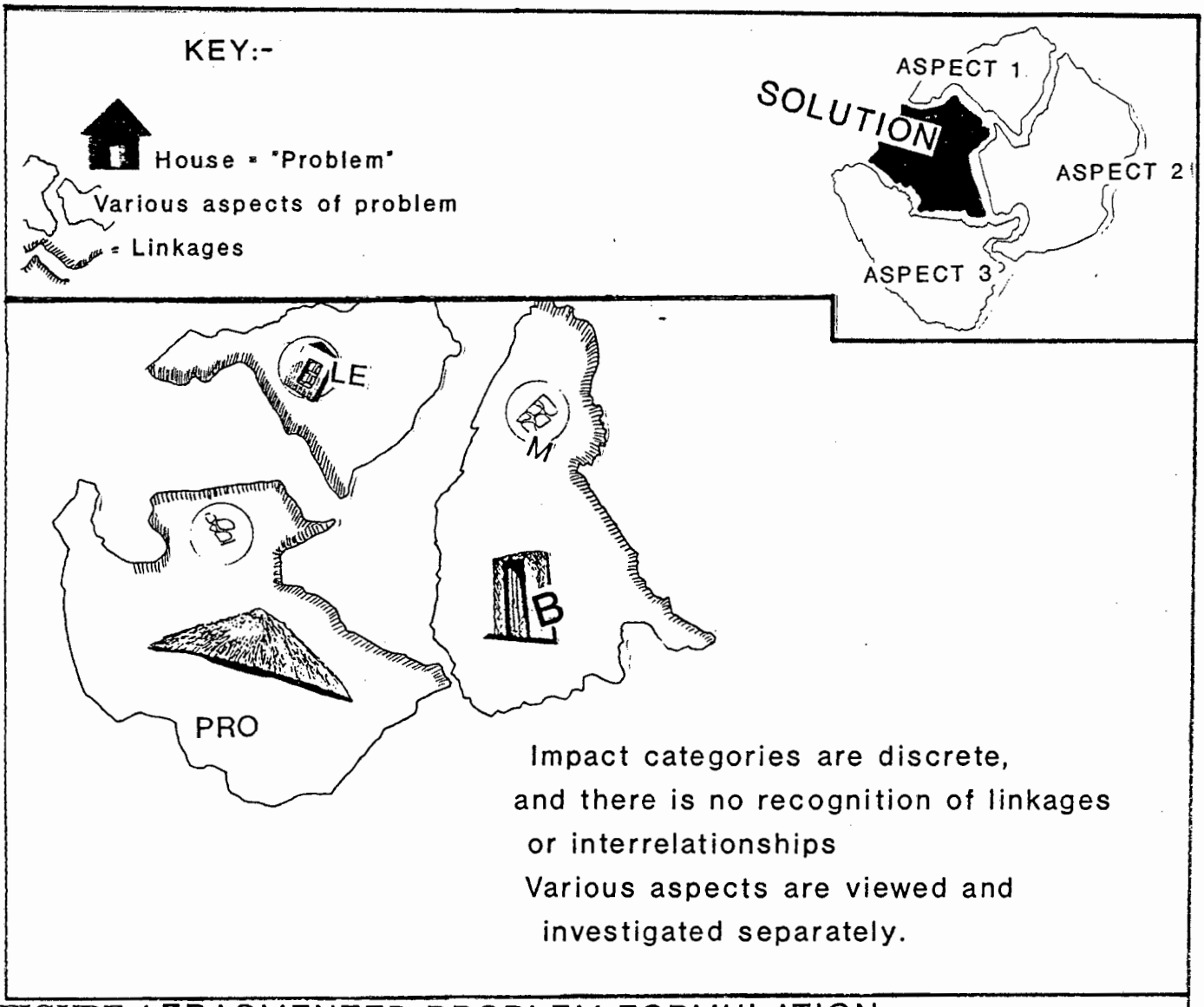


FIGURE 4 FRAGMENTED PROBLEM FORMULATION:

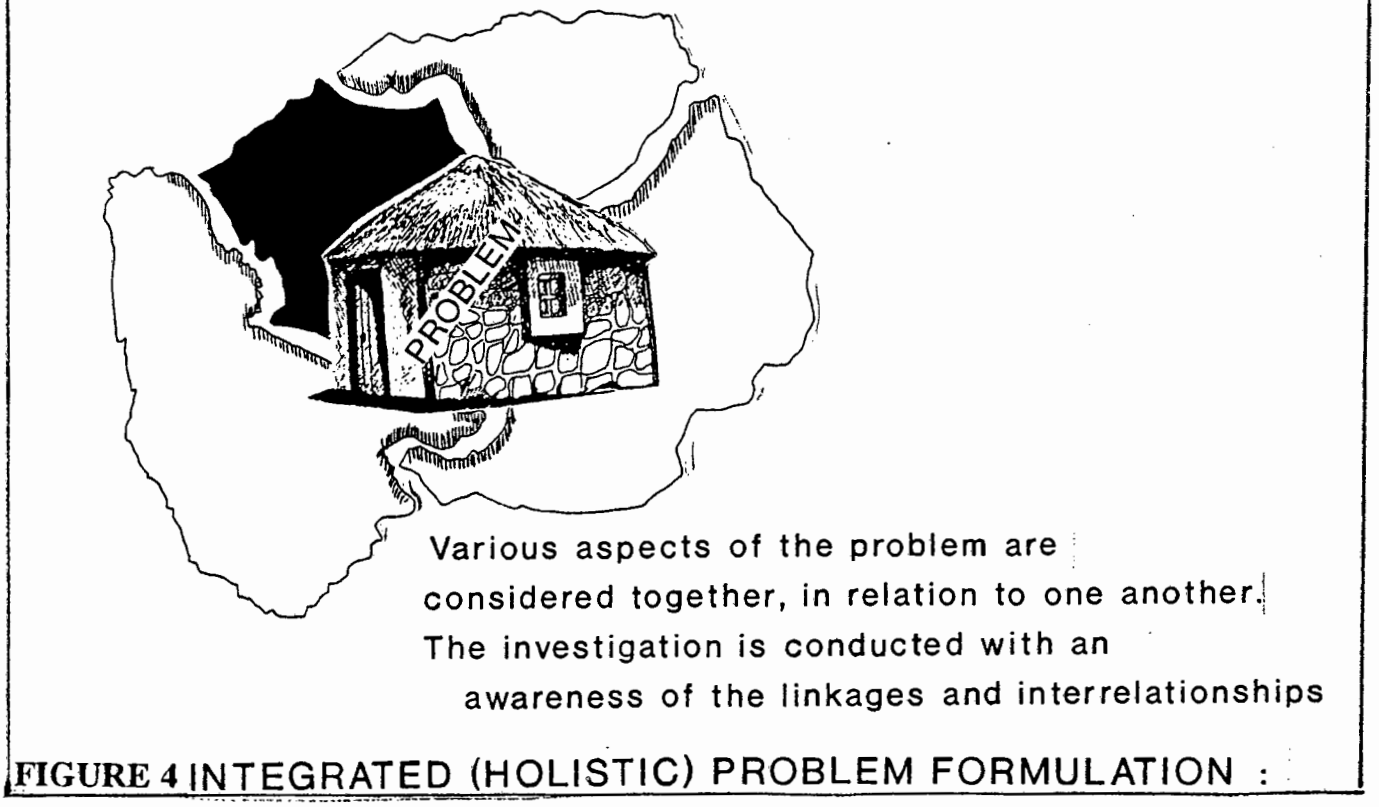


FIGURE 4 INTEGRATED (HOLISTIC) PROBLEM FORMULATION :

2.2.3 The Inherent **Dynamism** of Environmental Problems

Borrowing from the field of non-linear dynamics (specifically, chaos theory - see, eg Prigogine 1984), environmental scientists can better appreciate why impact prediction is often such a difficult task. Chaos theory holds that the occurrence of multiple uncertainties (bifurcations) within a (set of) system(s) leads to a situation where it is impossible to predict with any degree of accuracy which trajectory (future direction) a system will follow. Within the context of IA, an example of such bifurcations would be the set of decisions involved in project management. Uncertainties result from the impossibility of obtaining sufficient, up-to-date information about the system's prevailing conditions.

IA, the "science of surprise" [Berkes 1988:201], is an attempt to collect sufficient information to be able to predict the outcomes of specific interventions (project actions) in the system (the dynamic, affected environment). However, Orians has pointed out that the natural variability and complexity of ecological systems will always limit our ability to make precise predictions [Orians 1986:92]. This variability, whether caused by periodic (external) natural disturbances or by intrinsic cyclic behaviour of the system [Orians 1986:89, see also Roberts and Roberts 1984], makes it difficult to establish baseline conditions. Quinlan agrees: development projects are interventions which change socioeconomic conditions, but, equally, they occur always in a context of change [Quinlan 1991:7].

In view of the difficulty inherent in impact prediction, it has been proposed that the most useful function the IA researcher can fulfill is to identify the **sources** and likely **consequences** of these uncertainties [Orians 1973:41]. Even though precise and accurate impact prediction remains out of reach, it may be possible yet to learn enough about the **workings** of environmental systems to be able to formulate sound research strategies and management policies [Berkes 1988:218]. What is needed is an understanding of the dynamics of the receiving systems, both at an intra- and at an inter-system level. Unfortunately, in practice, this is one of the biggest "black boxes" of IA. There is a paucity of information on system behaviours (as opposed to descriptive **data** of affected environments), thus there is usually only a limited understanding of the dynamics of the relevant receiving systems (the "affected environments").

2.2.4 Problems are multi-layered and coexist at multiple scales

Any given problem (soil erosion, for example) may manifest differently at different spatial and temporal scales [fig 5]. The heterogeneity of affected environments is one of the reasons for this; the heterogeneous characteristics and responses of groups of affected parties is another. A local farmer, for example, will experience the consequences of soil erosion differently than might a party of tourists, and also

differently than might the national government's Ministry of Agriculture. Certain problems may be highly significant at a local level, but may be too localised to merit significant concern at a regional or national level. Skillful problem formulation should be able to separate out these details of scale. Coupled with a knowledge of the capacities and interrelationships of the relevant institutions, it then becomes feasible to match appropriate problem-solvers to specific problem areas. In the soil erosion example the national government would be responsible for co-ordination at the policy level, for the formulation of legislation, and possibly for providing subsidies. NGOs specializing in agricultural projects could be directed to specific local environments, and could also have a fund-raising role. Conservation groups could also be alerted to areas of particular environmental concern, and given the opportunity to contribute to the overall, integrated solution in an appropriate and effective way [see fig 6].

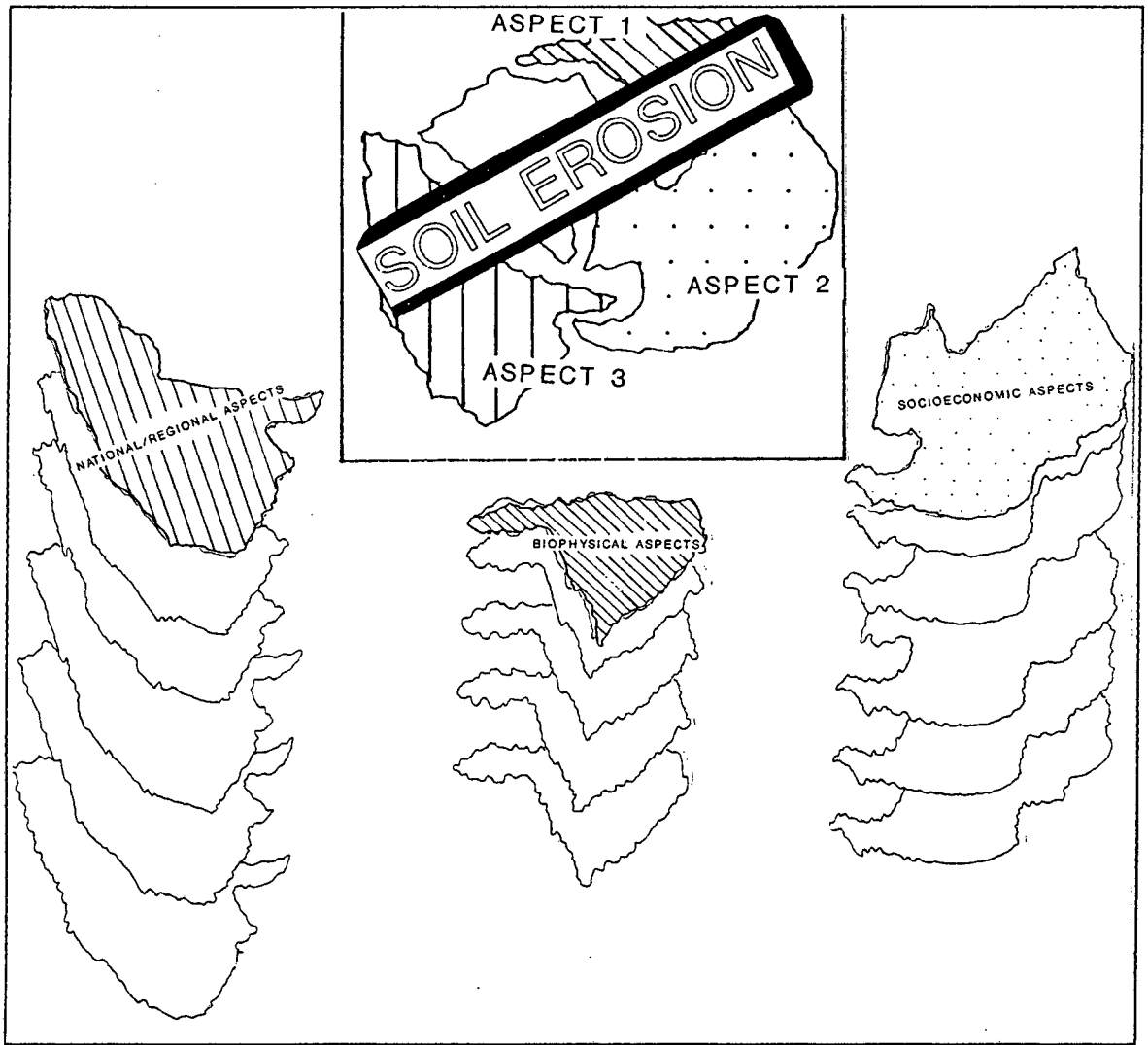


Fig 5 Conceptual diagram of a multi-layered problem

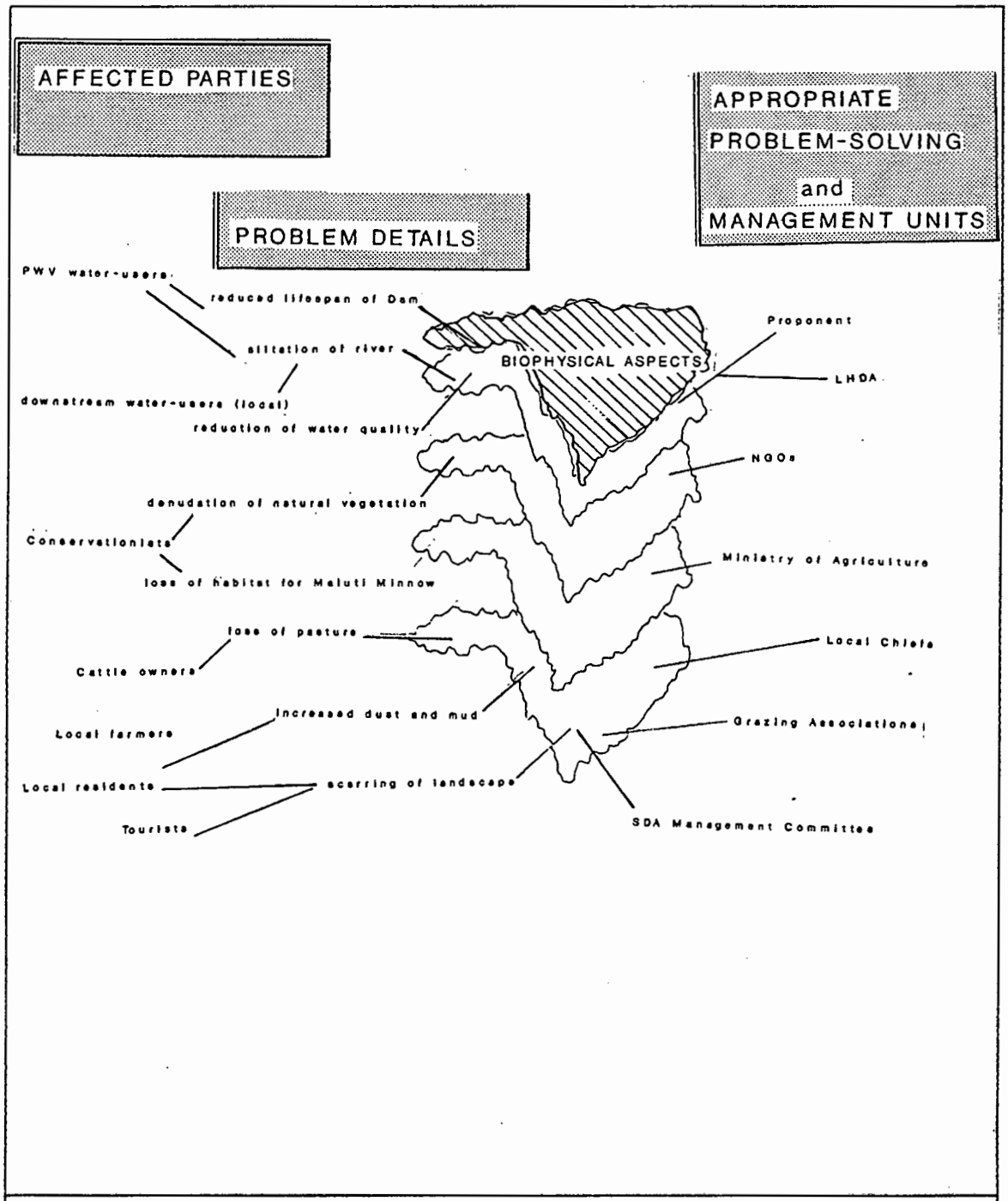


Fig 6 Conceptual diagram illustrating the correlation of problem layers with appropriate problem-solving units

2.3 Problem recognition and formulation in the ideal IEM process

Recently, Quinlan, who is a practitioner in the field of SIA, has argued that the common IA practice of categorising "impacts" into boxes (eg political, economic, social, cultural) leads to the formulation of equally discrete "mitigation" measures and to solutions that are "narrow and naïve" [Quinlan 1991:1]

IEM theory recognizes the dangers of compartmentalization, and advocates the adoption of a multi-disciplinary approach to the study [DEA2 1992:20] - but this is **not** equivalent to an **inter**disciplinary approach.
Stember's (1991) typology of disciplinary pursuits (Box 2) is instructive in this regard.

Box 2
Stember's (1991) typology of disciplinary pursuits :
Intradisciplinary: where the focus is within the discipline; Crossdisciplinary: reviewing a discipline from the perspective of another; Multidisciplinary: several disciplines providing their perspective on a particular topic; Interdisciplinary: (more complex) the viewpoints of several disciplines are integrated to the extent that the individual identities of those disciplines are sacrificed to achieve a more holistic perspective on the topic in question

Interdisciplinarity is profoundly integrative in nature, draws from the perspective of several disciplines, and attempts to achieve an holistic understanding of the issue or problem under investigation [Schoolmaster *et al* 1992:341]. Unfortunately, a truly interdisciplinary IA is yet to be carried out **anywhere** [see eg Berkes 1988:215]. In addition, the quest for interdisciplinarity is hampered by the attitude of reductionists: interdisciplinary endeavours frequently are viewed as inferior in scientific rigour to more traditional, disciplinary studies, and they are seen to lack depth [Schoolmaster 1992:342].

Other reasons for the failure to achieve inter-disciplinarity in IA practice, in spite of its intellectual endorsement, have been discussed by Quinlan. In part, he suggests that the principle of forming a multi-disciplinary research team is negated by the **separation of the team** into different sub-projects [Quinlan 1991:2].

Often, the **affected environment**, too, is broken up into different segments, "for convenience of analysis" [see, eg, GBJV 1993 104 b and c where the affected environment was divided into "national/regional"; "biophysical", and "socioeconomic" environments]. The resulting investigation can hardly be termed integrated, and it would not be surprising if the solutions identified by the IA **were** "narrow and naïve".

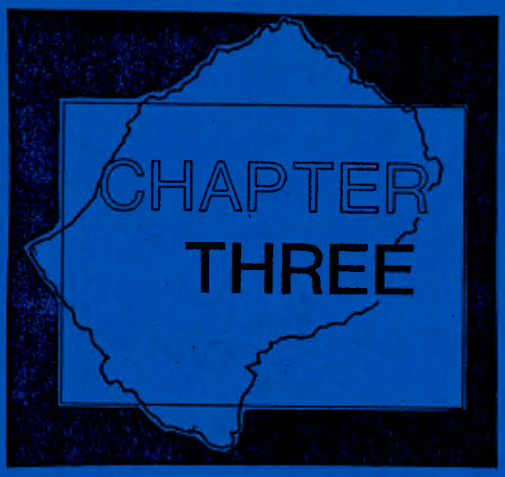
Integrated Environmental Management's chosen vehicle for identifying the range of issues and alternatives associated with an environmental problem is **scoping**, defined as "a procedure for determining the extent of and approach to an IA" [DEA2 1992:5, 19, 20]. The IA team, together with the proponent, has the bulk of the responsibility for scoping. Scoping, the "critical stage" in the IEM procedure, is an attempt to improve problem definition - firstly, by ensuring that the study is focused and therefore useful to the decision-maker [DEA2 1992:5], and secondly, by providing an opportunity for the proponent, consultants, authorities, and I&APs to identify key issues and potential alternative solutions. Scoping is thus expansive and restrictive in function: in practice the conflict inherent in this dual role seems to have been won by those seeking to **restrict** the scope of the investigation to only the "significant issues" and "reasonable alternatives". It is contended that it is important to **eliminate** insignificant issues from the investigation at the outset .
This `elimination approach' may well be inadequate, and may militate against the formulation of effective and meaningful solutions. Scoping, in fact, may be the root **cause** of IA's failure to achieve interdisciplinarity and people-orientation [Berkes 1988:215]. Because it involves preemptive fragmentation of the problem, and is driven by the IA team's ideological and disciplinary perspectives [see 2.2.1, above], the resultant scope can be "narrow, élitist or irrelevant" [Berkes 1988:215]. In principle, scoping *à la* IEM allows for the later introduction of additional issues and alternatives **should they be identified during the course of the IA**, but does not specify an explicit procedure for attaining this goal. One of the motivations for curbing the scope of the investigation is probably (an understandable) reluctance on the part of the proponent to become a social responsibility agency. IEM recognises that "consideration of certain alternatives may be beyond what can reasonably be required from the proponent ... or the decision-making authority" [DEA2 1992:18]. However, it is a major theme of this dissertation that better solutions should not be sacrificed to expediency: Short-term perspectives reduce the opportunities for developing solutions which are sustainable, equitable and efficient [Stauth's criteria 1992:32].

The traditional approach to IA often is a mismanagement of human resources: much insight could be gained if each specialist, instead of focusing **only** on his\her field of expertise, could be encouraged **and assisted** to contribute to the overall formulation of the problem (see also Chapter 5). Once the problem is well understood, it **then** becomes appropriate to begin apportioning responsibilities for the implementation of effective solutions.

2.4 Dynamic problem formulation, dynamic problem management

Although the inherent dynamism and complexity of affected environments present difficulties to the environmental scientist who is attempting to predict the outcomes of particular sets of project actions, dynamism and complexity are the very traits of systems (whether ecological, economic or social) that ensure their survival. Sociocultural systems, insists Derman, are **always** in the process of change as new ways of seeing the world and new ways of dealing with problems are constantly being created [Derman 1985:15]. Ecological systems, too, have the capacity to adapt to changes, irrespective of the sources of these changes. It is only a small step in logic to propose that our environmental management systems should also be designed with flexibility and adaptability in mind [see, eg, Faure and Hill 1989:vi]. Pretending that uncertainty is absent leads to bad planning and inflexibility [Orians 1986:17]. By contrast, proceeding from the assumption that project designers and managers **cannot** know everything and adopting a **flexible** approach leads to an enhanced capability to **solve problems** [Gow 1990:150]. Quinlan has extended the same logic to the design of (S)IA studies, arguing for a "central focus on change". If IA is to be useful, and used, due regard must be had to the changing contexts of environmental problems over time - both their historical and their future contexts. An appreciation of an environmental problem's history is allied to an appreciation of the depth of the problem; insight is gained into the dimensions of its policy and political milieux [Murphy *et al* 1992:311]. Quinlan has explained that a focus on change will generate awareness of development as a **process**, the **key feature** of which is **the evolving relationship between proponents and affected parties** [Quinlan 1991:11].

These observations have important implications for IA practice. Other practitioners in the IA field [eg Grindley 1992:4, Faure and Hill 1989:44] have also stressed the importance of fostering good relationships among proponents, non-governmental organizations (NGOs), government officials, and the public: communication with all the interest groups, particularly the client, is central to successful environmental evaluation [Faure and Hill 1989:44; see also Chapter 5]. Chapters 10 and 11, below, are an attempt to take cognizance of these concepts, using the IA for Contract 1000 (access roads to the Mohale Dam) as a case-study.



Generation of alternatives

Demand alternatives

System alternatives

Strategic alternatives

Tactical alternatives

Management alternatives

PART A Developing a Problem-solving Approach to IA

CHAPTER 3 Generation of alternatives

> The identification and examination of alternatives
> provide a basis for choice among options available to the decision-maker,
> and are therefore fundamental components of an impact assessment.
> [Preston et al 1992:756].

In principle, then, IEM acknowledges the importance of generating a suitable range of alternatives. The IEM procedure, too, has made some provision for the structured generation of alternatives [fig 7]. To date, however, few formal methods have been devised to assist in the actual identification of alternatives. Methods considered in the literature have been limited to the Delphi and nominal group techniques, and "brainstorming" [see, eg, DEA2 1992:18].

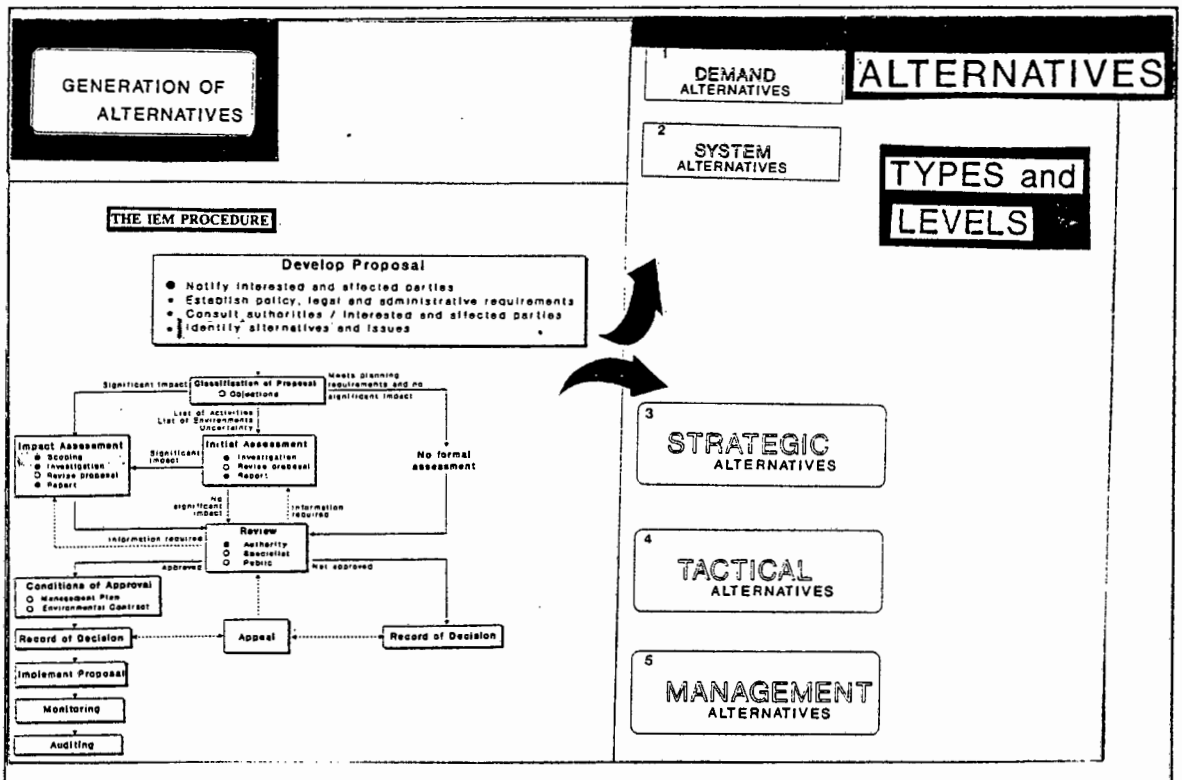


Fig 7 **Provision for the generation of alternatives in the IEM procedure**

Hill and Fuggle [1990] have devised a scheme for ascertaining the type and level of alternatives (ie alternative solutions) which may be formulated at various stages of the IA process and the project cycle. Five major categories are recognized [Fig 7], and within these, there are further sub-categories [Boxes 3.1- 3.4]. Chapter 11 of Part B illustrates one possible outcome of the application of the scheme to the project under discussion (access roads to Mohale Dam). The actual generation of alternative solutions that took place during the execution of the IA for Contract 1000 is discussed in Chapter 10 of Part B of this document.

DEMAND ALTERNATIVES relate to the **need** for the project. The alternative solutions to the proposed project are either to **stop** the project entirely, or to stop **parts** of the project, either permanently or for the immediate future (ie to adopt a slower schedule of project implementation).
In the simplest case, a project may be stopped if costs valued by decision-makers exceed benefits: no development actions at all are taken. A project may also be considered to have been stopped if the original objectives are modified, in recognition of new demand forecasts (ie a re-conceptualization of prevailing problems or needs). This may lead to alternative **uses of resources** or even to alternative **land-use plans.**

The "go slow" response is a flexible solution which also derives from a new, better (more informed) understanding of the specifics of prevailing needs or problems.

BOX 3.1

1) DEMAND ALTERNATIVES

1a) STOP (No action)
1b) STOP (New objectives)
  1b(1) (New uses of resources)
  1b(2) (New land-use plans)
1c) GO-SLOW (New scale of project)

SYSTEM alternatives retain as valid the existing project objectives, but are alternative **means** of achieving those objectives. Instead of, for example, providing monetary royalties to the Lesotho Government and "compensation" to Basotho directly affected

by the LHWP, payment for the sales of water to the Republic of South Africa could have been in the form of additional arable land [Thoahlane 1991:319].

STRATEGIC alternatives merit consideration once the need for the project and the preferred means of achieving it have been established. The IA under discussion was targeted explicitly at the level of strategies: the merits and demerits of alternative locations (corridors) for the project were investigated. Also at the strategy level is a consideration of alternative components and segments of a project.

BOX 3.2
3) STRATEGIC ALTERNATIVES 3a) Alternative sites/locations/corridors 3b) Alternative components/segments/routes

TACTICAL ALTERNATIVES

Modern roads, designed for speed while optimizing the safety and comfort of the road user, are built to exacting standards which control aspects such as alignment, grades, sight distances and road width. Rigid application of these standards in sensitive natural and human environments has in the past caused adverse effects on the functioning of environmental systems.

[Faure and Hill 1989:i].

The rise of popular concern for such sensitive environments has established the need for "contextual design" [Faure and Hill 1989:iv]. Numerous factors (such as budgetary and engineering constraints, and road-user safety standards) already inform road design: environmental concerns need to be added to this list. However, it is early days yet for environmentally-friendly engineering, and there is considerable merit in Hill and Faure's call for defining a dual set of standards: the Desirable and the Absolute Minimum [Faure and Hill 1989:27]. The application of one or the other set of standards would be contingent on the political and practical realities in which the project is embedded. The choice of standards may become an issue which must be negotiated - and re-negotiated - at various, later stages of the project cycle. Essentially, the determination of appropriate standards becomes a management decision, but the decision effectively is informed by (prior) professional engineering opinion.

BOX 3.3

4) TACTICAL ALTERNATIVES

4a) Design alternatives
- 4a(1) Choice of construction materials
- 4a(2) Alternative construction techniques
- 4a(3) Design features
- 4a(4) Pollution control

4b) Impact attenuation

MANAGEMENT alternatives are alternative ways of implementing specific (approved) proposals. The choice of management approach can be crucial to the success of a particular project. One of the most useful functions of an IA can be to establish specific areas of responsibility so that they can be apportioned among the key players. The matching of environmental problems to appropriate management units will facilitate the resolution of those problems (see also Chapter 2, above).

BOX 3.4

5) MANAGEMENT ALTERNATIVES

5a) Alternative management approaches
- 5a(1) Responsibility for implementation
- 5a(2) Local economic opportunities

5b) Altered scheduling

5c) Impact control plans
- 5c(1) Supervision of impact control plans
- 5c(2) Control systems for on-going review of site contract variations and design changes
- 5c(3) Environment training programmes among project personnel
- 5c(4) Community liaison personnel

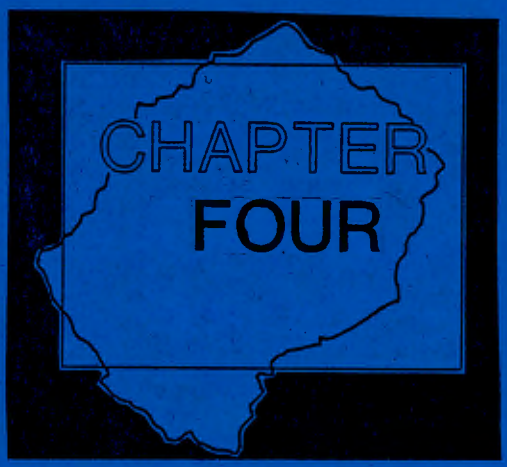
5d) Rehabilitation plans

5e) Management plan (operation phase)

5f) Monitoring plan

5g) Plans for decommissioning

5h) Timeous planning with local affected people



The implementation of solutions

PART A Developing a Problem-solving Approach to IA

Chapter 4 The Implementation of Solutions

> IA - the latest in an age-old line of mistaken and failed efforts to introduce rationality into politics.
>
> [Boggs 1991:1]

"Why, in the face of good evidence and sound technical advice, does policy sometimes not incorporate the work of environmental scientists?", ask Murphy *et al* [1992:315]. Boggs has argued that development projects are inherently political and that "ideological resistance and deep skepticism" are frequently encountered by practitioners of IA. Thoahlane [1991:303] has pointed out that the decision to implement the Lesotho Highlands Water Project was not made "in a political vacuum". Attempts to introduce ecological (and social) rationality into the planning and implementation of development projects - by conducting IAs - have failed because the IAs' "fine, tidy, logical recommendations" [Graybill 1985:12] are not necessarily carried out. This is attributable in many cases to the IA team's naïvete and lack of political realism [Boggs 1991:2].

In the case of road projects carried out in Lesotho in recent years (Contracts 103, 104 and 108), recommendations have been ignored and mitigatory measures not carried out effectively. A recent report [Grindley 1992:1] lamented *inter alia* the lack of progress in controlling ribbon development, the late implementation of the Rural Development Plan, delays in compensating villagers for lost spring water supplies, and inadequate liaison with the local inhabitants. Similarly, in Phase 1a of the LHWP, recommendations regarding rehabilitation of vegetation are yet to be carried out [EEU/2/93/104b: Appendix 6]. In some instances there were budgetary constraints on the efficacy of the intended mitigatory measures.

If IA is to be useful, and used, it needs to give attention to the non-technical aspects: IA needs to adapt to its political milieu [Graybill 1985:12]. Political reality encompasses several considerations:

* the **unpredictability** of impacts in general;
* **uncertainties** associated with the project during the implementation stages;
* monetary **budget;**

* **time** budget

* availability of relevant **expertise;**

* the existence of sufficient **political will** or effective enforcement measures and **sanctions** ;

* **institutional capacity** of various organizations including consultants, contractors, authorities at various levels, NGOs, agencies charged with the implementation of solutions, and monitoring agencies;

* project **schedules** and effects of the project cycle, and

* schedules of **financial** (aid or lending) institutions.

An appreciation of the workings of the project and of the prevailing political realities can be developed by the IA team by interaction with the client, project proponent, project design staff and any others "on the ground". By the end of the IA, when the report is to be finalised, there should be an understanding of what recommendations are realistic as opposed to those which are idealistic, and which are likely to merely diminish the IA team's credibility in the eyes of other professionals (see also Chapter 5).

Chapter 2 established a need for *flexible* recommendations and for a procedure that allowed the formulation of new, appropriate recommendations in the event that unforeseen impacts occur. It was also proposed that the best way to achieve this is to build *links* among the people and institutions likely to be involved in the problem area. In addition, a politically realistic strategy to increase the likelihood that recommendations will be implemented would be comprised of plural methodologies: both flexible (fluid) and defined (set) measures should be part of the strategy.

Fluid measures

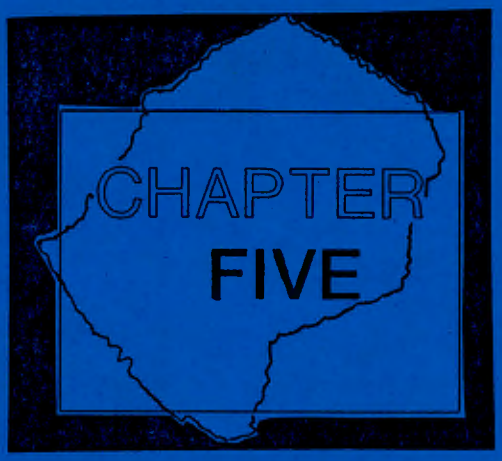
> Wise problem-solvers learn to expect the unexpected
> and to develop approaches that allow them to learn as they proceed,
> altering their responses as they learn more about the system
> and avoiding irrevocable actions
>
> [Orians 1986:210]

Because many project decisions are taken long after the IA has been completed, provision must be made for ongoing environmental input to the project. The office of

on-site environmental monitors, or control officers (ECOs) is one of the first steps in the right direction: constant communication between project and environmental staff ensures that realistic solutions are implemented.

"Set" measures

In order to negotiate effectively for environmental concerns, each environmental monitor needs to establish credibility and a *rapport* with the project staff on the site. The monitors' effectiveness, however, rests ultimately on more formal instruments than personal communication skills. Given the common imbalances of power among project proponents, the authorities and local affected populace, it is of course wise, where impacts have been predicted, to `set' minimum standards on paper; however, this will **only** be effective if they have some legal backing. Recommendations should be contained in the project's legal instruments - the specifications, tender documents or contracts - and penalties should be severe enough to encourage adherence to the environmental standards. "The specifications", argues Millard [1993 *pers. comm.*], "are everything".



Making the choice: Needs of the decision-makers

5.1 The information needs of decision-makers

5.2 Communication of information to decision-makers

5.2.1 The role of the IA report

5.2.2 The roles of the IA team

5.3 Informed decision-making is not necessarily better environmental decision-making

PART A Developing a Problem-solving Approach to IA

CHAPTER 5 Making the Choice: Needs of the Decision-makers

> ... no generally accepted formal procedure has yet been found for making trade-offs between the conflicting objectives of efficiency, equity and sustainability
>
> [Stauth 1992:47].

BOX 4	STAUTH'S CRITERIA FOR EVALUATION OF ALTERNATIVE RESOURCE USES
	EFFICIENCY: benefits exceed costs **EQUITY:** the benefits and costs are fairly distributed among the individuals constituting present-day society **SUSTAINABILITY:** benefits continue to exceed costs over intergenerational time

IA aims to improve the quality of environmental decisions [Preston *et al* 1992:748], chiefly by providing decision-makers with "objective information on the environmental consequences of actions, plans and projects" [Fuggle 1992:762]. It is assumed that better informed decision-makers are better **able** to make trade-offs (**and** that they will therefore **make** better trade-offs). It is the aim of the present Chapter to assess **how much** information, and what **types** of information are most useful to decision-makers. In addition, the efficacies of, respectively, the **IA report** and the **IA team**, in presenting information to decision-makers are assessed. Finally, the relationship of increased information to improved environmental decisions is considered.

5.1 The information needs of decision-makers

> People use much less information [to make decisions] than they believe they do
>
> [Miller, 1985:231].

Gow [1990:148] has endorsed the concept of "optimal ignorance" - the minimum information required to make reasonable decisions. In order to avoid blind and costly collection of data, the IA team needs to be critical of the amounts and types of information gathered. Demands for excessive information may be veiled excuses for inaction, or a buttress for caution [Gow 1990:148]. Different types of information may

be needed at various different phases of the project cycle. The IA should therefore take cognizance of the different types of decisions which need to be made during these different phases, and should provide appropriate and timeous information. Policy decisions, for example, have very different information needs than do day-to-day management decisions. The information required to make trade-offs will differ from that needed to formulate specific mitigation measures.

5.2 Communication of information to the decision-maker

5.2.1 The role of the IA report

> ... the report is incidental; more important is having its findings and recommendations implemented
>
> [Gow 1990:158]

Hoben [1984:17] has cautioned that formal reports do not influence projects; they are "seldom read or heeded" [Gow 1990:158]. By contrast, continuous lobbying on the part of the IA team **can** influence environmental decisions [Gow 1990:159]. Encouraging the early and ongoing involvement of all project staff, prioritising what **can** be done in the near future, and deliberate and regular contact with decision-makers are important tasks of the IA team [see 5.2.2, below] which form part of a more realistic approach to IA [see also Chapter 4, above]. The IA team needs to adopt a strategy of "no surprises" [Raimondo *pers. comm.*], and should ensure that information presented in the report has already been presented to decision-makers previously in other, less formal ways. Ideally, the findings of the IA team should continuously be reported to, and discussed with, the decision-makers.

If the report does not **influence** the decision, is it superfluous? Critics would argue that IA reports merely fulfill legal requirements; they are simply formal documents produced only after the key decisions have been taken. This viewpoint is somewhat extreme: the formal nature of reports serves several useful functions. The wide dissemination of IA reports represents an important step towards the democratisation of knowledge, and the task of writing a report can serve as a focal point for the IA team. In addition, reports can be used as source documents by planners, technical staff, and managers. This is particularly true where detailed information and sets of guidelines have been included in the reports (such as the rehabilitation guidelines in Appendix 6, and the tables of "environmental concerns at specific chainages" along the WAR and LCAR in reports EEU/2/93/104b and c).

The main function of the report *vis à vis* the decision-maker is to **clarify** the **trade-offs** that must be made among the various interest groups and among the criteria of

efficiency, equity and sustainability. Unfortunately, standard IA procedures have tended to produce reports with compartmentalised "specialist" findings which are not inter-compatible [Quinlan 1991:3]. It is difficult for decision-makers to adopt a "balance-sheet approach" in order to make trade-offs between sets of positive and negative impacts [Green 1989:53]. Recognising this, the writers of IA reports are tempted to resort to arbitrary constructs, such as rating scales [Quinlan 1991:3] in attempts to transform disparate measures into compatible impact indicators. Assuming that the report reflects the character of the IA, it is mooted that more integrated and interdisciplinary IA will make it possible to produce more meaningful IA reports, which may be better able to aid decision-making.

5.2.2 The roles of the IA team

The IA professional needs to move beyond the limited role of "environmental repair technician" [Turner 1989:47]. There are a number of distinct roles - some of which are discussed briefly below - that the IA team needs to learn to play if it is to achieve its goal of improving environmental decisions. .

Information management role

> There is too much information out there for anyone to handle.
> [Bardwell et al 1992:349]

The ability to determine exactly what the optimal level of information is, comes with experience - and is probably one of the essential functions which an IA manager should fulfill. The IA manager should ensure that the IA team is able to specify **what** information is needed in order to make a "reasonable decision"; **why** it is needed; **who** will use it; and **how much** it will cost to **collect, process, analyse,** and **present.** Imprecision is not a virtue, but saving time and money is [Gow 1990:149].

The IA manager needs to resist demands for excessive information and attempts to misdirect the study along conventional, but possibly unprofitable, lines [Gow 1990:148].

Management role: Integrating multidisciplinary teams

In 1989, the Council for the Environment listed as one of two prerequisites for the successful resolution of development / environment conflicts (environmental problems) the need for a co-operative spirit between the `key actors' [CfE 1989:4]. These `key actors' comprise both those within the IA team and those outside of it (such as the client, the decision-makers, and I&APs).

While IEM endorses the appointment of multi-disciplinary teams to carry out the investigation phase of the IA, and in some cases, to guide the scoping process [DEA2 1992:18] there is no guarantee that the team will be able to work together in an interdisciplinary way. Gow [1990:150] has admitted that it can be very difficult for specialists from different disciplinary backgrounds to work together as a multidisciplinary team. Most specialists will have had little experience in working outside the bounds of their disciplines, and it will fall to the IA manager to facilitate this process. Green's [1989:61] comments about the careful selection and management of expert panels executing the Delphi Technique apply equally to multidisciplinary IA teams.

In addition to managing the IA team, the IA manager needs to establish and maintain good communication with outside groups [Faure and Hill 1989: 44]. Quinlan [1991:3] sees (S)IA as an exercise in generating a dialogue and has argued that if management of the environment is to be improved, it is essential that a basis be established for the people concerned to interact in a constructive way [Quinlan 1991:3]. Where possible, and within the bounds of confidentiality, findings should be communicated to appropriate I&APs at an early stage and not only after the report is completed. One of the main reasons for this is that the appropriate agencies can then begin to formulate solutions at the appropriate level [see Chapter 2, above].

Planning role

Mitigation measures can be identified by the IA team and incorporated into an Environmental Management Plan, or, ideally, into the Conditions of Approval. In conducting Initial Assessments (as opposed to full Impact Assessments - refer back to fig 3), the IA team has an opportunity to play an enhanced planning role by suggesting **revisions** of the proposal [DEA3 1992:5].

Social activist/ advocacy role

In contrast to some practitioners of IA, the development anthropologist is not coy about his/her activist role: according to Finsterbusch and Partridge [1990:56], he/she "**champions** social factors in design decisions" by arguing in favour of their importance, and by "**negotiating** with other professionals on the project". Boggs [1991:1] has pointed out that inherent in IA is an attempt to change the *status quo*. Almost by definition, IA introduces the goals of equity and sustainability into project planning - the very commissioning of an (S)IA, argues Quinlan [1991:11], presupposes some commitment to equity and sustainability. Being an IA manager inevitably involves working for social change [Murphy *et al* 1992:315].

While it is a contentious hypothesis that "poverty is a major cause and effect of global environmental problems"; it is certain that rich countries and poor countries are both part of an interrelated set of ecosystems [Turner 1989:40]. Proponents of this "interdependency thesis", following the thesis through to its logical conclusion, assert

that poverty-induced environmental stresses could reach a stage in which global welfare is threatened, **regardless** of whether one lived in a developing or a developed economy [Turner 1989:42]. If this is true, then, even in the absence of a specific social conscience, and irrespective of one's philosophy of IA, IA in developing countries needs to incorporate the problem of poverty into successful environmental planning.

Based on the above considerations, it can be argued that the IA team has a professional responsibility to promote the goals of equity and sustainability. At the very least, the IA team should point out the likely inequitable or unsustainable features of proposals. One of the reasons for the reluctance of IA practitioners to assume this advocacy role may be the recognition that they enter the negotiation arena at a disadvantage both in terms of political resources and in terms of status [Murphy et al 1992:315]. In addition, few IA practitioners are likely to have the skills or experience necessary to resolve differences: compromise and bargaining are the prevailing **methods** in what is essentially a political arena.

Qualities and qualifications of IA team members

> ... it is difficult to predict who will best be suited
> to solve specific environmental problems
> or to function as environmental managers
> [Silverman 1992:321]

Based on the roles that the IA team will be required to play, a profile of an "ideal" team can be compiled: it requires courage [Gow 1990:148]; needs "political astuteness [Finsterbusch and Partridge 1990:64; see also Chapter 4, above]; should be skilled in management, and should have communication skills such as advocacy and facilitation.

5.3 Informed decision-making is not necessarily better environmental decision-making

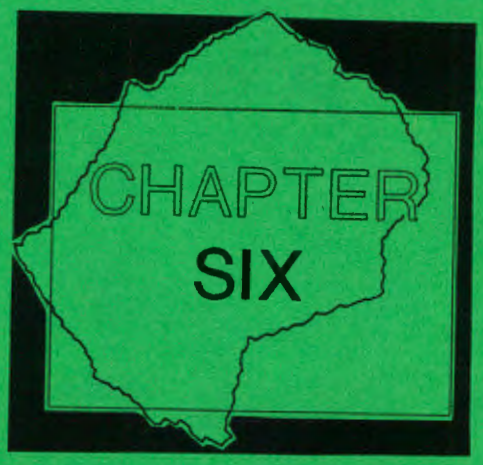
An important principle underpinning IEM is that there should be accountability for decisions [Preston 1992:749]. In practice, and in spite of the availability of adequate information, decision-makers have tended to turn a deaf ear to concern that a resource is being used in a way that is inequitable or unsustainable [Stauth 1992:48].

Accountable decision-makers constitute a species that is yet to evolve from the `jungle of competing interests' [Boggs 1991:2] that comprises society. It cannot reasonably be surmised that such a species will **ever** arise spontaneously; rather, it will have to be created by an active, (environmentally-) conscious society. The successful integration of "environmental" concerns into public policy and project decisions will depend on:

> an open system of government;
> wide disclosure of information, and
> an informed citizenry [Preston 1992:748].

In the absence of such an "environmentally-friendly" operating milieu, IA itself could face (deserved) extinction because it would not be fulfilling its chief function. If IA does not become an effective part of the decision-making process, but becomes instead a dormant, "quasi-scientific" [Graybill 1985:12] and costly exercise, it will rightly be judged to be maladaptive, and will not win the respect of either developers or "environmentalists".

Practitioners of IA are well placed to influence the future of their science, in order to ensure that IA continues to play a constructive role in harmonizing development / environment conflicts. Practitioners need to view each IA as an opportunity to win ground in the struggle to establish their legitimacy. Such activism on the part of IA practitioners needs to be done in a professional way; IA should not degenerate into a "reactive, excessively negative" process that causes great expense and delays to necessary development projects [Preston 1992:748]. This is particularly important in the context of less developed countries (such as Lesotho, and even the RSA). The education and "conversion" of decision-makers and society at large is likely to be a slow process. However, on a case-by-case basis, by expanding the terms of reference often imposed on IAs by reductionist thinkers whose main preoccupation is with efficiency, this is an achievable as well as an essential goal.



Problem recognition and formulation in the context of LHDA Contract 1000

6.1 Scoping

6.2 Integrated IEM within the IA team

6.3 Problems identified by the IA for Contract 1000

6.4 Generation of alternative solutions

PART B Applying the Problem-solving Approach to the IA for Contract 1000

CHAPTER 6 Problem recognition and formulation in the context of LHDA Contract 1000

PROCEDURAL ASPECTS

6.1 Scoping

Problem recognition and formulation were carried out under the banner of Scoping throughout the IA [fig 8]; problem specifications (in terms of location, extent and affected parties) were refined as new information became available. The main sources of new information were field visits, but ongoing consultations with I&APs and the client were also useful in this regard. The adequacy, in terms of effective problem formulation, of each of the scoping tasks actually carried out during the IA for Contract 1000 merits brief discussion:-

Consulting I&APs

During scoping, I&APs were asked what problems they foresaw, ie to *predict* what problems the project would create. It was not made clear in the reports of the methodology [EEU/2/93/104b and c] whether all I&APs were asked the same set of questions, or whether there was specific probing for existing problems (as opposed to project-induced effects, or **impacts**). There is also no evidence that I&APs were asked specifically to suggest alternative solutions. For logistical reasons, I&APs were consulted separately from one another, which meant that they only **exchanged information** with one another *via* the IA team [DEA2 1992:18]. There was no forum in which they could freely express their views and **discuss** problems and potential solutions.

Data Quality

A consideration that applies to information gathered from I&APs and during the social survey is that people are notoriously bad at predicting particular outcomes of particular interventions. Predictive ability depends on the respondent's or interviewee's previous experience, conceptualisation skills and knowledge. Even professionals are heavily influenced by *inter alia,* their training, operating paradigms, ideological perspectives, hidden agendas, and pre-existing notions of what they think *ought* to be the answer [refer to Chapter 2].

Literature surveys

Problems were also identified from the literature, which was comprised mainly of the work of other consultants who had conducted previous IAs or surveys. Recent social

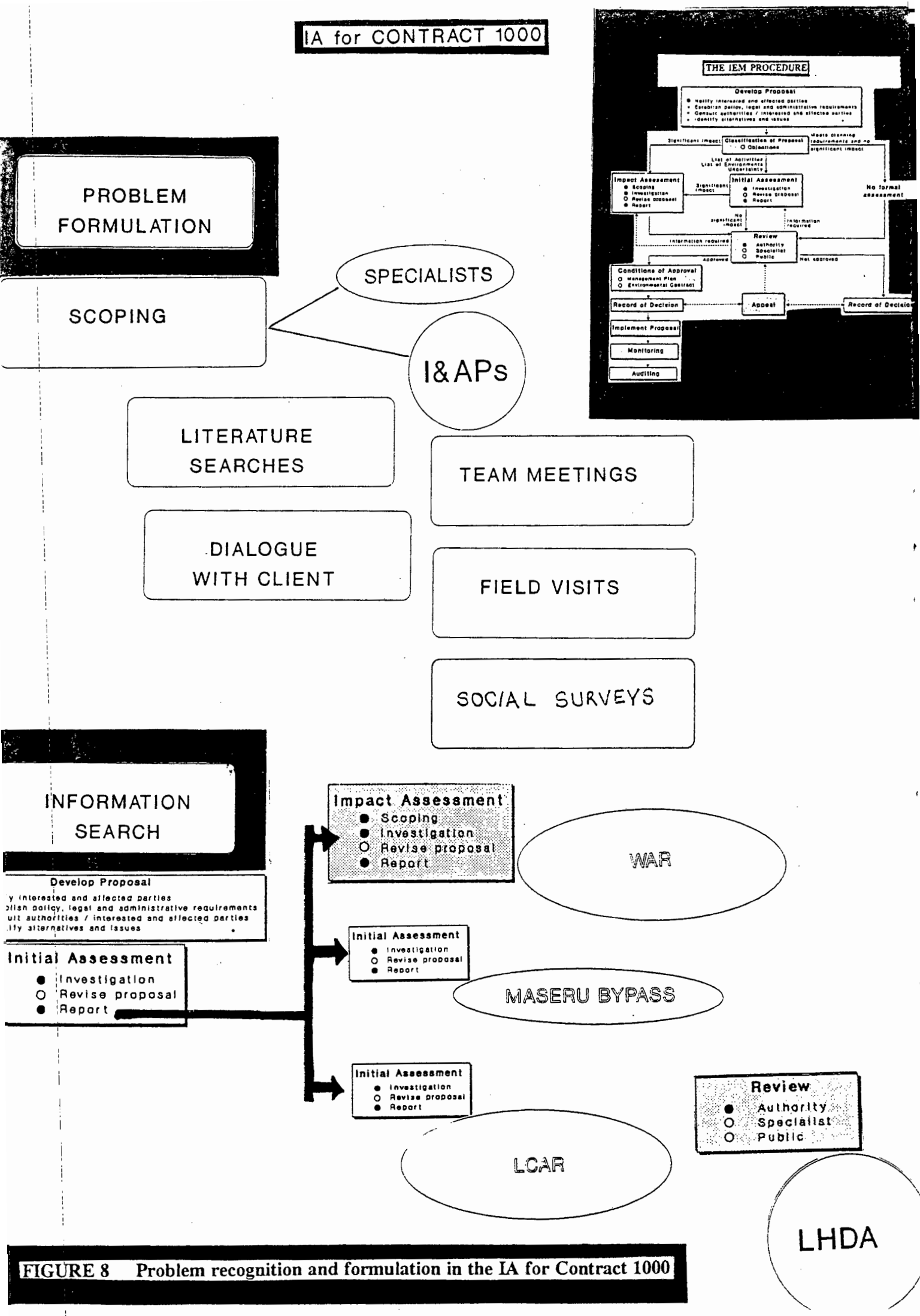


FIGURE 8 Problem recognition and formulation in the IA for Contract 1000

science literature contained a number of nationwide surveys of the attitudes and perceived needs of the Basotho [see reports EEU/2/93/104b,c and e for references]. Statistics from the 1986 national census and smaller field verifications of perceived needs and problems were also useful sources of data.

Consulting specialists

An **archaeologist** was consulted to identify potential problem areas, and to make recommendations for the mitigation of impacts. His findings were presented in a separate "specialist report", and he had limited contact with members of the IA team. He therefore had no input into the overall problem formulation process; nor did the IA team contribute in an interdisciplinary way to the archaeologist's problem formulation and generation of (alternative) mitigatory measures.

A **rehabilitation** expert was consulted to assist the IA team to formulate guidelines (alternative solutions) which could be included in the tender documents and contract specifications of the project (Contract 1000). The rehabilitation expert had several meetings with different members of the IA team, and made a number of joint field visits with the team. In addition, the specialist had considerable previous experience of the LHWP through his work as an environmental monitor during Phase 1a. As a result, his input into the problem of landscape scarring was integrated and of great practical value [see EEU/2/93/104b and c, Appendix 6].

Conducting the social survey

In the formal questionnaire, respondents were specifically asked to identify **both** their existing problems and needs **and** their concerns relating to possible future problems (or opportunities) which might result from the implementation of the project [Box 4].

BOX 5 SURVEY QUESTIONS
QUESTION 50 What are the main needs and problems facing your household at the present time? QUESTION 51 What are the main needs and problems facing your village at the present time?
QUESTION 52 In what way do you think the new road will make your life easier? QUESTION 53 In what way do you think the new road will make your life more difficult?

During the social survey, informal interviews were used as a methodological tool to better understand linkages among problems identified by the formal questionnaire (ie to give a measure of depth, whereas the questionnaire aimed to give a broad understanding of problems).

Conducting field surveys

Field teams, comprised of two or three members of the IA team, walked the alignments of each of the alternative routes. The field teams were guided by the 1:5 000 (WAR) and 1:20 000 (LCAR) engineer's drawings. No formal attempts were made to brief field teams with the latest findings and understanding of problems immediately prior to the field visits. The teams thus relied on their own, informally gleaned conceptualizations of prevailing problems, and on their observation skills to identify "environmental concerns at specific chainages" along the WAR and LCAR (this information was presented in tables in reports EEU/2/93/104 b and c, see Box 6, below).

BOX 6 **Extract from EEU Reports 104 b and c:**

Chainage (km)	Roadside (L/R)	Issue	Distance from Centre Line (m)	Number/ Area affected	Comments	Recommendation/ Mitigation
0		Building	8		No problem widening.	
0-1.35	L	Electricity/Telephone poles	7.8			
0-1.35	L/R	Mealie fields	10.5		No effect of road on mealies if widen on both sides of road.	
0.55	L/R	Access track (dirt) joins WAR			Slopes down to WAR	
0.70	R	Access track (dirt) joins WAR			Erosion of track onto WAR	
0.7-1.5	R	Grass drainage channel along WAR	5 m			

6.2 Integrated IEM within the IA Team

In general, the investigation of linkages during the IA itself was done in an informal and fragmented rather than in a structured and integrated way. The `fragmentation approach' was an attempt to guide the IA in a systematic and time-efficient way; however, in the absence of express procedures to elucidate the linkages among the impact categories, it may have been a relatively weak approach. In practice, the fragmentation approach of the IA for Contract 1000 was supplemented by occasional structured interactions among the individual researchers, review consultants, and the client. The effectiveness of problem-formulation was greatly bolstered by these interactions. In addition to informal contacts and feedback among the members of the IA team for the duration of the two-month investigation, formal meetings, discussions and reports (Box 7) provided opportunities to develop a relatively integrated and realistic understanding of the emergent set of perceived "environmental problems".

BOX 7	Schedule of formal interactions held during the IA for Contract 1000	
DATE	EVENT/REPORT	PURPOSE
23/03/1993	IA team meeting	Consolidation of findings
24/03/1993	Client/ IA team meeting	Presentation of Preliminary Findings
05/04/1993	Client/ IA team meeting	Discussion of Draft IA report

Other meetings of the entire IA team were held frequently, but these were largely administrative in function. During the study, the most-used problem formulation arena was the `small group meeting'. Typically, such a discussion would be among one or two IA team members and a specialist consultant, or other `I&AP'. In this way, the perspectives of at least two disciplines were brought to bear on selected problems (for example, rehabilitation).

In spite of the aforegoing, the central hypothesis of this dissertation remains unchanged: fragmentation of issues too early in the IA process limits the available range of "reasonable alternatives". The study itself was fragmented by the separate investigations of "national / regional "socioeconomic" and "biophysical" affected environments. In addition, a serious limitation of the study was the exclusion by the terms of reference of other components of Phase 1b of the LHWP. Preclusion from consideration of the impacts of the Dam itself (which are likely to eclipse many of the impacts related to the access road), or of the cumulative and potentially linked effects of construction camps, quarry sites, and the like was an artificial restriction on the IA. The terms of reference also imposed time and budgetary constraints on the study; some of these could have been avoided had a problem-solving approach to IA been adopted even **before** the terms of reference were drafted. Owing partly to these imposed constraints, and partly to the other failings of the IA that have been discussed already, specialist consultants did not have adequate opportunity for interaction with one another or even with the full IA team. Although there were some meetings of the IA team which could be termed at least "multidisciplinary", even if they were not quite "interdisciplinary", such team meetings should have been held more frequently, throughout the study.

6.3 Problems identified by the IA for Contract 1000

The findings of the IA for Contract 1000 have been compiled into a series of reports [EEU/2/93/104b-e]. From the texts of these respective IA reports, it is possible to generate comprehensive lists of "problems".
Such lists [Tables 1a and 1b], which have been compiled from various sections of the reports, can then serve as a **starting point** for investigating linkages among problems, and the basis for more effective problem formulation and resolution [see Chapter 10].

Listings such as those in Tables 1a and 1b are only partially processed information, clearly, they are not yet in a form accessible to decision-makers. In order to be rendered useful, the information must be placed in its dynamic and political contexts; linkages must be considered, and the information must be integrated into a form that is comprehensible to both specialist and lay readers [DEA3 1992:19]. It is not unreasonable to suggest that this **evaluation** task is made easier if the underlying IA study has been structured in a meaningful way. An integrated study that has taken cognizance of political realities and the inherent dynamism of project/environment problems is less likely to produce a "jumbled set of recommendations which confuse, rather than clarify the issues" [Quinlan 1991:4] than is a study which has been ill-conceived.

Above, it has been noted that the IA for Contract 1000, not surprisingly, has redeeming features as well as flaws. In light of the above discussion, it is pertinent to assess which features contributed to clarifying the issues, and which features of the study proved to be maladaptive.

In an attempt to communicate the variety of complex issues in a logical way [see DEA3 1992:19], "impacts" were grouped into categories: national/regional; socioeconomic; biophysical and archaeological. The writers of the report, recognising the limitations of this approach [see Chapter 2, above], then defined significance levels and applied them to the impacts in each category. It was hoped that the decision-makers would then be able to compare impacts in terms of this `common currency'. The assignment of significance values represents a brave attempt in the face of the daunting task of making trade-offs between sets of positive and negative impacts. However, it has been contended that the ascription of positive and negative values to impacts has <u>no</u> justifiable scientific basis [Quinlan 1991:4]. IEM espouses "democratic regard for individual rights" [DEA1 1992:5] - the failure to consider what "significance" the relevant I&APs might attach to particular impacts would violate this principle of democracy . During the initial scoping phase of the

TABLE 1a LIST of ENVIRONMENTAL PROBLEMS (the WAR)

PROBLEM	page REFERENCE in report 104b
poor vehicular access to Mohale Dam site	1
poorly developed national road network	1
no integrated development plan for the Phase 1b area	6
some project details are not yet available	6
design life of the WAR is 20 years	7
GoL is responsible for road maintenance after the Dam has been built	7
the design speed of the WAR is 30 - 75km/h	8
contractors determine the size and location of construction camps	13
contractors determine the length of road to be upgraded at any one time	13
contractors determine the details of road closure	13
unbalanced settlement pattern	17
limited tourism development	17
limited natural resource base	18
economic dependence of GoL on RSA	18
unemployment	18
lack of money	18
lack of schooling	18
reduction in soil quality	19
unequal wealth distribution	19
lack of services in the Highlands	20
vegetables cannot be grown in winter	20
economic stagnation	20
absence of spur roads to villages	20
Mountain road narrow	20
poor quality surface on Mountain road	20
lack of food	20
lack of good water supply	20
unemployment	20
lack of roads and transport	20
lack of money	20
lack of medical facilities	20
lack of household and personal possessions	20
lack of latrines	20
lack of good housing and building materials	20
lack of livestock	20
lack of fields	20
limited public transport	21
loss of able-bodied males to migrant labour	22
few children attend high school	22
villages have developed without physical planning	22
lack of fields near Maseru	22
limited availability of grazing lands near villages	22
resources are controlled by outsiders	23
water must be obtained from local springs	23
people wash clothes in local streams	23
chiefs nearer urban centres have reduced control over their people	23
poor quality village roads	25
lack of bus stops	25
lack of informal market areas	25
erodible soils	25
mountainous terrain	26
hydrological information not yet available	26
rain can result in flood events in the summer	26
reduction in water quality along the Mountain Road	26
the WAR crosses source water wetlands	27
a limited amount of natural vegetation remains	27
steep slopes unsuitable for cultivation	27
severe overgrazing has reduced pasture quality	27
little indigenous fauna remains	27

TABLE 1b LIST of ENVIRONMENTAL PROBLEMS (the LCAR)

PROBLEM	page REFERENCE in report 104c
poor vehicular access to the Mohale Dam site	3
Basotho and immigrants will compete for employment opportunities from the project	10
labour will require accommodation in the area	11
heterogeneity of affected environments	13
poverty	13
lack of productive employment	13
need for sustainable economic growth	13
unequal wealth distribution nationally	14
disparities in expenditure on social and economic services for highland versus lowland areas	14
lower quality road network in highlands as opposed to lowlands	14
unpaved roads	15
low quality roads	15
roads impassable in the wet season	15
no vehicular access	15
poor transport linkages to the highlands	15
inadequate maintenance of existing roads	15
stagnant rural economy	15
structural obstacles to development	16
lack of access to resources	16
lack of access to credit	16
rural overcrowding	16
tendency of rural poor to invest in stock at the expense of arable farms	16
limited tourism	16
poor infrastructure for tourism	16
poor advertising/promotion of tourism	16
lack of desire for high levels of agricultural production	18
isolation of the Jorodane Valley	20
hunger	20
lack of roads	20
lack of clothes	20
limited access for drought relief	20
reduced availability of employment on South African mines	22
emigration of young people from the highlands	22
lowlands cattle graze in highlands, causing overgrazing, and social conflicts	22
stock theft	22
scarcity of fuel resources	22
complete lack of regular income	22
restricted movement of bulk goods	22
lack of oxen for ploughing fields	24
lack of farm labour	24
lack of money for agricultural inputs	24
difficulty in transporting crops to markets	24
lack of access to clinics	25
degradation of natural vegetation	27
information on possible bird nesting sites not yet available	27
reduction in size of wetlands	29
overgrazing of grasslands	29
populations of endangered spiral aloes	29
endangered species (Maluti minnow)	29
restricted species (riverine frog)	29
sensitive sediment transport balances in Jorodane River	29
sensitive environment (Jorodane Valley)	30
wetlands sensitive to disturbances	30
occurrence of rock paintings	31
despoilment of rock paintings by local children	31
annual road maintenance burden	39
requirement for periodic resealing of road	39
lack of administrative control in the highlands	41
poor soils	46
lack of bridges	48

study, the IA for Contract 1000 **did** consider, albeit briefly, the relationship between different sets of I&APs and particular environmental problems or issues [Box 7]. However, this initiative was not carried into the remainder of the study.

In Chapter 7, particular I&AP groups ("user" groups of the proposed access roads) are delimited, and their respective needs and values (which inform their rating of impacts as "significant" or not) are discussed.

BOX 8 **Correlation of Issues with I&APs**

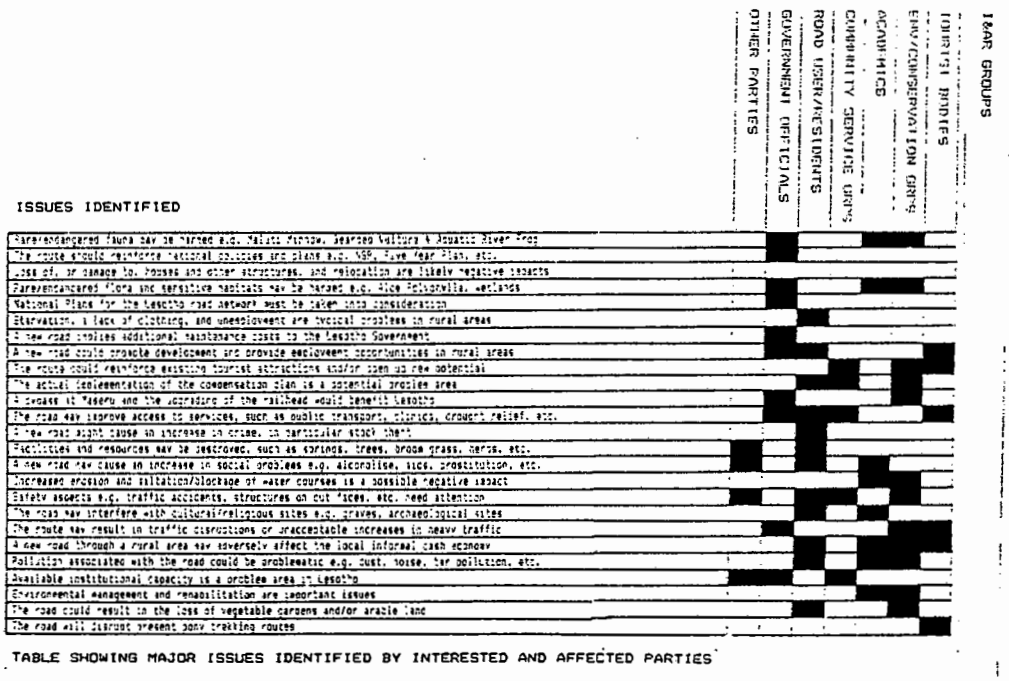
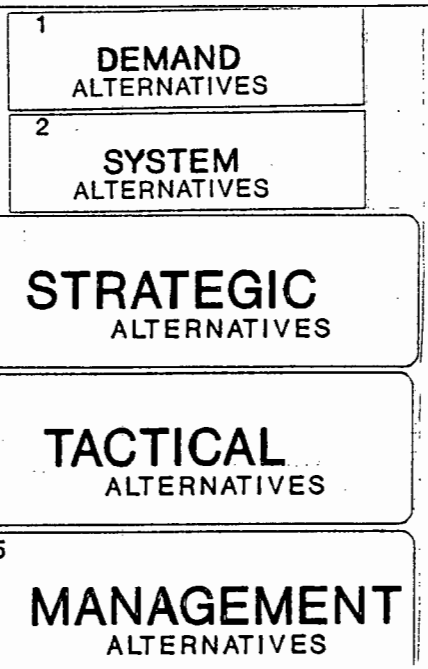


TABLE SHOWING MAJOR ISSUES IDENTIFIED BY INTERESTED AND AFFECTED PARTIES

6.4 Generation of alternative solutions

Hill and Fuggle's scheme was not applied explicitly during the execution of the IA for Contract 1000; nevertheless, it is possible to use the scheme to **analyse** the actual process of alternative generation.

Box 9 Hill and Fuggle's Types and Levels of Alternatives



Demand alternatives

The ultimate driving force for the implementation of any of the sub-projects comprising the Lesotho Highlands Water Project (LHWP) is the perceived need for water on the PWV. It was beyond the scope of the IA for Contract 1000 to consider whether this perceived need was valid or not, or even whether the forecast water demands are accurate or not. Once the need for the LHWP is accepted, and given other factual constraints (eg unavailability of dam building materials and personnel with construction expertise in Lesotho), the need for some type of access road to the Dam site soon becomes a *fait accompli*. Nevertheless, it must be obvious that faulty or inappropriate conceptualization of the needs to be addressed (the problems to be solved) at the highest level, will inevitably be transmitted to all the component projects of a mega-project such as the LHWP. An additional constraint imposed by the initial, broad conceptualization of the mega-project is that the feasibility study may already be outdated by the time later phases are implemented. In the case of the LHWP, for example, indications are that the PWV's demand for water may be considerably less than the initial projections would suggest. This could be traced to an economic environment that differs from that which prevailed when the feasibility study was conducted [LHDA:1986]. In addition, it is possible that in the intervening years, water conservation technology may have improved to the extent that demand effectively becomes reduced.

System alternatives

The need to transport bulk quantities of construction materials to the Mohale Dam site has been established. There is also a need to transport skilled and unskilled construction personnel to and from the site for a period of at least five years. Alternative means to achieve these objectives presumably were considered prior to the commissioning of the IA for Contract 1000. The IA did not consider the use of air, rail, or any other form of transport system, or even a combination of some of these together with road transport. The IA assumed that road transport had been identified as the most appropriate system, at least from the proponent's perspective. It further assumed that a single road route (as opposed to more than one route) would be adequate to meet the proponent's transport needs [see Chapter 11].

Strategic Alternatives

The IA under discussion was targeted explicitly at the level of strategies: the merits and demerits of alternative locations (corridors) for the project were investigated.

Also at the strategy level is a consideration of alternative components and segments of a project. In the case of Contract 1000, these were largely seen as "non-negotiables": the WAR comprises only a segment of the Mountain Road, and the proposed Maseru Bypass is assumed to be a part of the WAR. Also, one of the limitations of the IA was that the terms of reference constrained a comprehensive and integrated consideration of the various components of the study. The Bypass, the WAR from St Michael's, minor access roads 1 and 2, and the resident Engineer's camp were evaluated in isolation from one another. Other components of the project, such as construction camps, quarry sites and the Dam itself, were similarly excluded from consideration by the terms of reference.

Tactical Alternatives

The IA team was able to suggest environmental guidelines to the engineer prior to the determination of an alignment for the LCAR. Subsequently, several detailed changes to the proposed alignments of both the WAR and of the LCAR were recommended by the IA team, based on "environmental concerns" at specific chainages along the respective routes [see reports EEU/2/93/104b,c].

Based on social surveys, and informed by field visits to the Katse road, certain desirable design features were identified by the IA team. These included wider road shoulders to accommodate pedestrian and animal traffic; shallower and less dangerous drainage ditches, and culverts that are better able to dissipate the (erosive) hydraulic force of run-off water. Unfortunately, some of these recommendations have been made at a late stage in the project cycle, and would therefore **not be incorporated into**

design. This information was divulged at an IA team meeting with the project engineers, and representatives from LHDA Environmental and Technical Divisions [23/04/1993].

Management Alternatives

The IA team accepted implicitly the existing allocation of responsibilities for project implementation (alternative level 5a.1), but made recommendations for the optimisation of local economic opportunities (level 5a.2). Recommendations were made for the altered scheduling of construction activities (alternative level 5b): project managers were advised to take into account seasonal differences in the sensitivity of local affected biophysical environments. These recommendations were unlikely to be implemented, because the resultant losses of project time would be too costly. The IA team also advocated the appointment of on-site environmental monitors (level 5c), and this was endorsed by the LHDA during the meeting of 23/04/1993. Guidelines which were drawn up by the IA team for rehabilitation of damage caused to the (biophysical) environment by road construction [EEU/2/93/104b,c: Appendix 6] constitute a consideration of alternative solutions at level 5d. Finally, although it was beyond the scope of the IA for Contract 1000 to devise Environmental Management Plans, the IA team recommended that such plans be drafted (level 5e).

Impact subjectivity: Defining significances

PART B Applying the Problem-solving Approach to the IA for Contract 1000

CHAPTER 7 Impact subjectivity: Defining significances

Stauth [1992:32] has pointed out that the three evaluation criteria borrowed from the field of resource economics - **efficiency, equity** and **sustainability** - will have different degrees of importance (ie will be given different weightings) to different types of decision-makers and evaluators. Impacts do not affect all interested and affected parties equally; in order to make informed trade-offs, it is necessary to know **which I&AP ("user") group** will be affected by an identified impact. The degree to which each group is affected will determine the significance of the impact **to them.** Failure to recognise this truth could render meaningless any attempts by the decision-maker or the IA study team to define an average, or blanket significance.

For the purposes of this discussion, the following **user groups** will be defined (recognising that, in the same way that the particular definition of problems affects the final solutions, definition of categories of user groups will affect the perception of the problem and, consequently, the final solution):

1 The proponents (also ultimately representing the interests of the water users in the PWV)

2 The Government of Lesotho (GoL) (ostensibly, but not necessarily representing the interests of the Basotho nation who form a diffuse group. The needs and aspirations of the GoL are, for convenience, assumed to be reflected in national and regional planning initiatives.)

3 Conservationists, Tourists and Posterity (Basotho and international)

4 LCAR Residents (people living within the LCAR catchment)

5 WAR Residents (people living within the WAR catchment)

6 Travellers Business- and tradespeople, commuters in Maseru, motor tourists

In addition to being differentially affected by the set of actions comprising the project (Contract 1000), each of these groups may be expected to have different inherent aspirations and needs, and is likely to attach different weightings to the evaluation criteria, efficiency, equity and sustainability.
The **proponent**, for example, would likely be concerned primarily with the **efficiency** of the chosen solution. By contrast, the **conservationist group** are likely to place a higher relative value on **sustainability** than some of the other groups.

A likely (but, necessarily, hypothetical) weighting by the six user groups of the three evaluation criteria is presented in Table 2.

TABLE 2

TABLE of EVALUATION CRITERIA rated by 6 USER GROUPS

USER GROUP	CRITERIA
PROPONENTS	* EFFICIENCY (1) * equity
GoL	* EQUITY
CONSERVATIO -NISTS	* SUSTAINABILITY
WAR RESIDENTS	* EFFICIENCY (2)
LCAR RESIDENTS	* EFFICIENCY (3)
TRAVELLERS	* EFFICIENCY (4) * SUSTAINABILITY

KEY:-

LARGE TYPE	HIGHLY ESTEEMED CRITERION
small type	less important criterion
EFFICIENCY (1) - (4)	Efficiency as defined by each respective group

However, even if a particular group were to attach value to one or more of the criteria, the situation is further complicated by the fact that each group is likely to have a different interpretation of the precise implications of a single criterion. For example, while the proponent and the LCAR residents may each place a high value on "**efficiency**" (benefits exceed costs), benefits to one group may be costs to another group [Stauth 1992:31]. The LCAR residents, for example, would consider an efficient solution one which met **their** needs effectively, perhaps by providing employment (EFFICIENCY 2 in Table 2). By contrast, the same solution may **cost** the proponent both time and money because it may require financial investment in training programmes and it may result in delays on the project schedule.

Sustainability, for the proponent, might be defined in terms of the project life-cycle (ie the road should remain functional for the four years required to build the Dam), rather than in terms of perpetuity. Similarly, the proponent may restrict the definition of the **equity** criterion to mean that the distribution of costs and benefits is sufficiently equitable to prevent (potentially disruptive) local opposition to the project.

If different groups of I&APs have different inherent values, it follows that they may attach different respective significances to particular problems within a given set of such problems. In Chapter 10, below, the set of problems associated with Contract 1000 can be divided into three sub-sets: problems relating to lack of **access**, to economic **underdevelopment**, and to **environmental degradation**. At this coarse level of problem definition [see Chapter 6, above], it is possible to correlate particular user groups with particular problems, in the same way that this was done for Stauth's evaluation criteria. Table 3 highlights the respective needs and aspirations of the six user groups already defined.

TABLE 3 MAIN PROBLEMS and NEEDS of 6 USER GROUPS

GROUP	NEED/PROBLEM
PROPONENTS	Access
GoL	Underdevelopment
CONSERVATIONISTS	Environmental Degradation
LCAR RESIDENTS	Underdevelopment
WAR RESIDENTS	Underdevelopment
TRAVELLERS	Access

Boggs [1991:2] has declared that society is a "jungle of competing interests" and that so-called "rational evaluations", the supposed outcomes of "objective" IA, may be "reduced to rhetoric in the service of special interests".

In the context of Contract 1000, the Lesotho Highlands Development Authority (LHDA) will be called upon to arbitrate in such a "jungle". Based on the information contained in the IA reports EEU/2/93/104a-e, the LHDA must "trade off" the interests of some groups of I&APs at the expense of other groups. In Chapter 8, it is suggested that the Western Access Route will be chosen as the access road to serve the Mohale Dam, and not the Least Cost Alternative Route. Chapter 9 then discusses the implications of this decision for the six respective I&AP groups.

Political realities and the decision-makers' choice

PART B Applying the Problem-solving Approach to the IA for Contract 1000

CHAPTER 8 Political realities and the decision-maker's choice

Table 4 highlights what were felt by the IA team to be the "most significant" problem areas associated with the WAR and the LCAR respectively. Based on these, and particularly on the difference in financial cost to the proponent, the decision-makers do not have a difficult task. The WAR emerges as the preferred route: it has negligible "environmental" (biophysical) problems; social disruption is localised, and only "moderately significant", is able to be mitigated, and is far outweighed by the social benefits that are expected to accrue to local residents as a result of the upgrading of this section of the Mountain Road. The LCAR, by contrast, is associated with high risks in the biophysical environment (the loss of a species), and possible disbenefits to the GoL, in terms of an imposed road maintenance burden which was not considered in the (GoL) Ministry of Works' current budget. A consideration of positive **and** negative impacts (here, project-induced problems) associated with each route confirms this diagnosis [Tables 5 and 6].

An additional consideration, which previously has not been mentioned explicitly, but which weighs heavily in the favour of the WAR, is that three months of project time (and an undisclosed sum of project money) have been invested in detailed survey- and design work for the WAR. This work was conducted contemporaneously with the IA for Contract 1000. This suggests that in the proponent's mind, at least, the "choice" between the alternative routes has been a foregone conclusion.

As has been discussed previously in this document [Chapter 7, above], particular sets of impacts are associated with clusters of affected individuals, who may, for convenience of analysis, be defined into particular "user groups". The implications to each user group of selecting the WAR as the access road for the transport of materials and personnel to the Mohale Dam site are discussed below, in Chapter 9.

TABLE 4

	WESTERN ACCESS ROUTE	LEAST COST ALTERNATIVE ROUTE
Socio-economic	• *Loss of agricultural resources* • *Social disruption* • *Interference with potable water supplies* • *Inconvenience and increased risk to people and livestock* • *Loss of houses, businesses & facilities* • Impact on archaeological materials • Aesthetic impacts • Increased cost of living	• Contradicts existing road plans and places additional burden on road maintenance budget • *Impact on existing tourist facilities* • *Disruption of local economy* • Interference with potable water supplies
Biophysical	• 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	• Impacts on Maluti Minnow (endangered) and Aquatic River Frog (restricted) • *Loss of spiral aloe populations* • *Increased siltation of water courses* • *Destruction of wetlands* • Loss of *Leucosidea* woodland • Clogging of river courses with rockfall • Altered drainage through culverts and bridges • Loss of future options for conservation
Financial	M 178 229 243	M 178 229 243 + 46 819 592

Key to significance of impacts:-

High
Moderate
Low

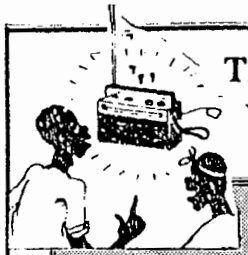


TABLE 5

WESTERN ACCESS ROUTE: Summary Table of impacts

	Negative impacts	Positive impacts
National / Regional	No significant impacts	• Accords with national road plans • Reinforces national planning objectives • Maseru bypass will relieve congestion • *Reinforces objectives of the National Settlement Policy* • Promotes tourism
Socio-economic	• *Loss of agricultural resources* • *Social disruption* • *Interference with potable water supplies* • *Inconvenience and increased risk to people and livestock* • *Loss of houses, businesses & facilities* • Aesthetic impacts • Increased cost of living	• Improved transport, and access to facilities, goods and services • *Increased business and employment opportunities* • *Reduced dust and mud* • *Improved speed and safety of travel*
Biophysical	• 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	• Impact on archaeological materials	No significant impacts

Key to significance of impacts:-

High
Moderate
Low

TABLE 6

LEAST COST ALTERNATIVE ROUTE: Summary Table of impacts

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

Key to significance of impacts:-

High
Moderate
Low

Unresolved problems: Issues and problems not resolved by the chosen alternative

PART B Applying the Problem-solving Approach to the IA for Contract 1000

CHAPTER 9 Unresolved problems: Issues and problems not resolved by the chosen alternative

The decision-maker in the case of Contract 1000 is the Lesotho Highlands Development Authority (LHDA). In Chapter 8, it has been submitted that the LHDA would choose the WAR above the LCAR to serve as the access road for the transport of materials and personnel to the Mohale Dam site. In making this (or any) choice, the LHDA is forced to make trade-offs: to balance the needs of some groups of affected parties against the needs of others. The LHDA has a clear brief to ensure that no group is worse off after the implementation of the chosen project (and as a **result** of the project) than it was before. Mitigatory actions, including compensation and rehabilitation, are the proposed remedies for projects that unavoidably cause disbenefits to certain groups.

From the findings of the IA for Contract 1000, it is possible to distill out "loser groups" from the user groups defined in Chapter 7. Table 7 illustrates the correlation of such "loser groups" with particular negative impacts of the WAR.

Additional "loser groups" can be identified, if, following the argument developed in Chapter 5, IA plays a more activist role by actually addressing environmental problems instead of merely describing them as part of the affected environment. It could be argued that there are "invisible" losses associated with the choice of the WAR over the LCAR. Certainly, for some I&APs, the opportunity to redress some of their primary concerns will have been lost by the failure to build the LCAR [see Table 8].

Based on the information in Tables 7 and 8, a "broad-brush" evaluation of the WAR's ability to meet the primary concerns (values) of each of the six user groups is presented in Table 9.

"LOSER GROUPS"

TABLE 7

	WESTERN ACCESS ROUTE
Socio-economic	• *Loss of agricultural resources* • *Social disruption* • *Interference with potable water supplies* • *Inconvenience and increased risk to people and livestock* • *Loss of houses, businesses & facilities* • Impact on archaeological materials • Aesthetic impacts • Increased cost of living
Biophysical	• 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
Financial	M 178 229 243

Key to significance of impacts:-

Moderate

Low

TABLE 8
LEAST COST ALTERNATIVE ROUTE

	Positive impact
National / Regional	• Promotion of planning objectives (economic growth, democratisation and employment creation) • *Creation of new transport linkages* • *Promotion of new tourist activities* • Promotion of decentralisation
Socio-economic	• Improved access to goods, services and facilities for remote rural people • *Increased employment opportunities* • Increased opportunities to market goods
Biophysical	No significant impacts
Archaeology	No significant impacts

"LOSER GROUPS"

GoL

TRAVELLERS

LCAR RESIDENTS

Key to significance of impacts:-

High
Moderate
Low

TABLE 9 **The WAR's ability to meet the concerns of the 6 user groups**

GROUP	CONCERN	EFFECT of the WAR
PROPONENT	Efficiency[1]	optimal; lowest financial cost; considerable savings in project time
	Equity	minimal social disruption
GoL	Equity	not optimal; most remote highland regions obtain no benefits; only marginal direct benefits to WAR residents
CONSERVATIONISTS		
	Sustainability	acceptable; no irreversible or widespread "significant" damage
WAR RESIDENTS	Efficiency[2]	perceived benefits outweigh costs (such as the reduced availability of potable water)
LCAR RESIDENTS	Efficiency[3]	no direct benefits or costs
TRAVELLERS	Efficiency[4]	Maseru bypass will relieve congestion improved road link along 63 km of the Mountain Road

The LHDA's latitude to ensure that each group benefits maximally from the project is less clearly specified than its responsibility to minimise negative impacts, although it may (arguably) be construed from the context of the LHWP in general. In Chapters 10 and 11, this `optimisation aspect' is investigated further. The alternative conceptualization of the environmental problems faced by each user group serves as a convenient starting point for such an investigation.

Problem recognition and formulation revisited: What might have been

10.1 Problem recognition: Consideration of needs

10.2 Problem formulation: First iteration

Accessibility

Underdevelopment

Environmental Degradation

10.3 Problem formulation: Second iteration

a) Taking account of the dynamic context

b) Taking account of the linkages
c) Taking account of political realities

10.4 Generation of new alternative solutions

Part B Applying the Problem-solving Approach to the IA for Contract 1000

CHAPTER 10 Problem recognition and formulation revisited: What might have been

10.1 Problem recognition: Consideration of needs

At a primary level, it is convenient to delimit three basic problem areas within the purview of the Lesotho Highlands Water Project (LHWP). It must be emphasised that these are categories of **problems**, and not of environments, or of contexts.
It can be shown that, in broad terms, these three basic problems apply also to Contract 1000 (the access roads for the Mohale Dam). Only their specific manifestation in both space and time differs. It is therefore not wholly unreasonable to suppose that, at some level, categories of generalised **solutions** may be devised which would differ for the LHWP and Contract 1000 respectively only in terms of details of design, timing and scale. If this proves to be possible, there may be important implications for the enhanced efficiency of future IAs.

The LHWP was conceived in order to address two problems:

1. Shortage of water on the PWV
2. Underdevelopment of Lesotho.

These are its expressed goals; the primacy of each respectively is not assessed here, although Thoahlane has questioned the likelihood that the LHWP was ever designed to address effectively the problem of underdevelopment [Thoahlane 1991:338].

Early on, it was recognized that the very implementation of the LHWP could **create** a new set of problems:

3. the deterioration of the environment (where "environment" has a broad definition, encompassing "biophysical" and "socio-economic" spheres)

These primary problems, in the context of Contract 1000 (access roads to the Mohale Dam), "translate" as:

1) **LACK OF ACCESS** from the RSA to the proposed Mohale Dam site in the face of the need to transport construction materials and personnel to the Dam site;

2) **UNDERDEVELOPMENT** of the Mohale Dam's hinterlands, and

3) **ENVIRONMENTAL DEGRADATION** caused directly and indirectly by the construction of access roads to the Mohale Dam.

Some fundamental problem areas have been identified - the next step is to clarify what is meant by each of the three primary problems, ie to begin to formulate the problems into usable concepts .

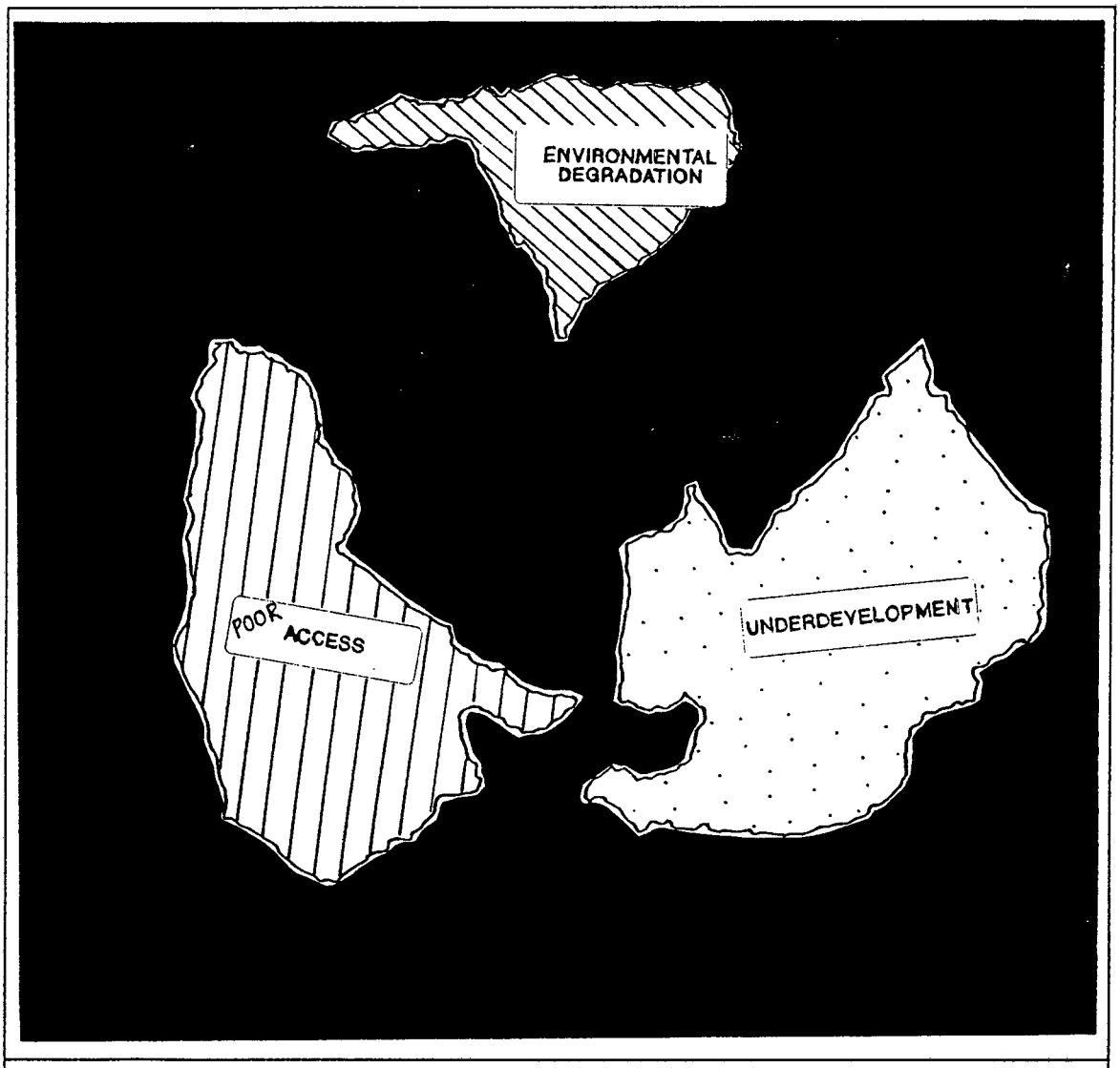


FIGURE 9 **Three fundamental problem areas**

10.2 Problem formulation: First iteration

a) Accessibility: Some dimensions

Transport networks

The spatial separation of people, goods and facilities represents a barrier to their mutual interaction: transport networks of various kinds are the means of overcoming this barrier of distance. Transport networks are structures comprised of **nodes** (points of origin and destination), **links** (routes), **flows** (passenger and goods transport) and **modes** (means of transport, such as motor vehicles) [see, eg, Haggett 1969:288].

Network properties

Not surprisingly, particular networks have particular attributes, *inter alia,* total length and density of links, importance (degrees) of nodes in terms of a functional hierarchy, and quality of links in terms of the types and volumes of flows that they can accommodate. Haggett [1969:312] has pointed to the interesting theory that network structure can be adapted - or maladapted - to certain types of traffic flows. It has been suggested that a network adapted to fast motor traffic may have an inefficient structure for the needs of animal-drawn traffic. This theory has important implications for the design of roads in rural areas, such as the Lesotho Highlands.

Nested systems

Theorists have pointed out that networks are nested systems: regional networks are "nested" within national networks, and local area networks are contained within regional networks [see, eg, Haggett 1969]. The properties of each component network will be unique - for present purposes, the most important implication is that a national network may be efficient, but may contain inefficient regional and local area networks.

Comparison of network properties

In order to facilitate the comparison of different networks, theorists have devised classification schemes for networks, as well as a set of simple indices. The relative and absolute numbers of nodes and links in a network, and the relationships of nodes to links can be used to derive various measures of accessibility.

Overall accessibility of a network

An `overall accessibility' can be defined for the network, and it is possible to calculate how the structure and properties of a network will change in response to the addition of

(or upgrading of) new links or nodes [Hay 1973:3a]. The national road network of Lesotho will be influenced in particular, structural ways by **either** the building of the LCAR (a new link) or by the upgrading of the Mountain Road to form the WAR (an improved link).

Nodal accessibility

`Nodal accessibilities' can be calculated for individual nodes in a network; in part, this is related to the number of links passing through the particular node. However, there are additional variables in the `accessibility equation'. Particularly relevant variables in the context of Contract 1000 are the number of **access points** (bus- and taxi-stops, spur roads into villages, feeder roads from the main routes) and the types of flows. The type, frequency and cost (efficiency) of transport vehicles will affect the degree to which local people's mobility will be affected by the new network structure. Mobility is also affected by culture [Hurst 1974:288]; Taaffe has explained that each traveller has his own "mental map", or perception, of a specialised and fragmented area containing desirable potential destinations [1973:201]. In addition, "access" always has a context, and without resources to be utilized, access has no meaning [Hurst 1974:383]. This is borne out by the reported lack of service availability to residents along the Mountain Road, in spite of the fact that the Road has been in existence for over thirty years [EEU/2/93/104c]. Finally, according to Taaffe [1974:399], it should be recognised that access can be measured not only in terms of distance, but also in terms of cost and travel time - factors which have differential relevance to different groups in society. In the context of Contract 1000, the proponent, tourist and business travellers, and local residents are likely to have their own, different respective definitions of what constitutes accessibility.

b) Underdevelopment

"Development" is an ill-defined concept which depends heavily on subjective value judgements about what constitutes progress [see, eg, Quinlan 1991:6]. The development conflict is a vast subject, and far beyond the needs and scope of the present discussion. Accordingly, the discussion will be restricted to road-related development, itself a topic fraught with dissension.

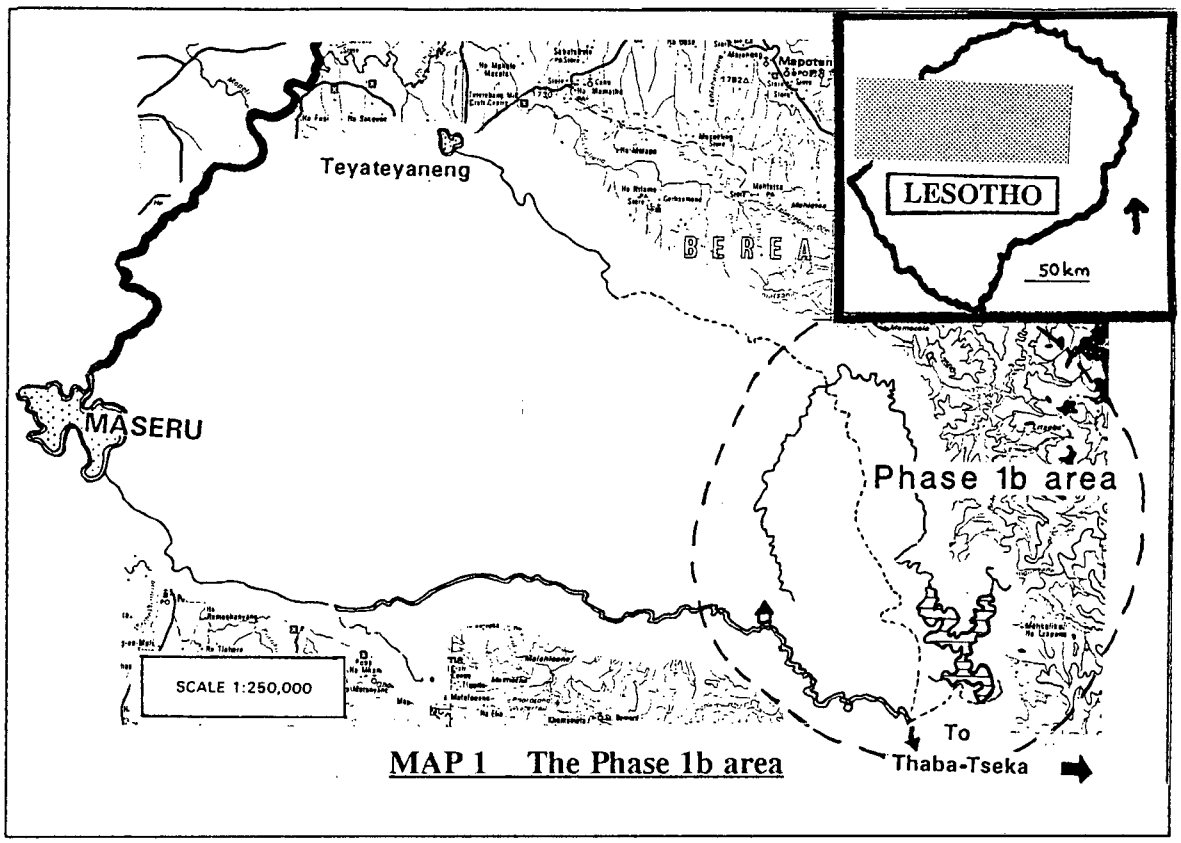
For example, some commentators have argued that infrastructural improvements, by diverting money from other development projects, may actually have a negative effect on socioeconomic development [EEU/2/93/104bc: Appendix 7]. However, a contrary position has been adopted by other authors, based on the premise that "immobility perpetuates poverty" [Owen 1974:3]. Stanley has asserted that the improvement of transportation is a "critical factor" in the developmental process and "can hardly be overemphasised" [1974:417], while Martin and Warden regard with skepticism those national planners in aspiring less developed countries who "look longingly toward transportation investment as the catalyst of economic development" [1974:407]. Road transport, because of its versatility and flexibility, represents a uniquely useful

instrument for social and economic progress [Stanley 1974:417], but it should be seen as a **necessary** rather than a **sufficient** condition for such progress [EEU/2/93/104bc: Appendix 7].

There has been much debate in the literature about whether roads enhance, impede or have no effect on socioeconomic development; but it has been recognised that a road is so much more than a long strip of ground devoted to a public end [Haggett 1969:46]. Roads are related to accessibility, and have complex links to development; roads also have direct and indirect effects (impacts) on the quality and functioning of their surrounding environments. Roads are embedded simultaneously in multiple, interacting environments - sociocultural, economic, political, and biophysical environments.

c) Environmental Degradation

Like "Development", "Conservation" of the "Environment" is a vast topic, informed by many, often conflicting, viewpoints. A particular society's environmental history [Murphy 1992:311], economic standing [Turner 1989:41], and cultural mores affect its perception of environmental quality, and therefore the perceived need to conserve particular environmental elements. A given society may place only utilitarian values on environmental elements, such as individual species; while a different society may give weight to "existence" values over and above utilitarian values [see, eg, Fuggle 1992:8]. Environmental conservation encompasses the conservation of functional ecosystems, viable habitats, communities and populations, as well as the continued existence of individual species. In the context of Contract 1000, the Maluti Minnow is valued by conservationists for scientific and ethical reasons, but has no immediate practical value to the people who live in the valley in which the Minnow is found. The loss of a species is valued by a (diffuse) international community, but does not evoke concern at a local level. Interventions that threaten the survival of the Minnow as a species are likely to anger the conservationists, while "mitigation measures" to conserve, or preserve, the species could impinge directly or indirectly on the well-being of local people. This is only one of several potential conflicts that may arise over the future use of the biophysical environment of the Phase 1b area [Map 1]. The gap between conservationists and would-be developers can be bridged by environmental education (which may be a very slow process), and by negotiation and necessary compromise. Resolution of environmental conflicts must take place at the levels of planning and of management, as well as with an awareness that total "non-interference" is an impossible ideal. Intelligent, informed environmental management is the only remaining practicable option [Fuggle 1992:3].



MAP 1 The Phase 1b area

10.3 Problem formulation: Second iteration

At this stage it would be profitable for the IA team to incorporate consciously those features of environmental problems which have up to now been stumbling blocks to their successful, long-term resolution [see Chapter 2]. The team should begin to consider specific issues that have been identified by scoping [see Tables 1a and 1b in Chapter 6, for lists of such issues]. Below, are some suggested considerations which are meant to serve as illustrations; they do not purport to be comprehensive listings of all the possible factors that could have been considered.

a) Taking account of the Dynamic context

Focus on the Historical Context: Some considerations

* The new military government had been in power for only nine months when it made its "hasty decision" to sign the Treaty implementing the Lesotho Highlands Water Project (LHWP) [Thoahlane 1991:304]. Furthermore, the military government was a "new and unknown regime" which needed to establish its legitimacy to the international community - the mammoth LHWP was an exciting vehicle for doing so [Thoahlane 1991:303].

* Conflicts over resources can be traced back as far as the turn of the century [see, eg, Parsons 1982]. These conflicts have manifested recently as wage and labour disputes in the Phase 1a area [see EEU/2/93/104b,c]

* The country's history over the past few decades shows that remote rural areas have been neglected by central government; provision of services and government expenditure has been concentrated in Maseru and the Lowlands at the expense of the rural Highlands.

Focus on the Future: Selected Aspects

* The Mohale Dam will be constructed over a period of approximately five years.

* The Dam will inundate land and villages in the southern reaches of the Jorodane Valley [[Map 2] up for up to 9 km along an imaginary Valley axis.

* The Dam represents a new development node in the area. It will be associated with relatively sophisticated, permanent and temporary infrastructure such as a Dam control centre, housing and services for Dam staff, and tourist facilities.

* There are plans to declare the Phase 1b area a Selected Development Area (SDA) and to found an SDA Management Committee. This Committee effectively aims to introduce central government control to the area which is currently controlled by traditional chiefs.

b) Taking account of linkages

It is possible to categorise each of the problems identified by the (conventional) IA for Contract 1000 according to the tripartite scheme of fundamental problems described above (poor accessibility, underdevelopment, and environmental degradation). The basis of categorisation is not rigorous, but reflects the most striking feature of the problem in question. "Lack of money", for example, falls into the category of "Underdevelopment"; while "lack of roads and transport" is mainly a problem of "Access". Table 1a is reproduced here to illustrate the categorisation of the range of identified problems into the three problem areas.

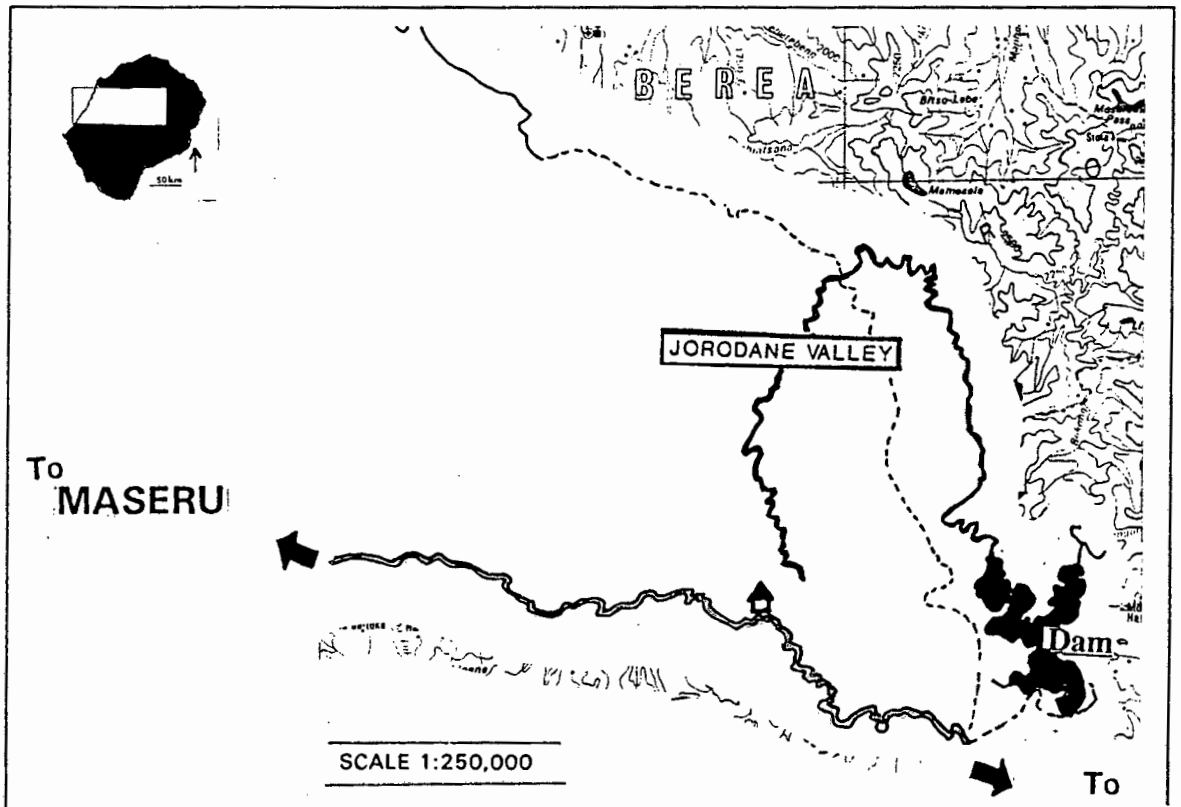
This categorisation is at least a partially **functional** one, as opposed to the more arbitrary one according to "affected environments" [see EEU reports /2/93/104b and c], which was not informed by any prior conceptualisation of problems. The usefulness of even a revised categorisation will remain limited, however, unless additional "problem-solving" steps are carried out. Firstly, remembering that the `fundamental problem areas are already linked in the pre-project context [fig 10], it is useful to recognise that each of the specific problems listed in Tables 1a and b have

TABLE 1a LIST of ENVIRONMENTAL PROBLEMS (the WAR)

PROBLEM	page REFERENCE in report 104b
poor vehicular access to Mohale Dam site	1
poorly developed national road network	1
no integrated development plan for the Phase 1b area	6
some project details are not yet available	6
design life of the WAR is 20 years	7
GoL is responsible for road maintenance after the Dam has been built	7
the design speed of the WAR is 30 - 75km/h	8
contractors determine the size and location of construction camps	13
contractors determine the length of road to be upgraded at any one time	13
contractors determine the details of road closure	13
unbalanced settlement pattern	17
limited tourism development	17
limited natural resource base	18
economic dependence of GoL on RSA	18
unemployment	18
lack of money	18
lack of schooling	18
reduction in soil quality	19
unequal wealth distribution	19
lack of services in the Highlands	20
vegetables cannot be grown in winter	20
economic stagnation	20
absence of spur roads to villages	20
Mountain road narrow	20
poor quality surface on Mountain road	20
lack of food	20
lack of good water supply	20
unemployment	20
lack of roads and transport	20
lack of money	20
lack of medical facilities	20
lack of household and personal possessions	20
lack of latrines	20
lack of good housing and building materials	20
lack of livestock	20
lack of fields	20
limited public transport	21
loss of able-bodied males to migrant labour	22
few children attend high school	22
villages have developed without physical planning	22
lack of fields near Maseru	22
limited availability of grazing lands near villages	22
resources are controlled by outsiders	23
water must be obtained from local springs	23
people wash clothes in local streams	23
chiefs nearer urban centres have reduced control over their people	23
poor quality village roads	25
lack of bus stops	25
lack of informal market areas	25
erodible soils	25
mountainous terrain	26
hydrological information not yet available	26
rain can result in flood events in the summer	26
reduction in water quality along the Mountain Road	26
the WAR crosses source water wetlands	27
a limited amount of natural vegetation remains	27
steep slopes unsuitable for cultivation	27
severe overgrazing has reduced pasture quality	27
little indigenous fauna remains	27
soil erosion caused by overgrazing	28

☐ Access
☐ Underdevelopment
☐ Environmental Degradation

aspects pertaining to more than one (problem area) category. For example, erodible soils are mainly a problem in the area of "environmental degradation", but also have implications in the sphere of "underdevelopment". The fundamental problems thus serve as a tripartite context for each of the specific problems [see Tables 1a and 1b, Chapter 6] identified by conventional IA (the IA for contract 1000). Figure 11 illustrates this idea graphically. The likely effects of the project (the access roads) on these linkages - both in terms of specific problems such as soil erosion, and on the generalised problem areas - needs to be assessed in order to generate acceptable alternative solutions.



Map 2 Location of the planned Mohale Dam

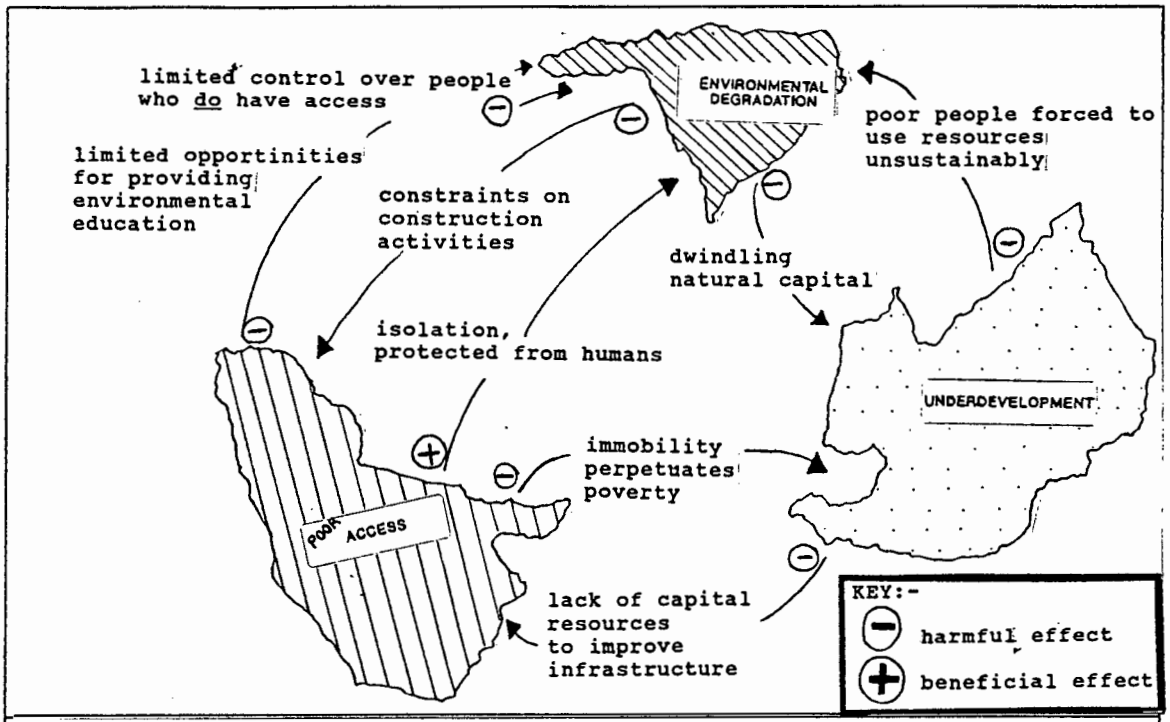


Fig 10 Schematic diagram of interrelationships among problem areas

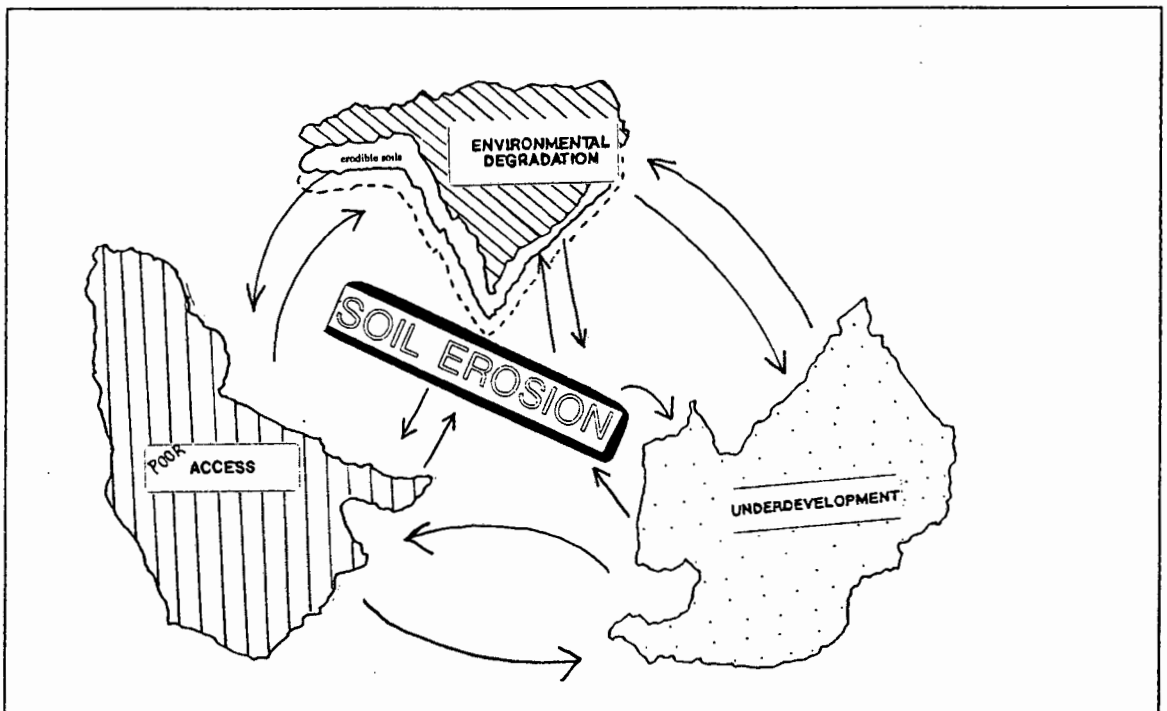


Fig 11 The tripartite context of a particular problem: soil erosion

c) Taking account of political realities: some examples

* Lesotho is a small, still-developing country in which a general lack of institutional capacity prevails - recognition of this fact was the reason for establishing the LHDA to manage the LHWP efficiently.

* The LHDA has "poached" many of the most talented and best qualified administrative and technical personnel from existing government departments; this has weakened further the administrative capacity of central and regional government.

* In the absence of severe penalty clauses and their effective enforcement, recommended mitigation measures, including rehabilitation are unlikely to be implemented.

* The inter-governmental body established by the Treaty (the JPTC) is of such a nature as to "perpetuate and reaffirm the economic dependency of Lesotho on South Africa" [Thoahlane 1991:305]

* The LHDA/GoL discussion forum is largely dysfunctional [LHDA Environmental Division, *pers. comm.*]

* There has been too little funding and staffing of Compensation and Rural Development programmes; staff training has also not been adequate.

* Royalties already received by the GoL from the RSA, as advance payments for water, are currently "locked" within the GoL bureaucracy; none of this money has been made available for planned development projects [Jeuness *pers. comm.*].

10.4 Generation of new alternative solutions

Using Hill and Fuggle's Types and Levels of alternatives as a series of prompts, it is possible to consider anew what range of alternative solutions **might** have been generated by the IA had a problem-solving approach been adopted *ab initio*. Chapter 11 develops this theme by using the problems associated with Contract 1000 as a case-study.

Description and evaluation of a "new" problem-solving solution

PART B Applying the Problem-solving Approach to the IA for Contract 1000

CHAPTER 11 Description and evaluation of a "new" problem-solving solution

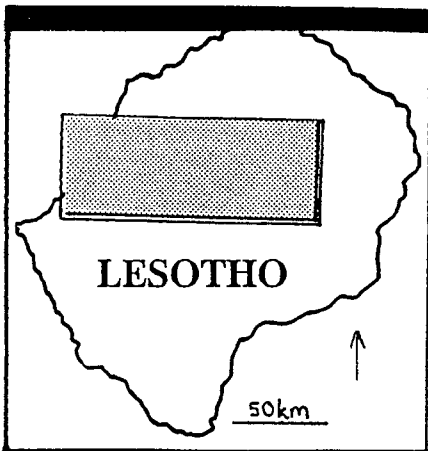
11.1 Description and assessment of some possible alternatives

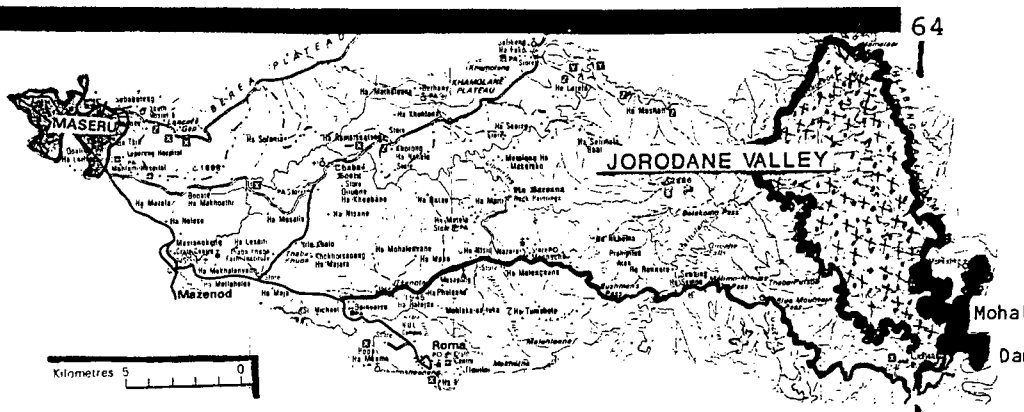
11.1.1 Problem formulation

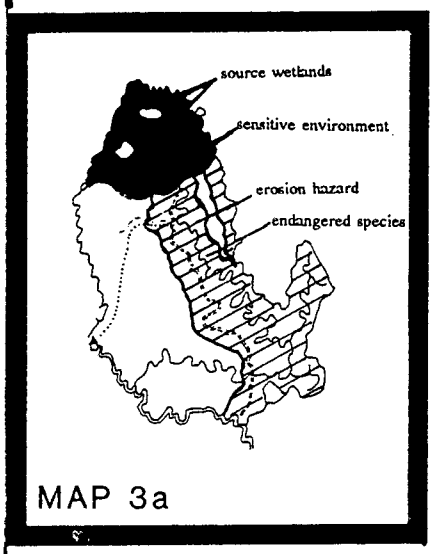
In the aforegoing chapters it has been proposed that a key problem which is **not** addressed adequately by the alternative route most likely to be chosen to serve as the access road to the Mohale Dam site, the WAR, is the lack of "development" in the remote highland region known as the Jorodane Valley [see Table 8]. Assuming a mandate to address this problem (based on the arguments above) is equivalent, in terms of Hill and Fuggle's types and levels of alternatives [Box- see Chapters 3 and 6], to adopting new objectives (alternative level 1b).

BOX 10

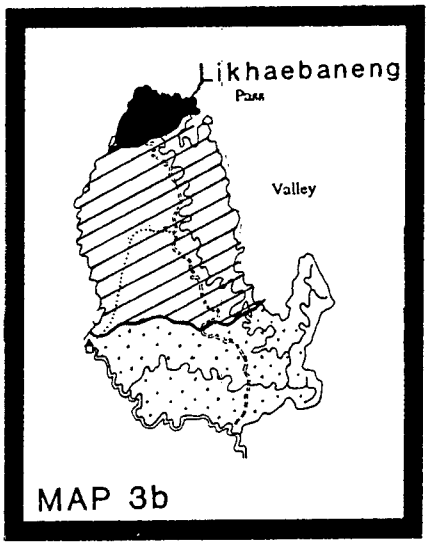
It is helpful to begin the search for acceptable solutions with an assessment of the potentials, needs and hazards associated with the affected environment (the Jorodane Valley). Already this differs from conventional







ENVIRONMENTAL SENSITIVITY



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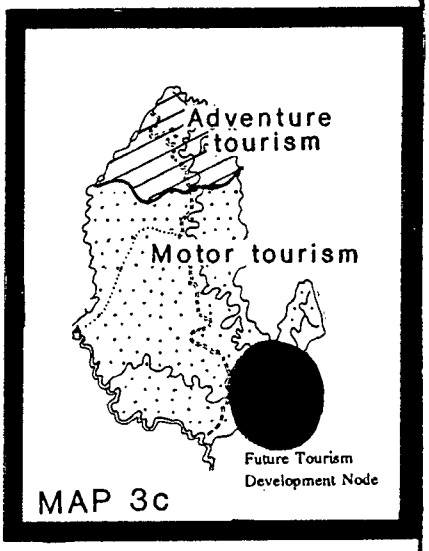
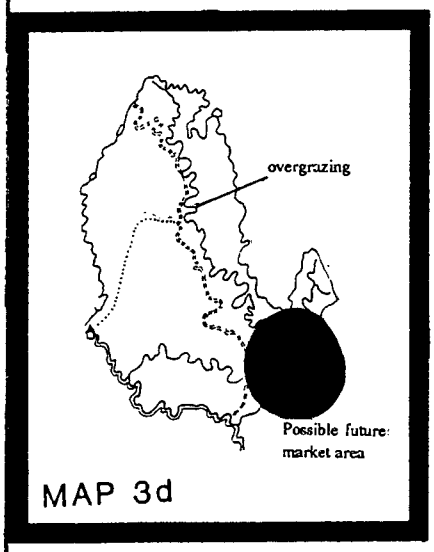
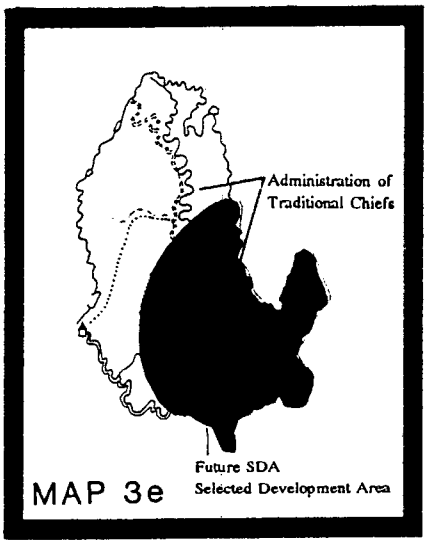


TOURISM POTENTIAL



AGRICULTURAL POTENTIAL



ZONES OF ADMINISTRATIVE CONTROL

ZONES OF ACCESSIBILITY

ZONES of POTENTIALS, NEEDS and HAZARD in the JORODANE VALLEY

effect of high intensity/ effect of high probability/

moderate intensity effect

low intensity effect

descriptions of the affected environment because there is a conscious attempt to consider different types of aspects simultaneously, and at an early stage. The approach can be likened to M^{C}Harg's Overlay Approach to mapping [M^{C}Harg 1971], although here the maps are not overlain because insufficient quantitative data was generated by the baseline (IA) study for this purpose. Maps 3a-f demarcate qualitatively the area's environmental, tourism, market and agricultural potentials; the zones of need (accessibility), and zones of hazard which could hinder any developments in the area (zones of high cost, overgrazing, and erodible soils). Even though the assessment is relatively coarse, there has also been an (embryonic) attempt to take into consideration the dynamic context and political realities of the problem. Some of the planned and possible future changes to the area are the construction of the Mohale Dam and associated tourist facilities [3c]; the declaration of a Selected Development Area [3e], and the potential demand for commodities which may derive from the establishment of construction camps in the area [3d]. In the light of the experience (history) of Phase 1a of the LHWP, problem-solvers ought to take into account the possibility of future conflicts over the declaration of an SDA. In areas controlled currently by traditional chiefs this may prove to be an unpopular decision: early awareness of this fact may enable project and environmental managers to adapt their approach in order to mitigate the problem, or even to transform it into an opportunity. Early consultation, and the establishment of relationships with traditional chiefs and with other parties (government officials and locally-involved NGOs) likely to be included in an SDA Management Committee can improve the chances of generating solutions that are acceptable to all parties (equitable) - and therefore sustainable. The early establishment of relationships may be particularly important during the transition phase from traditional (chiefs') to government (SDA Management Committee) control. The transition phase could be expected to be a period of instability, which could result in expensive and counter-productive delays for any development projects in the area.

11.1.2 Generation of alternatives

The juxtaposition of complex issues does not necessarily lead to obfuscation: rather, it can suggest solutions. For example, Map 3d shows that overgrazing is prevalent in an area of high agricultural potential, and that there is a future potential market area nearby. Map 3f shows that the same zone has poor accessibility generally, which would include poor access to (agricultural) markets. The (possible alternative) solution which "suggests itself" is that: cattle farming should be replaced by the establishment of market gardens, and that a farm-to-market road should be built. In terms of Hill and Fuggle's types and levels of alternatives, the establishment of market gardens may be classified as a Demand Alternative (level 1b.2). The proposed farm-to-market road constitutes a consideration of alternatives at the system level (level 2).

11.1.3 Problem formulation (first iteration)

This new "proposal" which aims to address a particular need (lack of development in the Jorodane Valley) should immediately be weighed against other needs. The

different needs (or concerns) of other I&AP groups have been defined in Chapter 7, and include:

> the proponent's need for **efficient** access to the Mohale Dam site;
> the WAR residents' need for efficient development;
> the requirements of tourist- and business travellers for efficient access;
> the GoL's need to promote efficient and equitable planning goals, and
> the concerns of conservationists for sustainable use of the biophysical environment (ie avoidance of environmental degradation).

11.1.4 Generation of alternatives (first iteration)

In Chapter 9, it was concluded that the WAR addressed the proponent's needs for efficient access extremely well; it was also in accord with many (but not all) of the GoL's planning goals, and it was deemed to impose little significant damage on the surrounding biophysical environment. The WAR was also regarded by the writers of reports EEU/2/93/104b and c to address, at least partially, the needs of local (WAR) residents and of tourist and business travellers. Thus the WAR could be retained as part of the overall solution to the problems of the Phase 1b area. At the system level, when considering which system components are feasible, there is a possibility is that more than one of the component proposals should be implemented. The Contract 1000 IA team construed their terms of reference to have excluded such a consideration. The components to consider for the Phase 1b Area may be summarised as:

> an access road (the WAR);
> a farm-to-market road, and
> an agricultural land-use initiative (market gardening).

A solution comprised of **all** of these components has potential to be a comprehensive solution to the various basic needs and problems defined above; it also has potential to be an integrated solution, for reasons considered below.

An access road to the Mohale Dam (the WAR)

The third level at which alternatives should be evaluated is the Strategy level. Assuming that the findings of report EEU/2/93/104c are valid, the WAR is situated in an optimal corridor [level 3a]. There is, however, scope for suggesting that alternative, additional segments of the Mountain Road from Maseru to Thaba-Tseka be built [see EEU/2/93/104c]. At present, the usefulness of the WAR to the Basotho nation (as defined in the GoL's planning goals, specifically the national road network plans) is constrained by the absence of immediate plans to upgrade the rest of the Mountain Road. Plans that do exist for upgrading other sections of the Road are still in the early stages of conceptualisation: funding has not yet been obtained, and the budget of the Roads Department has been subjected to rationalisation measures imposed on the GoL by international financial institutions [see, eg, LHDA 1986]. Political realism thus dictates that the remaining sections of

the Mountain Road are unlikely to be built in the near future; it is also unrealistic to expect the proponents of Contract 1000 to finance the building of additional segments of road far in excess of their needs. This alternative should not, however, be wholly discarded. There may be scope to develop inter-institutional relationships to the extent that co-operative ventures and innovative financial and technical arrangements can be initiated. The feasibility of such ideas will depend on both institutional capacities and on the nature of the inter-institutional relationships that can be established - the negotiation, facilitation and networking skills of the IA team can play a crucial role here [see Chapter 5]. Before resorting to the sequential consideration of alternatives in terms of Hill and Fuggle's Scheme, the IA team might find it helpful to test the feasibility of co-operative ventures at the level of management alternatives (level 5).

A farm-to-market road

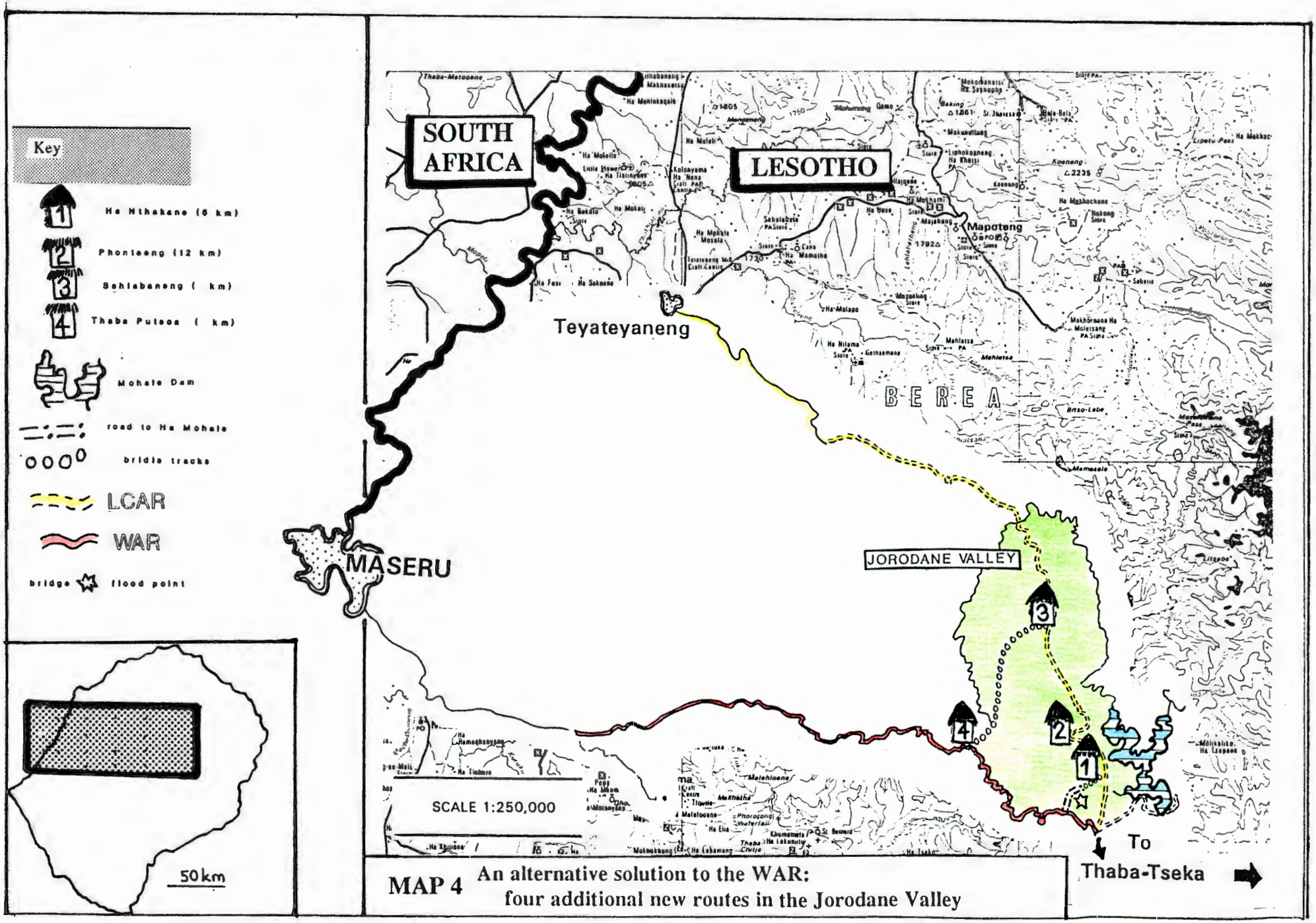
Assuming, for the moment that the WAR will be built as originally designed, in terms of alignment, and design standards [see EEU/2/93/104c], the next step in the process of generating alternatives is to consider the strategic and tactical alternatives for the farm-to-market road and for the proposed market gardens. At a large scale, the possible locations for market gardens in the Jorodane Valley must be limited by the agricultural potential and by the access to markets. At a relatively smaller scale, other factors (*inter alia* quality of soil, slope, availability of water, erosion hazards and proximity to existing villages) will refine location, but for the present, this level of detail is unnecessary.

In Chapter 10, it was pointed out that access to markets is determined partially by distance, partially by the quality of transport links, and, finally, by the availability of suitable modes of transport. Because "access" is a complex issue underlain by numerous (currently unknown, or unknowable) variables it becomes necessary to consider simultaneously alternatives at levels 3, 4, and 5. In practice, this will take the form of numerous iterations of problem formulation/alternative generation. If, however, there is good communication at regular intervals among problem-solvers (the IA team, the client, and the I&APs), this procedure can be efficient rather than cumbersome. Corridors for the farm-to-market road, and the length of such a road need not be identical to those proposed for the LCAR: the respective purposes of these roads are very different. For example, there is no immediate need for the farm-to-market road to provide access/egress at the northern end of the Valley if the main agricultural markets are situated to the south of the Valley (the construction camps at the Mohale Dam site), or can at least be accessed adequately from the south of the Valley (via the proposed WAR). Access to northern markets (eg at Teyateyaneng) may not prove essential to the viability of a market garden scheme. Consideration of the high construction costs at the northern end of the Valley as a result of the extremely rugged terrain (the Likhaebaneng Pass - see Map 3b) reinforces this emerging alternative: an extended feeder road into the Valley from some point on the WAR.

At the level of tactical alternatives, contextual design [see Chapter 3] should take into account the expected types and volumes of traffic in order to formulate an appropriate set of standards. Initially, possible types of traffic are scotch carts, pack animals, and pedestrians. Depending on the design standards of the road, motor vehicles such as commercial transport vehicles, (kombi) taxis, and tourist cars may also be expected. The possibility of tourist use of the road represents an additional development opportunity, which can be maximised by pro-active planning [see Preston 1992:749]. **This** alternative merits a revisitation of level 2 (system) alternatives (what tourist facilities, or system components might be proposed?), as well as investigation at lower levels (*inter alia* where, when and how should these facilities be built?; who should fund them?, and who should build and manage them?).

At this stage of the planning process, it could be profitable to draw potential I&APs into a negotiation forum for "brainstorming". A range of integrated, alternative solutions for further investigation could be distilled from this process. At this relatively early stage, planners could identify development aspects which counteract one another, enabling potential solutions to be formulated timeously. For example, damage to the biophysical and cultural environment that results in scarring of the landscape from the point of view of future tourists will impinge on the success of any tourist developments. A possible range of solutions which could be negotiated among (*inter alia*) local residents, local chiefs, a future SDA Management Committee, the tourist industry and the GoL could include proposals for maintaining the traditional character of some local villages. The details would need to be negotiated at the levels of tactical and management alternatives (levels 4 and 5). Experience (or, problem history - see Chapter 2) along other roads built recently in Lesotho has shown that villagers tend to replace traditional thatch roofs with corrugated iron as soon as improved road access makes transporting corrugated iron more feasible. In addition, "compensation houses" provided by the LHDA have deviated from the local traditional architecture; the LHDA Compensation Division would thus have to be a party to these negotiations. There would have to be negotiation about which construction materials and design features constitute vernacular architecture (alternative levels 4a.1 and 4a.2), and about how local villagers could be assisted to conserve vernacular architecture and whether they could derive benefit from doing so (alternative levels 5a and 5e).

At this negotiation forum, there should be some attempt to delegate certain facets or levels of the problems/proposed alternatives to appropriate, interested management units. New amalgamations of institutions should be formed, if necessary, to address specific issues. The success of the forum will depend, once again, on the skills of negotiators and facilitators.



MAP 4 An alternative solution to the WAR: four additional new routes in the Jorodane Valley

11.1.5 Generation of alternatives (second iteration)

Currently in the problem-solving process, alternative solutions proposed for the major problems of the Phase 1b Area may be summarised in a more refined version as:

an access road (the WAR);
a farm-to-market road suitable for tourist use, and
an agricultural land-use initiative (market gardening) that is compatible with tourist activities.

the farm-to-market and tourist road

In the absence of a real negotiating forum with actual I&APs, it is not possible to develop this (alternative) solution to its full extent. However, in order to be able to discuss potential issues at the level of management alternatives some feasible (but hypothetical) routes are indicated on Map 4. For the sake of convenience, all the routes follow the approximate alignment of the proposed LCAR. This alignment has already been designed with features of the biophysical and socioeconomic environments in mind, but final alignments need not necessarily coincide with the LCAR's alignment (lower design standards, for example, may make possible even more environmentally-optimal alignments). All the routes begin where the Mountain Road is joined by an existing, but poor-quality gravel road to the village of Ha Mohale (not shown). This road is approximately four kilometres long. Route 1 [Map 4] comprises an upgraded Ha Mohale road, supplemented by a two kilometre stretch of new road up to the village of Ha Nthakane. Route 2 is an extension of Route 1; an additional seven kilometres of new road is required, up to the village of Phontseng. Route 3 extends Route 2 by a further seven kilometres, and terminates at the village of Sehlabaneng. Route 4 makes use of an existing, but also poor-quality gravel road from Sehlabaneng to the village of Thaba Putsoa, which is on the Mountain Road (and the proposed WAR). Route 4 is thus a ring road, and can provide alternative access to a 20 km section of the WAR from Thaba Putsoa to the Mohale Dam site.

The rationale behind the selection of these four particular routes is that they afford the opportunity for **phased** implementation of the road project. If the proposed set of routes is seen as a single project comprised of several sub-projects, there are also inherent opportunities for negotiating the implementation responsibilities (alternative level 5a.1.). In the context of political realism [see Chapter 4], a coordinated but phased solution, with appropriately-distributed responsibilities, may be an (not **the**) efficient, equitable and sustainable solution. Local economic opportunities could be maximised by such an approach: local residents could be employed to build the road, and especially to maintain it over the longer term. This should keep the road maintenance costs at a level affordable to the GoL, and would alleviate the "boom-and-bust" phenomenon associated with the temporary nature of such employment opportunities [see also EEU/2/93/104c].

11.1.6 Problem formulation (second iteration)

The IA for Contract 1000 has shown the LCAR to be associated with "significant" concerns relating to the biophysical environment. Before proceeding with the planning of the Jorodane Valley scheme under discussion, it is pertinent, therefore, to consider whether these concerns, or negative impacts, apply equally to the "new" hypothetical routes (Routes 1-4). Based on the available information in report EEU/2/93/104b, it is possible to make some crude predictions and assessments. With reference to Map 3a, it can be seen that the more sensitive biophysical environments are located at the northern end of the Jorodane Valley, beyond the reach of any of the hypothetical routes 1 -4. The source wetlands, and the clearest streams, are situated in the upper reaches of the Jorodane River system. The Pampiri waterfall (the southernmost extent of the proposed Maluti Minnow sanctuary - see EEU/2/93/104b) lies north of Sehlabaneng Village. Additional considerations are that the southern and mid portions of the Valley have been transformed considerably by humans already (the Valley has an agricultural, as opposed to a wilderness character), and are soon to be subjected to further major transformations catalysed by the construction of the Mohale Dam.

The context of change

The process of change has thus been initiated in the Valley already; all that remains is to select a preferred **direction** of change. The agents of change (project planners, proponents, managers, and would-be impact controllers) should assume responsibility for the induced changes by attempting to manage this direction of change in an integrated way rather than leaving the system to its own devices, or "managing" only selected aspects of the system. In mathematical language, the existing system is moving inevitably along some trajectory to a new state; all that remains is to select the preferred end point and then to manipulate internal and external system variables in such a way as to limit the available range of trajectories - ideally, (but unattainably) to one. Applying these ideas to the Jorodane Valley scheme under discussion here, the preferred "endpoint" is a thriving local economy based on the tourist industry and on market gardening. The undesirable endpoint is a still-stagnant economy which is merely spatially, and not functionally, linked to developments associated with the Mohale Dam and its access roads. Based on knowledge of the affected environment (incorporating biophysical, socioeconomic, political and infrastructural aspects), the system has little inherent potential to attain the preferred state [EEU/2/93/104c: Appendix 6]. Realistic, integrated management interventions will be required to harness the development potential of the Valley.

Managing for change

It is a major theme of this dissertation that well-targeted inputs, achieved as a result of improved problem formulation, can be more effective system manipulators than can large financial inputs. The viability (sustainability) of market gardening, for example, can be enhanced by awarding a contract for vegetable supply to the Jorodane Valley farmers. Construction camps and tourist lodges in the area should be bound to buy their fresh produce from the local area. The farm-to-market road must therefore already be operational when the Dam is being built. This scheme

would give the local farmers five years of valuable business experience while the Dam is being built; thereafter, they may be able to adapt to supplying markets further afield (such as Maseru). The existing dynamism of the developers should also be "tapped" by the scheme in the form of transfers of knowledge and skills. In the past, LHDA has provided training schemes for local people, but these initiatives need to be better planned. There needs to be some incentive or inducement for the developer to operate such schemes effectively, and not as token, "after the fact" efforts. If the developers' only source of fresh produce is local markets, there is a good chance that the developers will encourage and assist locals to produce and deliver adequate supplies on schedule. This will require the establishment and continued smooth functioning of production and delivery systems. Not only the road, but the market gardens themselves would need to be managed efficiently and sustainably; learning to do so will empower the local people - unlike the dependency-inducing provisions of "compensation" payments [see generally Thoahlane:1990].

Market gardens and tourism

NGOs currently involved in agricultural projects in Lesotho can play an important role in giving technical advice and support to local farmers, however, the role of local authority structures may be even more important in ensuring that the long-term agricultural potential of the Valley is not sacrificed for short-term gains. In addition, there needs to be pro-active and ongoing environmental education of local people (another role that NGOs could fulfill) in respect of soil erosion, pollution of the river, the value of certain endangered species and of intact archaeological features. Although current agricultural practices are sustainable (being low-impact, subsistence methods), new economic cues and altered social expectations, coupled with the possible erosion of existing community controls on environmental abuse [Turner 1989:44], could result in new (and less sustainable) agricultural practices. The increased access to agricultural inputs, as a concomitant of new access roads in the area, may result in the introduction of agro-chemicals to the area. Proactive problem-solvers should devise appropriate measures, such as legislation and education, to counteract the undesirable side-effects which such innovations might have.

11.1.7 Problem formulation and alternative generation (nth iterations)

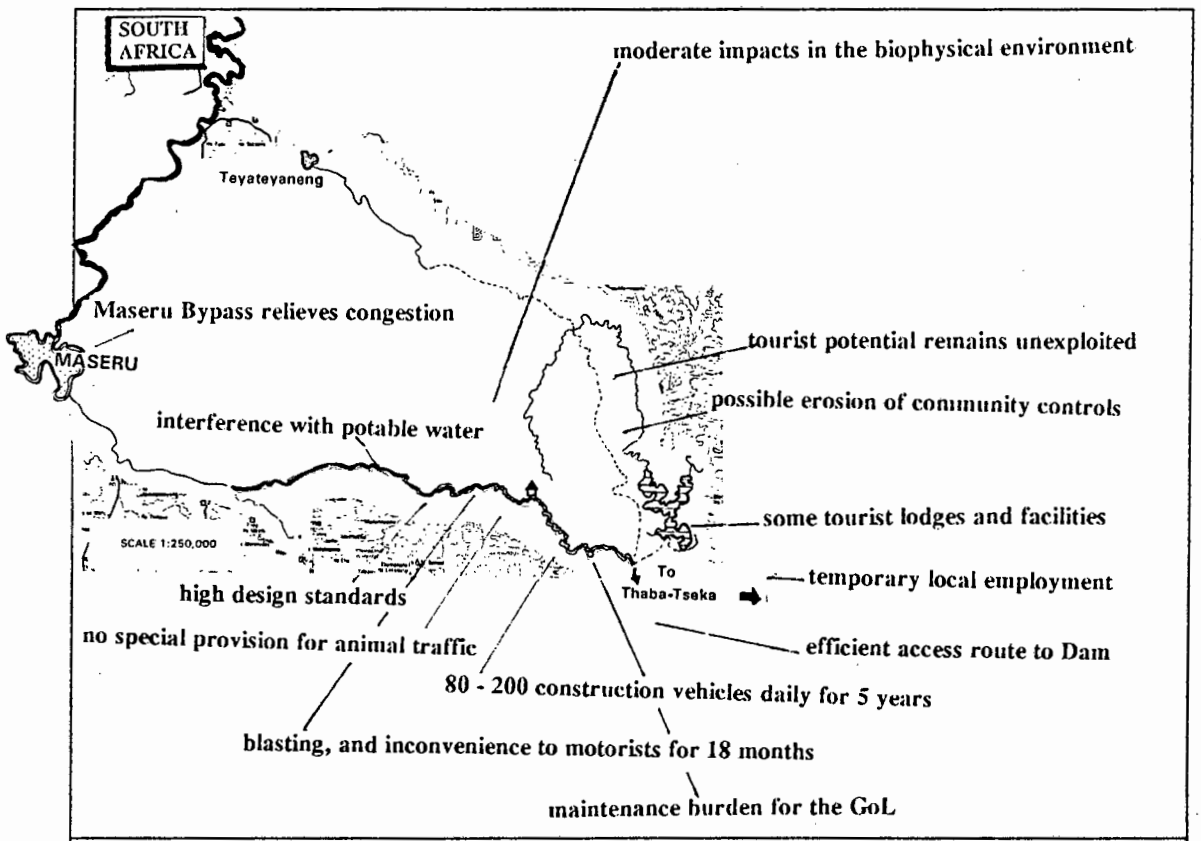
The problem-solving approach to IA has demonstrable potential for being flexible, adaptable, and able to generate implementable and sustainable solutions. There is no theoretical restriction on the number of iterations of the process, although in practice there will be limitations, such as time limitations imposed by project schedules. The quality of solutions will also always depend on the quality and effectiveness of the relationships established among problem-solvers.

In this dissertation, it has been contended that the problem-solving approach, because of its focus on change and its orientation to people, can generate solutions that are more integrated and equitable, at least as efficient, and more sustainable than conventional approaches to IA have been able to do. This hypothesis can be investigated by using Contract 1000 as a case-study. Comparison and evaluation of the respective solutions generated by the conventional and problem-solving approaches to IA is attempted in the discussion below, and by means of Framework tables 10-12.

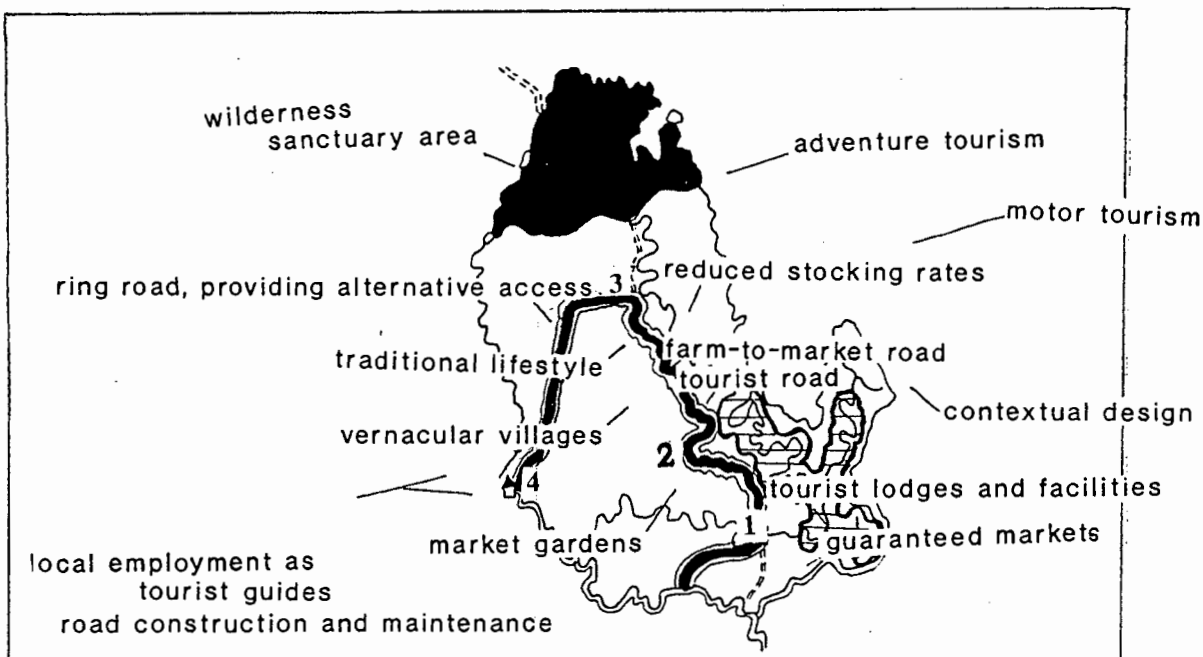
11.2 Evaluation and comparison of the "new" alternatives with the WAR

11.2.1 Summarised project descriptions

The WAR, as explained above, is the preferred alternative which has emerged from the conventional approach to IA. It is comprised of the Maseru Bypass, and of a 63 km upgraded section of the existing Mountain Road. The problem-solving approach has generated a range of alternatives which have in common the following elements: the WAR, market gardening and tourism developments, and a farm-to-market road which doubles as a tourist route.



Map 5 Summary of features of the WAR



Map 6 Summary of features of the "new" solutions: the Jorodane Valley Scheme

11.2.2 Evaluation: comparison of the implications for the respective user groups

In the discussion below, the implications of the WAR for the six respective user groups are compared with those of the "new" alternatives (or, the Jorodane Valley Scheme). The discussion is summarised in Table 10. The effects of the WAR and of the "new" alternatives on the main problems and basic needs of the six groups are derived from Table 10, and are presented without further discussion in Table 11. Similarly, Table 12 presents the implications of the WAR and of the "new" alternatives in terms of Stauth's evaluation criteria.

Proponents

The WAR affords the proponent (LHDA) efficient access to the Dam site [see Chapter 8].

The Jorodane Valley Scheme (the "new" alternatives) should not detract from this efficiency: proper coordination of interested and affected parties, and realistic allocation of Scheme responsibilities will protect the proponent from becoming a social responsibility agency. Minor, short-term inconvenience may be experienced by the proponent if negotiations with I&APs are protracted. Much will depend on the skills of negotiators and facilitators; however, even the "inconvenience" of negotiations may be to the proponent's advantage in the longer term. Project decisions that are taken are more likely to be acceptable to all parties concerned.

Disruptive and costly delays may be avoided, and the final solutions may be more sustainable than project decisions imposed on I&APs, without consultation or negotiation.

GoL

The WAR satisfies partially some of the GoL's national planning goals [see EEU/2/93/104c: Appendix 6]. The improvement of the road link along the Mountain Road is limited because the link does not extend all the way from Maseru to Thaba-Tseka; the WAR is only 63 km long. The main benefits of the WAR to the GoL are the indirect savings in road maintenance that will accrue to the Ministry of Works.

The WAR's ability to provide employment to local Basotho will relieve only temporarily the GoL's national unemployment problem: most of the work will only be available for the five year road construction period, and the experience of the Phase 1a area has shown that few local people have sufficient skills for any but the most menial work. The WAR does not redress the inequities in service provision between the highlands and the lowlands in any remarkable way.

The Jorodane Valley Scheme, by contrast, retains the advantages of the WAR, but also provides real employment opportunities for local people and represents an investment in the infrastructure of the long-neglected highlands. Employment opportunities are both temporary and permanent, and cover a range of skill types and levels. Road construction and maintenance can be achieved by schemes such as the GoL's existing food-for-work programmes. Market gardens will make use of existing farming skills in the surrounding communities, and may trigger a natural process of skills diversification. People may undertake transport, retail, or processing activities, and will have enhanced opportunities to develop new skills, including managerial and general business skills. The tourism sector also potentially provides jobs across a spectrum of skills. The provision of wholly new road links, although not part of the existing national road development plans, can enhance the regional road network. Under optimal conditions (acceptable standards of design and maintenance), it can provide an alternative access route to the Dam. Given the distant and the recent history of Lesotho, particularly in regard to highlands areas such as the Jorodane Valley, and given the GoL's expressed "development" priorities (according to the Five Year Development Plans - see EEU/2/93/104c), as well as the growing reluctance of international financial institutions to lend the GoL more money (as evidenced in the recent "rationalisations" within GoL institutions), it is highly unlikely that any roads will be built in the Jorodane Valley for decades to come. The Scheme takes advantage of the unrecognised opportunities inherent in the current plans for the Phase 1b area.

WAR Residents

There are great expectations among WAR residents that the WAR will bring new services to their area, and will be a source of employment. In reality, service provision is likely to fall short of expectations (eg because the GoL has a limited development budget), and because there is no real economic impetus in the vicinity of the WAR. Employment opportunities, in the absence of effective skills training programmes, will be limited in scope, as well as temporary (for a maximum of five years).

The Jorodane Valley is more fertile than surrounding agricultural areas along the WAR. A market garden scheme could thus increase the availability of fresh produce to residents in the surrounding areas who are unable to grow their own. (Among residents along the western half of the WAR a shortage of fields was reported, as well as the deterioration of soil quality.) WAR residents also stand to benefit indirectly, although probably only to a small extent, from enhanced business and employment opportunities that will be associated with the Scheme.

LCAR Residents

The WAR does not solve the LCAR residents' accessibility or underdevelopment problems; its implementation represents "opportunity lost". In the absence of an integrated development plan for the Phase 1b area and the Jorodane Valley as a whole, residents' quality of life is not likely to improve, and may well deteriorate. Compensation, for example, has not always proved adequate in the Phase 1a area - a core principle of the LHWP Treaty is violated as people are, in fact, left worse off than before [see EEU/2/93/104c and e]. Economic stagnation will prevail, young people will continue to leave the area, and retrenched migrant workers will return home to a Valley which is becoming degraded because of ineffective range management.

The Jorodane Valley Scheme, if properly managed, has great potential to address the basic problems of the LCAR residents: lack of access, and underdevelopment. The Scheme has the potential to reverse current downward trends in the Valley, both in terms of the biophysical environment and the prevailing economic conditions. Already, some residents exhibit entrepreneurial spirit - some sell cash crops; others rent out accommodation to tourists; yet others sell spiral aloes, food, or crafts). Currently, lack of access to credit and resources limits the expansion of businesses in the Valley; a major contribution of the Scheme would be in improving access to credit and resources through the more effective collective bargaining powers of the various parties involved (including NGOs, and GoL institutions). Various aspects of the Scheme could serve as rallying points for communities which will, in the context of the Dam itself, soon be faced with a period of great change and uncertainty. The Scheme, which has traditional elements (growing vegetables, building traditional houses) as well as modern innovations (bulk goods transport and retail sales, contract sales), can ease the transition that communities **must** make in order to adapt to their new environment.

Conservationists

The Jorodane Valley Scheme provides some impetus for the declaration of a wilderness area; linking it to tourism is one way to attach "value" to the resource (at least in the eyes of the relevant resource managers). A valued resource is more likely to be conserved than one which is not. The Scheme also indirectly benefits the cause of conservation in that soil erosion may decrease in the Valley following a reduction in stocking rates. This benefit will be contingent on the effectiveness of the control exerted over the replacement agricultural developments in the Valley (ie the market gardens). Vernacular architecture is another feature of the Valley which may be lost over time in the absence of a coordinated development plan for the Phase 1b area, but which could be conserved as an element of the Scheme.

Travellers

The Maseru Bypass is the most obvious benefit to business and tradespeople who use the national road network of Lesotho; the upgraded section of the Mountain Road does not extend far enough (ie to Thaba-Tseka, a regional centre) to make a functional difference in ease of travel at a national scale. There will be some benefits for more local business traffic, such as between Nazareth and Maseru. Tourists visiting the Dam, or the existing (pony trekking) facilities at Molimo Nthuse, will also benefit in terms of safer and slightly faster travel.

By contrast, the Jorodane Valley Scheme enhances considerably the tourism potential of the region; the WAR would thus have an important contribution to make in serving this new tourist attraction. The WAR would also become a trade route for the produce of the Jorodane Valley market gardens. The transport industry (taxis and buses) could also be rejuvenated if all of the elements of the Jorodane Valley Scheme are implemented successfully. A greater number of tourists may introduce a demand for public transport, and local people may become commuters to the area of work and business opportunities, or even shoppers if the market gardening scheme is viable enough.

TABLE 10 Framework comparison of the WAR and the "problem-solving" solution: positive and negative effects

USER GROUP	WAR	"NEW"
PROPONENTS	* provides efficient access to Dam site	
		* ring road provides alternative access to Dam site * minor, temporary administrative inconvenience
GoL	* savings in national road maintenance and transport development budgets * provision of temporary employment for Basotho	
		* economic development and service provision in the highlands * wide range of temporary and permanent jobs and business opportunities
CONSERVATIO -NIST	* localised biophysical impacts	* enhanced possibilities for declaring a wilderness sanctuary * (indirect) reduction in soil erosion * controlled future development of the Jorodane Valley * preservation of cultural and architectural heritage
WAR RESIDENTS	* possible improved availability of public transport * temporary construction jobs for some residents	
		* additional temporary and permanent job and business opportunities * increased availability of fresh vegetables
LCAR RESIDENTS	* no benefits or costs	* wide variety of business and employment opportunities * retention of cultural heritage (skills and vernacular architecture), community cohesion * conservation of natural resource base * opportunities to develop new skills * improved access to services, goods and facilities
TRAVELLERS	* temporary disruption of traffic during the 18 months of road construction * Maseru Bypass relieves congestion * faster and safer travel along 63 km mid-section of the Mountain Road * provision of some Dam-related tourist facilities	
		* new opportunities for motor tourism (mountain scenery, traditional villages and lifestyles, Dam-related facilities) * protection of existing "unspoilt" area, and enhanced opportunities for adventure- and eco-tourism

TABLE 11 Framework comparison of the WAR and the "problem-solving" solution: addressing fundamental problems

USER GROUP	WAR	"NEW"
PROPONENTS		
GoL		
CONSERVATIO-NIST		
WAR RESIDENTS		
LCAR RESIDENTS		
TRAVELLERS		

TABLE 12 Framework comparison of the WAR and the "problem-solving" solution: satisfying Stauth's evaluation criteria

USER GROUP	WAR	"NEW"
PROPONENTS		
GoL		
CONSERVATIO-NIST		
WAR RESIDENTS		
LCAR RESIDENTS		
TRAVELLERS		

KEY:-

	SATISFIED
	PARTIALLY SATISFIED
	NOT SATISFIED

CONCLUSIONS

i Conclusions to Part A

ii Conclusions to Part B

CONCLUSIONS

> the challenge is to make the science more practical,
> and the art more disciplined
>
> [Gow 1990:144]

Conclusions to Part A: Theoretical Considerations

IA theory and IA practice are not always in harmony: theory sometimes lags behind what good practitioners are doing in the field; practice sometimes cannot achieve the theoretical ideal. The IA's operating environment has certain features which are not expressly taken into account by current IA procedures: dynamism, complexity and linkages, and political realities such as the project budget, the political will of key players and the interrelationships among them, institutional capacities and the taboo subject of the difficulties inherent in persuading disciplinary specialists to work together in an interdisciplinary way.

In South Africa, the Council for the Environment (CfE) has predicated that one of prerequisites for the successful harmonisation (resolution) of development/environment conflicts is an "efficient procedural framework" [CfE 1989a].

The procedural framework that has been developed is the Integrated Environmental Management (IEM) procedure [DEA1 1992]. The design of the IEM procedure has been informed by perceptions of its drafters as to the nature of the operating environment (the South African business, planning and development milieux). A procedure that is too naïve, or that precociously challenges the status quo is likely to be rejected out of hand by those who currently control the planning and development processes; that much is obvious. In the absence of enabling legislation, where IEM necessarily depends on the goodwill of proponents and authorities for its implementation, caution has been the watchword of both drafters and practitioners of IEM. However, in this dissertation it has been implied that a too-cautious approach to IA may undermine rather than bolster the foundations of environmental awareness that are being laid. If IA does **not** affect the planning process, and if environmental considerations are **not** effectively incorporated into planning, then its existence cannot be justified, nor can the time and money expended on IA studies be rationalised. In order to win the respect of those in other disciplines, IA practitioners need to be comfortable with their roles; in order to be fair to decision-makers, they need to communicate the important issues with clarity and be prepared to risk confrontations. The procedural framework needs to make provision for such confrontations so that they can be managed in a professional manner;

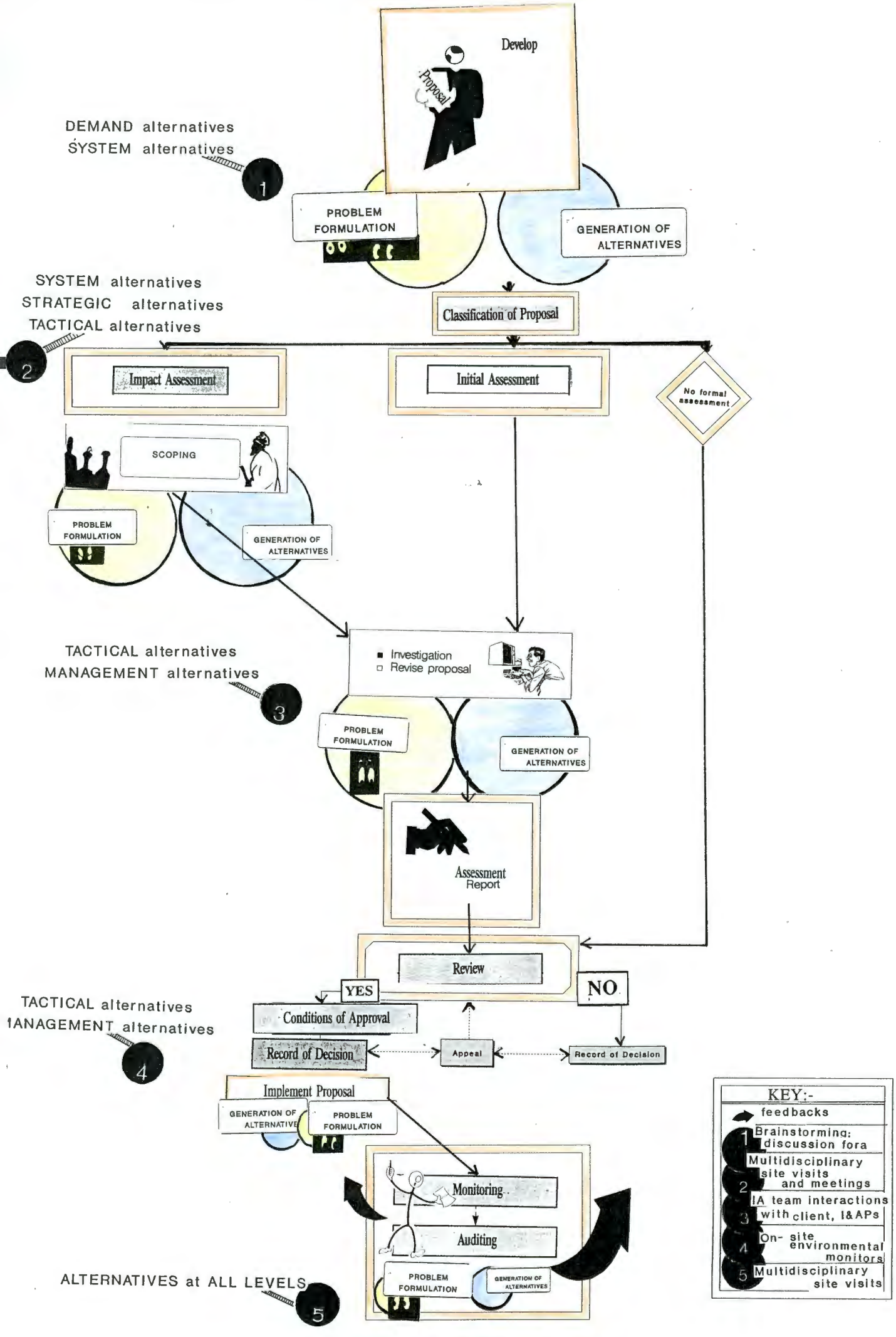


FIGURE 12 Flow diagram of a possible "problem-solving" IA procedure

environmental activism need not be synonymous with the "irresponsible radicalism" so feared by both authorities and business communities.

In this dissertation, IEM has been criticised for failing to make adequate provision for addressing "real problems". Especially at the initial stages (the scoping stage), IEM fosters the preemptive fragmentation of issues and problems. In subsequent stages, IEM does not provide adequately for the ongoing incorporation of new issues. IEM has no explicit procedure to counteract the "real world" tendency of budgetary and time constraints to limit the attention given to problem formulation. In addition, the structure of IEM, and the realities of the project cycle (such as non-negotiable and predetermined completion deadlines for particular phases of the project) can encourage an undue focus on the generation of IA reports, possibly at the expense of better environmental solutions. IEM has adopted (from those currently in control of the development process?) a predominantly short-term perspective - which precludes the adequate consideration of complexity, dynamism and linkages and interrelationships of "real world" environmental problems. In practice, IEM has fallen into the trap of equating more data with better information (the St Lucia EIA is a case in point) and has not given enough time and weight to the generation of solutions.

In this dissertation, a new IA model has been developed which may be better able to take into account some of the features of environmental problems which hinder their resolution [see fig 12]. The model proposes a focus on change, and a stronger orientation to people, as well as deliberate attempts to identify and formulate problems accurately and to generate a wide range of alternative solutions. The model has been derived from several sources:-

the existing (1992) IEM procedure;
an understanding of the human problem-solving process [after Miller 1985],
a classification scheme of "alternatives" [after Hill and Fuggle 1990], and
the experience of the IA for Contract 1000 [see reports EEU/2/93/104b-e].

As a concomitant of the model, specific roles for the IA manager have been distilled from the same sources, as well as from the IA literature. These roles include:-

information management;
management of multidisciplinary teams, and
environmental advocacy.

In order to fulfill these roles effectively, environmental professionals will need to develop particular competences: communication skills, in particular, will be essential elements in the environmental professional's toolbox.

Conclusions to Part B: Application to Contract 1000

The WAR is less environmentally-damaging, and is more cost-effective to implement than the LCAR. It may also hold some indirect benefits for the GoL in the form of derived savings in the national road maintenance and transport development budgets. As a solution to the basic problems of the Phase 1b area, however, the WAR is not an optimal one: it is a better solution than the LCAR, but it is not the best one. The IA for Contract 1000, constrained by its terms of reference, did not set out to formulate an optimal solution. In terms of the (1992) IEM procedure, the IA bypassed some "crucial" scoping requirements. As a result of this, the actual procedure followed was a somewhat artificial one [refer back to fig 8]. From the outset, the IA failed to adopt a problem-solving approach, and was therefore limited in the range of alternative solutions which it could assess and present to the decision-maker for consideration.

One of the main problems which the WAR failed to address was the problem of underdevelopment of the remote highland settlements in the Jorodane Valley. The LCAR, notwithstanding its potential for significant damage to the natural environment, and its high monetary costs relative to the WAR, would have addressed, at least partially, the problem of underdevelopment.

Attempts in Chapters 10 and 11 of Part B to formulate more effective and integrated solutions to the whole **set** of environmental problems associated with developments in the Phase 1b area proceed from the assumption that new road links into the valley from the existing Mountain Road (to become the WAR) and the planned development node at the Mohale Dam site would facilitate access to markets, services and employment opportunities. Several options for such links have been presented in Chapter 11. Recognising that "access" has elements other than the mere provision of a road, an integrated strategy has been developed as an enhanced (not necessarily **optimal**) environmental solution. The strategy takes cognizance of the dynamic nature of the surrounding affected environments by considering past and projected changes (and the sources of these changes) as well as existing features of these environments. It also attempts to take into account political realities, such as the institutional capacities and ideologies of relevant interested and affected parties. The "new" solution is evaluated against the WAR, and is found to have considerable potential advantage. The solution need not be a utopian dream: in keeping with the tenets of "win-win" negotiating [Fisher 1983], it is possible to generate better solutions that please more of the people more of the time. The most important inputs required are planning and

negotiation/coordination time, not vast sums of (misdirected) money. Already, within the context of the LHWP are initiatives to address issues of equity and sustainability. Examples are the Compensation Plan and the Rural Development Programmes. Better solutions simply require better coordination of these and other efforts. The advantages of the "new" alternative, for example, are contingent initially on the success of the IA manager's advocacy and managerial roles (particularly the effective apportionment of the responsibilities of the revised project), and in the longer term, on the quality of the relationships established among the key interested and affected parties (I&APs). Better co-ordination of these parties, coupled with realistic legal and economic sanctions for 'environmental violations' (which effectively curb the disproportionate influence of politically stronger groups), will allow the IA to influence the development project effectively over its whole lifetime. Environmental considerations have more chance of being relevant and therefore incorporated into project management if they have in-built flexibility. This flexibility would flow from the suggested negotiation forum established for the I&APs. The overall effectiveness and flexibility of the IA can be further bolstered by regular, effective monitoring processes which feed back continually into planning and management decisions [fig 12].

To some extent, the actual features of the "new" solutions described above are immaterial, except to serve as an illustration of the "problem-solving" approach to IA. Although actual data were used to generate the "new" solutions, they remain hypothetical solutions as they have been generated artificially, by the author of this report, and not over time by real I&APs. However, given real negotiating fora, and the professional input of committed environmental professionals, the problem-solving approach to IA demonstrably has potential to generate solutions that are more people-oriented and interdisciplinary in nature: more equity and sustainability **can** be attained without sacrificing efficiency.

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