LESSONS LEARNT IN ADDRESSING ENVIRONMENTAL ISSUES OF NEW WATER RESOURCE PROJECTS – A CASE STUDY IN KWAZULU-NATAL, SOUTH AFRICA.

by
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ABSTRACT

Developing new water resource projects without taking cognisance of the environmental impacts, both bio-physical and social, has received global condemnation for many years now and is largely becoming a practice of the past. However, it is the prominence, extent of issues addressed, timing and intensity of the investigations and the commitment to environmental protection and mitigation that has increased significantly over the past few years. Practices in South Africa are no exception to this.

Environmental legislation in South Africa requires that an Integrated Environmental Management (IEM) approach be adopted when any new project is being considered. This IEM approach was recently put to the test in South Africa during the planning and implementation of an inter-basin transfer scheme in the province of KwaZulu-Natal. This paper will discuss the steps that were taken to address the environmental issues during a protracted planning phase, and what was accomplished. It will compare how these recommendations were taken forward into the construction phase and the operations phase, and the lesson learnt from the process.

KEY WORDS

Environmental Impact Assessment, Environmental Management Plan, Inter-Basin Transfers, Integrated Environmental Management, Water Resource Development.

INTRODUCTION

Access to water is regarded as a major limiting factor in the socio-economic development of many countries and competition between uses for agriculture, power, industry, environment and human development needs can lead to political and civil tension. (WEHAB Working Group, 2002). The response by many governments has been the rapid development of water storage and distribution infrastructure to meet demands over the last century. Initially the profiling of economic benefits overshadowed the environmental costs. However in the last 30 years a growing opposition to building dams, mainly from environmental and human rights groups, has emerged. (WCD Report, 2000). Governments continue to face the dilemma of how best to achieve both equitable access and adequate supplies for sustainable development while at the same time protecting and preserving the environment.

In 1992, the Dublin Principles relating to the holistic concept of Integrated Water Resources Management (IWRM) were formulated and widely adopted as best practice. Environmental awareness in South Africa started to gather momentum in the mid-1970s, and really came of age in 1992 with the publication by the national Department of Environment Affairs & Tourism (DEAT) of the Integrated Environmental Management (IEM) guideline series. However, it was only in 1997 that Environmental Impact Assessments (EIA) became a statutory requirement. This has subsequently been followed up by a plethora of guidelines, standards, recommendations and legislative requirements, such that developing large water resource projects without taking cognisance of the environmental impacts, both biophysical and social is illegal. However, it is the prominence, extent of issues addressed, timing and intensity of the investigations and the commitment to environmental protection and mitigation that varies from project to project and makes the difference between a development that puts in place all possible interventions to minimise the impacts on the environment and one that simply meets minimum requirements out of obligation. Practices in South Africa at this time vary considerably.

This paper examines the environmental process with regard to large water resources developments in South Africa using a practical example of the Mooi-Mgeni Transfer Scheme in KwaZulu-Natal, South Africa (an inter-basin water resource development), which has recently progressed from the planning

phase into the implementation phase. This paper discusses how the environmental process was taken through the various phases of the scheme, how the shortcomings were dealt with, and the lessons learnt from the process.

ENVIRONMENTAL LEGISLATIVE REQUIREMENTS IN SOUTH AFRICA

In 1994 the South African Constitution created a fundamental right to an environment that is not harmful to human health or well-being. It states that the government must act reasonably in order to protect the environment by preventing pollution and by promoting conservation and sustainable development. All subsequent environmental laws and regulations are based on this constitutional right.

The initial provisions for effective protection and controlled utilisation of the environment were provided for by the Environment Conservation Act No. 73 of 1989 (ECA). Sections 21 and 22 of the ECA, and subsequent publications in the Government Gazette of September 1997, provided for a list of activities, procedures and guidelines for the implementation of EIAs. EIAs are undertaken during project planning and support development decisions that take into account environmental feasibility and acceptability. Both social and biophysical impacts are identified and evaluated on the basis of magnitude and significance and recommendations for mitigation are made. Through an iterative planning process, EIAs provide environmental information that enable balanced project decisions. This process is in agreement with best practice as advocated by the International Association of Impact Assessment (IAIA Report, 1999)

The National Environmental Management Act No. 107 of 1998 (NEMA) entrenched the principles of IEM, requiring organs of State to work together in the interest of the environment, and that project developers ensure that the affected parties and interested public are allowed to participate in the decision making process in an informed and transparent way. Chapter 1 of NEMA also requires that development must be socially, environmentally and economically sustainable. IEM is an umbrella philosophy that covers a suite of policies, procedures, and methodologies that are designed to ensure

that the environmental consequences of development proposals are incorporated in the planning and implementation process. The term "environment" is broad and encompasses both biophysical and socio-economic components. IEM principles include informed and transparent decision-making, accountability, an open and participatory approach to development, due consideration of alternatives, compliance from "cradle to grave", and ensuring that "environmental costs" are outweighed by, "environmental benefits".

Before any project can move into the implementation phase, the provincial environmental authority must approve a relevant environmental scoping report and/or an EIA. For the case study discussed in this paper it would be the Department of Agriculture & Environmental Affairs (DAEA). When projects are of a national scale or involve other national departments, then the EIA also requires the approval of the national environmental authority DEAT. Approval is given by way of a Record of Decision (RoD), which stipulates the conditions against which the approval is granted and that need to be incorporated into the Environmental Management Plan (EMP). The requirement to compile an EMP, and have it approved by the regulatory authority, is to ensure that the project developer is indeed implementing the mitigation measures identified. The EMP translates recommendations into action during project execution, and addresses the critical questions with respect to impact management. It also provides environmental specifications that can be incorporated into project contract documentation.

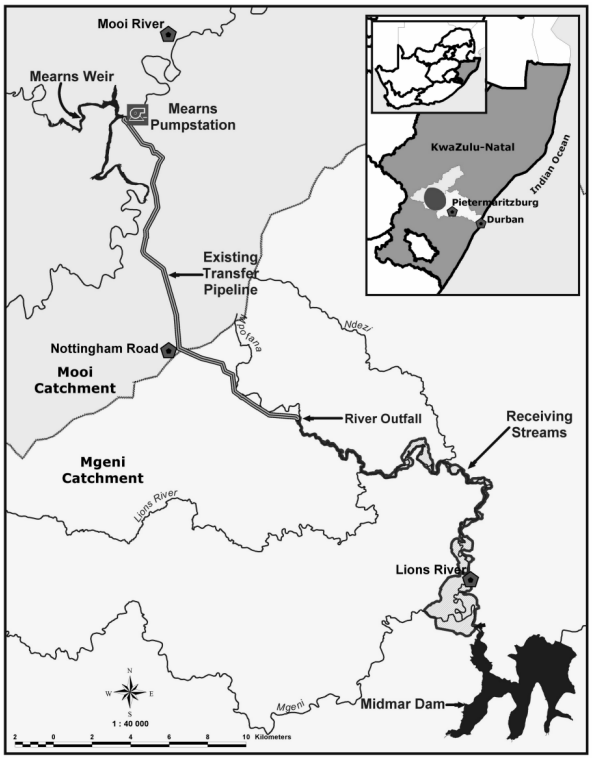
BACKGROUND AND CONFIGURATION OF THE MOOI-MGENI TRANSFER SCHEME

In order to properly comprehend the environmental complexities discussed throughout this paper, it is important to understand part of the background, and the configuration, of this inter-basin water resources development.

In 1983, during the height of a severe drought in the Mgeni catchment, an emergency scheme was installed within a very short time span (Phelines, 1985), to supplement the Mgeni River with water from the adjacent Mooi catchment. This emergency scheme consisted of a small 3m high weir in the Mooi

River at Mearns, which diverted water into an adjacent pump station, where the water was pumped using two pumps at a combined maximum rate of 3.2 m^3/s across the watershed via a single 22 km buried steel pipeline. The water was discharged into the 'Receiving Streams', which comprises the eMpofana River, which flows into the Lions River and then into the Mgeni River immediately upstream of Midmar Dam (refer to **Figure 1**). This emergency scheme was mothballed in 1985 and then brought back into operation in 1993 to intermittently supplement the Mgeni catchment when required.

Figure 1: Mooi-Mgeni Transfer Scheme



The predominant land-use within the Mooi catchment around Mearns is maize and dairy farming, with no rural settlements, while the area through which the Receiving Streams flow is primarily farmland and smallholdings, with a growing tourist industry.

In planning for a long-term inter-basin transfer scheme between the Mooi and Mgeni catchments, it was established through numerous hydrological studies, that maximising the use of as much of the existing emergency scheme infrastructure as possible was the optimal solution. The scheme that was thus eventually agreed upon consisted of the following components divided into two Phases:

- Phase 1 – to construct an 8m high weir at Mearns on the Mooi River to replace the existing lower structure; to utilise the existing pump station, pipeline and Receiving Streams; and to raise the full supply level of Midmar Dam by 3.5 m. The maximum transfer capacity will remain at 3.2 m^3/s, and pumping will occur only when there is a need in the Mgeni catchment and whenever there is adequate storage or flow at Mearns Weir. This phase of the scheme is currently under construction and is the case study discussed in this paper.

- Phase 2 – to construct a 32 m high dam on the Mooi River at Spring Grove situated a few kilometres upstream of the Mearns Weir; and to install additional transfer infrastructure including a pipeline from Spring Grove to join the existing pipeline from Mearns, and then to utilise the Receiving Streams. This phase is still only at the planning stage. The maximum transfer capacity is to be increased to 4.5 m^3/s and the intention is that pumping would eventually occur on an almost continuous basis.

In terms of Phase 1, there were thus three main components of the water resource development that needed to be considered, viz. Mearns Weir, the Receiving Streams, and Midmar Dam. These components are discussed in what follows.

ENVIRONMENT PROCESSES DURING THE PLANNING PHASE

No environmental assessments were undertaken in 1983 when the emergency transfer scheme was installed, as it was neither the practice nor a legal requirement at the time. . This scheme was designed and constructed in a crash programme of four months. The first environmental study in the area that contributed to the initial building blocks for the overall environmental assessment of the final scheme was an estimate of the environmental flow requirements of the Mgeni system, including the Receiving Streams that was completed in January 1993 as part of the regional hydrological system analysis study that was being undertaken at the time.

When the planning to develop a transfer scheme truly got underway in 1994, the first step was to undertake a number of Relevant Environmental Impact Prognoses (ROIPs) of the three potential dam sites (Mearns, Dartington and Spring Grove), the proposed tunnel, the existing pipeline and the Receiving Streams. A ROIP is a concept developed by the national Department of Water Affairs & Forestry (DWAF) that serves as a point of departure for the EIA. It provides an initial assessment of the relative severity of impacts, the potential mitigation thereof, and of the need for further related work. It

thus provides the basis from which to initiate studies of the environmental aspects of the proposed scheme. The ROIP cannot be substituted for a public scoping document, as the level of public participation is minimal, and there is no formal structured approach. These ROIPs provided valuable input into an Environment Impacts Workshop, which collected together a range of environmental specialists and selected stakeholders with the set objective of identifying the issues of concern, any significant impacts, and to suggest mitigation measures for the proposed water resource developments in the Mooi and Mgeni catchments.

Following this, a feasibility level Social Impact Assessment was undertaken, which involved a review of all available data and reports, and interviews with affected communities. Interest group meetings were held with key role-players and the affected communities. The Mooi River Liaison Forum was established to formalise discussion with the two Irrigation Boards that would be partially affected by the proposed development. This Forum met on a number of occasions to be updated on developments and for the local farmers to raise issues of concern. Newsletters were prepared and distributed in the area – an activity that continued until the operational phase.

At this early stage, biophysical assessments were also undertaken. However, they were not as comprehensive as the social assessment. The only exception to this was an extensive survey that was undertaken of the invertebrate life living in the rivers. This investigation was primarily centred on the search for a rare species of burrowing mayfly that was seen for the first time in 1958 on the Mooi River and had not been seen since.

A number of specialists were called in to establish the Instream Flow Requirements (IFR) of the Mooi River downstream of the proposed Mearns Dam, and of the Receiving Streams. To this end a number of site visits, surveys and scenario meetings were held. The Mooi River IFR was completed first and together with the technical and environmental investigations led to the conclusion that there were no fatal flaws with the initial proposed scheme, which included a 10.6 km long tunnel and a 15.5m high dam at Mearns, and that it could be implemented. This lead to official approval of the scheme by the South

African Cabinet early in 1996. This scheme allowed for an average discharge of 6 m^3/s, with a peak of 10 m^3/s, into the Receiving Streams.

Notwithstanding this, a further impact assessment investigation of the Receiving Streams was commissioned, as problems with the continued use of the existing pumping scheme existed. Pumping was being restricted to one pump (1.8 m^3/s) otherwise social disruptions, including flooding of bridges and agricultural lands, resulted. This detailed impact assessment was part of an attempt to manage these existing impacts and increase the transfer efficiency. The assessment was completed in 1996, and investigated biophysical, social, and water quality aspects. Importantly, this assessment concluded that the flow in these streams should not exceed a maximum of 6 m^3/s, which was less that what was being proposed at the time. This put the various components of the proposed scheme in doubt and led to a series of reviews and further analyses of the hydrological and technical data.

Affected stakeholders within the proposed development area became increasingly anxious as to what the future held for them and how their properties were to be affected. In order to deal with the numerous requests for information that was pouring in, a Public Liaison Officer (PLO) was appointed to deal with these queries. The PLO's function was to provide the liaison between the project team and the public for the planning and implementation elements of the transfer scheme. This was a separate function to the social impact assessments that would be undertaken in terms of the EIA requirements.

Although the final report detailing the revised configuration, sizes and phases of the transfer scheme was only completed in January 1999, the water resource planners became aware some time before this time, of what the results would be and proactively began initiating the necessary EIA studies. The Minister of DWAF approved Phase 1 of the revised scheme for implementation in October 1999 with the condition that the investigations to comply with environmental legislation be satisfactorily completed, and a public meeting was then held to describe the scheme that was to be implemented.

The following environmental investigations were then undertaken:

Mearns Weir

The development of the proposed new Mearns Weir was registered with DAEA, and a detailed EIA, comprising biophysical and social components was commissioned. Subsequent to the commissioning of this study it was identified that the archaeological component was not being addressed and a study to complete this component was then also commissioned. The IFR was again revisited at this time and the required flows adjusted upwards. Whilst this study concluded that there were no environmental fatal flaws associated with this project component, a number of actions were stipulated as being essential, particularly relating to social issues. These actions included, inter alia:

- Continued consultation and information feedback with the residents of the area who will be affected;
- Production of a zonation plan for the use of the impoundment and the surrounding land;
- Implementation of a transparent and equitable compensation payout procedure: and
- A study on the economics of the agricultural activities in the area with emphasis on the impacts of the loss of irrigable land and/or loss of irrigation water rights.

(Alletson Ecologicals et al, 2000)

Midmar Dam

The raising of Midmar Dam was also registered with DAEA, and the detailed EIA commissioned. This EIA considered both the biophysical and social components associated with the proposed raising, and here again, the study concluded that no environmental fatal flaws were identified with the project. However, a number of issues were identified that required attention, viz.:

- Loss of recreational land and related facilities and infrastructure;
- Impact on interest groups that use the facilities at the dam;
- Loss of vegetation and habitat; and
- A few institutional aspects.

(David Totman & Associates, 2000)

Importantly, the loss of wetlands was not considered to be an issue as it was adjudged that there would be a reciprocal migration and gain in wetland area.

Receiving Streams

As part of this water resource development, the need to register a 'servitude of aqueduct' along the Receiving Streams was identified. Although, it was planned that only Phase 1 of the scheme would be initially implemented (with a maximum discharge of 3.2 m^3/s), it was decided to register a servitude wide enough to cope with a flow rate of 4.5 m^3/s, which is required for the Phase 2 component of the scheme. Even though the Phase 2 component is only scheduled for implementation at some unspecified date in the future when increased water demands dictate its requirement, it was considered optimal to go through the registration process only once. This meant a single round of stakeholder interactions and environmental assessments rather than having to repeat the exercise again at some point in the future.

This component was registered with DAEA and the EIA was completed in January 2001. The width of the servitude was established by way of a hydraulic modelling exercise using numerous surveyed cross-sections of the various rivers and by assessing the impact of various sized floods through a number of river reaches. The study area for this EIA consisted of this defined strip comprising both banks along the entire length of the Receiving Streams. The EIA comprised of biophysical, geomorphological, social, and archaeological components. Water quality was not included in this study, as it had been extensively examined as part of previous and parallel studies. The geomorphological component was important in order to establish the likely changes that would occur, particularly in the upper reaches of the Receiving Streams, as a result of the increased flow levels.

Concerns of the property owners along the Receiving Streams largely centred on potential erosion, continually flooded areas on their adjacent lands, and compensation for loss of access across the rivers. The study concluded that none of the components identified any fatal flaws, and that if the transfer

scheme is to proceed a number of on-going actions were needed to manage the impacts on the Receiving Streams and to ensure that the system does not become degraded. These included:

- the establishment of a multi-sectoral Environmental Working Group; and
- the development of an EMP that would assist in the management of the impacts of the transfers.

ENVIRONMENTAL PROCESSES DURING THE CONSTRUCTION PHASE

Once DEAT had granted a RoD authorising the proposed development, DWAF as the client was required to notify the interested and affected parties consulted during the planning process within three days of the date of authorisation, indicating that the project has been approved. In addition, the client was then required to draw up an EMP, to be approved by DEAT, prior to commencing with construction. The purpose of the EMP is to address site-specific mitigation measures to be addressed during the construction period as well as advising the operating process. The process to be followed is defined in law and is therefore a statutory requirement.

While the process was rigorously followed for the raising of Midmar Dam and the acquisition of a servitude on the Receiving Streams, the construction of the Mearns Weir proceeded before the drafting and approval of the EMP. The reason for this was that an entire season would have been lost, together with the associated increased construction cost, should the construction only commence when the EMP was approved.

DAEA, the affected communities, as well as the project funder challenged this non-compliance. The issue was taken to the Director Generals of both DEAT and DWAF, where it was agreed that, considering the impacts of the project were not adversely impacting on the environment to any great degree, the project should continue.

The results of this action impacted on the project in several ways:

- The development of the EMP allows for a focussed reassessment of project impacts and allows for the identification of liabilities and allocation of responsibilities for addressing project impacts. The failure to do this resulted in several shortcomings, viz.:
  - The riparian zone is heavily colonized by alien vegetation, especially by the Grey Poplar *(Populus canescens)*. While the need to clear the vegetation was identified, the roles and responsibilities with set timeframes were not.
  - The acquisition of land and the subsequent impacts on communities is a very time consuming process. The RoD requires that all property compensation matters must be concluded in accordance with the Statutes, in this case the National Water Act (No. 36 of 1998) and the Expropriation Act (No. 63 of 1975). The Mearns Weir component had not concluded this process at the completion of the project with the result that several properties were subject to inundation. There is confusion as to who is liable for loss between the various authorities and affected parties. The failure to secure ownership of the property also resulted in delays to progress on certain project activities and created an atmosphere of animosity at many Basin Management meetings (a group established to oversee the ongoing management of the Mearns weir impoundment). This was counterproductive to project progress.
  - Specialist input into the rehabilitation plan, which is part of the EMP, ensures that the final product is aesthetically pleasing, environmentally sound, and has added value for the surrounding community. Whilst the developer eventually compiled a rehabilitation plan, it gave little consideration to how the opportunity could be used to enhance the property. Aspects of environmental soundness could also be challenged.

DEAT required that DWAF outsource the EMP for the Mearns Weir to an independent environmental consultant, which was subsequently done. The revised EMP was submitted to DEAT in October 2002 and approval was received in February 2003, on the day that water storage in the impoundment was initiated. Within 3 days the impoundment was full.

The EMP for the Midmar Dam raising component was completed in good time and provided guidance to the project development process. The construction process was audited several times per month against the EMP with reports on compliance and non-compliance being addressed at project management meetings. The environmental issues were given equal weighting to technical and economic issues by project management.

Land acquisition was minimal at Midmar Dam (the land to accommodate the raising had been acquired when the dam was originally built). The current user of this surrounding land (a parastatal organisation) challenged whether co-operative governance, as defined in the South African Constitution, was really possible. The Constitution mandates various levels of government to work together so that overlaps in responsibilities and associated costs are minimised for the South African taxpayer. There were several instances where resources (such as bulldozers etc.) had been acquired for construction purposes on the dam wall and lay idle, while the same resources were needed by the parastatal, which was mandated by the Provincial Government to effect rehabilitation within the dam basin. Financial rules and auditing measures did not allow for this level of co-operation.

The EMP for the Receiving Streams provided the basis for putting into place a program of adaptive management that was recommended by the EIA. The efficiency and accurateness of the recommendations are being tested. An Environmental Working Group has been established and a baseline survey of the Receiving Streams has been completed. Transfers were initiated in April 2003. While one of the basic principles of best IAIA best practice is that of adaptiveness (IAIA, 1999), the defining of roles and provision of budget for ongoing adaptive management and mitigation becomes tricky. Seldom do project budget provide for future possible impacts. In the case of the Receiving Streams initial pumping episodes that took place between April and June of 2003 has resulted in eroding areas along the stream. The question is now raised as to whose responsibility it is to initiate mitigative measures and pay for them.

ENVIRONMENTAL PROCESSES FOR THE OPERATIONAL PHASE

The environmental process as described above will come to nought if measures are not put in place to monitor and audit projects in the operational phase, and to evaluate whether sufficient mitigation measures have been put in place to respond to potential environmental degradation. All large projects are required to develop an Operations and Maintenance EMP that is forwarded to DAEA for these audit purposes. The content of the Operation and Maintenance Manuals include guidelines, roles and responsibilities for monitoring the dam site, the dam basin and downstream of the dam for the following:

- Post construction site monitoring;
- Reserve releases;
- Emergency preparedness plans;
- Waste management plans;
- Training and awareness;
- Environmental monitoring program (water quality, fire, pollution, erosion, alien plant control);
- Compliance monitoring and auditing procedures; and
- Principles for abandonment.

These reports have been completed for both the Mearns Weir and Midmar Dam. As the operation has just begun there are no results to share at this stage as to their usefulness and effectiveness.

REVIEW OF THE PROCESS

The planning and development timeline for water resources, such as large dams is usually in excess of eight years. In many instances initial planning begins as early as fifteen years ahead of the required infrastructure. The project found that while this is necessary in water resources development, it also brings with it several problems. Further, many environmental related problems associated with the implementation of water transfer projects relate to the planning phase of these schemes (Snaddon, Davies and Wishart; 1999). For example:

- A lack of comprehensive environmental assessment;
- The subordination of environmental assessments to technical and economic aspects;
- A lack of co-ordination between environmental assessments and other aspects of inter basin transfer (IBT) planning; and
- A general bias toward the recipient catchments at the expense of donor systems, while transfer routes are effectively ignored

Whilst many of these problems that arose in the later phases of this project could be attributed back to the planning phase, some were however, as a direct result of issues in that particular phase. The following discussion outlines some of the shortfalls in the entire process that have been identified through retrospective review.

1. A separate EIA for each scheme component

The EIA studies that were conducted for each of the three scheme components where submitted separately to DAEA as they were completed. Compilation of the EMPs and the consequent tendering and construction phases could not commence until approval had been given by way of the RoD from DAEA and ultimately DEAT. It was soon realised that treating the scheme as a number of separate components was a mistake, as there were linkages between the components that needed to be considered and it was not possible for the EIAs to be appraised in isolation of each other. Consequently, DAEA and DEAT waited for all three EIAs to be submitted before reviewing them, even though it was technically preferable to begin construction of the Mearns Weir prior to that at Midmar Dam. This delay in the approval had a ripple effect on the entire implementation programme. Initial construction is only possible in the dry winter months, thus a short delay of a few months can translate into the loss of an entire season.

2. Application of different environmental processes

The initial planning of this scheme started prior to the promulgation of some of the environmental legislation. As a result, the processes that DWAF had established governed the levels of detail for the environmental investigations. In 1998 DEAT, through sections 21 and 22 of ECA, have identified clearly defined processes for project level investigations. What remains unclear, however, is an understanding and comfortable fit between the DWAF process for investigations and planning for new water resource developments and the DEAT legislative processes. The DWAF process is one of reiterative investigations of water resources developments where, following each iteration, alternatives are eliminated and the focus becomes more detailed. DEAT on the other hand have a process whereby the final project, assuming implementation in the near future is the intent, is examined initially at a scoping level and submitted for approval. The Regulator then decides which aspects of the development/ impacts require more detailed investigation.

An attempt has been made to match these two processes with respect to environmental investigations for a water resources development. (Refer to **Table 1**).

Table 1: Relationship between the DWAF and DEAT environmental processes

DWAF Level of Investigation	Goal	DEAT legislated requirements	DWAF activities
Reconnaissance (Basin study)	To determine all potential water resources within a catchment for future development.	None	Studies to investigate areas where supply could be boosted through catchment management activities such as wetland rehabilitation, alien control programs, reduce afforestation activities, curtail farmdam developments etc.
Pre-feasibility	Looks at a number of possible sites/ schemes to determine a feasible scheme free of fatal flaws from an environmental or technical perspective.	None. However it is recognized that public participation should take place as early in the process as possible.	Will conduct scoping level investigations from an environmental perspective.
Feasibility	Detailed design and environmental investigation.	Register project with DEAT/ DAEA. The process to be followed is defined and regulated. A RoD is conditionally provided. If not built within a specified time period the investigations require updating.	Full EIA is commissioned including - social impact assessment - biophysical impact assessment - public participation process - archeological and cultural assessments
At the end of the feasibility stage DWAF has identified the best option for water resources development. However, the actual program to develop the resource is dictated by demand. A period as long as 15 years may lapse before the project is implemented. During this period the EIA is shelved by DEAT.			
Implementation	To build the proposed water resource infrastructure	DEAT reviews the earlier EIA and advises which aspects of the study must be updated/ reinvestigated. DEAT approves the EMP for construction.	DWAF commissions a review of the earlier study as identified by DEAT. Any bridging studies that have been carried out are also included in the final assessment. The land acquisition process is set in motion. The EMP for construction is completed and submitted for approval.

(Adapted from JJ Geringer "Proposed generic Terms of Reference for DWAF Project Planning. April 2002.)

3. *Impact of delayed development on properties*

Some may argue that the environmental process appears to be inefficient and subject to costly repetition. It has also been identified that involving communities early on as possible in the planning

process, as recommended by DEAT and also acceptable international best practice (IAIA, 1994), carries several problems:

- Affected properties are 'marked' and, while the water resource development may not take place for an entire generation, the public knowledge of a possible activity in the future affects the property price. The cost of this action is never born by the developer.
- In some cases the proposed activity can lead to land speculation, which in turn skews the regional economics. This is also difficult to respond to.
- In the case of the Mearns Weir development it was reported by an affected community member that the uncertainty with regard to pumping rights from the future impoundment and the possible impacts of the weir on the way of life in the region did in fact affect the price of properties with several landowners having sold their properties at less than their true value. The U.S. Interorganizational Committee highlighted this issue in a paper prepared for the U.S. Department of Commerce and suggested that social assors in planning phase should examine the activities of each phase of the project process and assess the impacts of each activity. (Interorganizational Committee, 1994).

4. *Lack of focus by interested and affected parties*

The development of all large water resource infrastructure requires a comprehensive social impact assessment as defined in the Environment Conservation Act (No. 73 of 1989). Interviews were conducted and questionnaires were circulated to identify peoples' perceptions, issues, concerns and estimates of loss with regard to the proposed impacts.

The initial Mearns studies were carried out in 1994 to 1999 and the Midmar studies in 1998. In both instances, although the impacts, issues and concerns were identified, the effects of these impacts with respect to roles and responsibilities had not been fully described, and planning by the respective parties initiated.

The approval of the projects and the subsequent development of the EMPs became a period for concerted focus on the impacts whereon secondary impacts, not initially identified, were raised. An example is the impact of construction on the water levels at both Midmar and Mearns. While it was evident that the water levels would fluctuate, the impact of the change in water level on dam use activities was not clearly described and mitigation plans put in place.

5. *Land acquisition: It always takes longer than allowed for*

While the RoD, as well as approval of the EMPs by DEAT, requires that all compensation matters be completed before construction begins, this condition is seldom adhered to. On all components of this water resource development, negotiations were only initiated after the construction process began. This has been counterproductive for several reasons:

- All issues became clouded with distrust as the compensation negotiations dragged on to the point where DWAF was forced to expropriate the land or place the State at considerable risk because the project was complete and the property (which they did not own) was about to become inundated.
- The money required by the people displaced was not available in time, yet the reestablishment of a farming operation takes several years. In the case of the Mearns, some of the farmers had less than 3 months after compensation payouts to make alternate plans. In other cases no time was allowed as mentioned earlier. Inundation in fact happened before compensation procedures were completed.
- While the relevant State department (Public Works) had their representatives do the negotiations with the affected landowners, the State was also the developer (DWAF), albeit a different department. Objectivity, transparency and independence became clouded from the community perspective making it difficult for even the most educated of the community to understand. Disagreement and rivalry between the different State departments further exacerbated the affected parties concerns.

- In the case of Mearns, compensation issues were discussed at monthly project meetings with "the project engineer" making value judgements. Dealing with people issues is a skill and should be tackled by people appropriately trained to carry out this task.

6. *Minimal assessment of the regional socio-economic impact of the proposed project*

While all three EIA's did examine the socio-economic impacts of the project, less emphasis was placed on the regional socio-economic impact although it was recommended in the Mearns EIA that further investigations should be done to quantify this.

More noteworthy is the fact that the scheme was not assessed as a whole, but rather each component of the scheme was assessed individually. In addition, the scheme did not consider the socio-economic impact of water transfers on the donor catchment (Mooi). While considerable attention was paid to investigating the IFR of the Mooi catchment and the establishment of the Reserve (minimum water requirements for downstream use), little was done about establishing the impact of the scheme and the transfer of water on the possible economic development in the Mooi catchment. It must be noted however that the storage capacity of the weir is relatively small (5 million m^3) compared to the mean annual runoff (270 million m^3).

7. *Popular science and thought is dynamic*

Whilst the value of wetlands in the water cycle is recognised and every effort is made to protect these ecosystems, the nature of the development of dams usually results in several wetlands being inundated.

At the time of the EIAs, the wetland specialists identified that there would be wetlands inundated by the rising water levels associated with the new full supply levels, but also indicated that as the water migrated new wetlands would be developed and as such there was no net wetland loss.

By the time the project was completed, science had evolved and wetland experts point to the incorrectness of this assumption and that indeed there would be great wetland loss. The impacts associated with the loss in wetland functioning have not been quantified. At the implementation stage the specialists call for additional monies to be granted for off-site mitigation, however, laws precluded the use of State monies in this manner.

8. *Communication between technical studies and social impacts.*

A hydrological analysis was done on the Mearns Weir to simulate the minimum average daily water level using 6 years of available data. It was reported that the fastest rise in water level from empty to full would be 7 days.

The weir was already partially filled with water on the 7th February 2003 when a decision was taken to start impoundment. The decision to impound carries considerable responsibility in terms of the impacts of the impoundment on the human and natural environment within the basin. At the same time, there is a responsibility to secure sufficient and timely water supply for consumers. The public were advised by the developer that the weir would take about two to three weeks to fill. As mentioned earlier, the weir went from being partially full to full-and-spilling in less than 4 days, in a sense endorsing the hydrological study. Due to the lack of accurate communication, several of the affected farmers, who had not yet received compensation and had not moved their pumps, suffered financial losses. Further, it is important that a site inspection is conducted of the whole impoundment in terms of safety and completeness of recommended mitigation procedures before impoundment commences. This was not the case with the Mearns Weir.

9. *Assessment with respect to recommended international practice (World Commission on Dams Report).*

The recently published World Commission on Dams (WCD) report of 2000 provides a set of guidelines for good practice. **Table 2** summarises how well this water resources development complied with the

WCD guidelines based on the author's post assessment of the process undertaken in terms of Phase 1 of the Mooi-Mgeni Transfer Scheme (MMTS-1).

Table 2: Compliance with WCD guidelines

WCD Guideline	MMTS-1 Compliance
Gaining public acceptance of key decisions is essential for equitable and sustainable water resources development	☺
A negotiated decision-making process in which stakeholders have an equal opportunity to influence decisions is vital;	😐
A Strategic Impact Assessment is required, which covers entire sectors, policies and programmes and ensures that environmental, social, health and cultural implications of all options are considered at an early stage in planning;	😐
This should be followed by project-level impact assessments that include environmental, social, health and cultural impacts;	☺
Life cycle assessments	☹
A valuation of social and environmental impacts is necessary to ensure that impacts are internalised in the economic analysis where appropriate and possible;	😐
Once constructed, it is necessary to ensure that operating rules for dams reflect social and environmental concerns, such that the operating conditions should reflect commitments to social and environmental objectives in addition to the commercial interests.	😐
It is also necessary to conduct baseline ecosystem surveys to gather the necessary baseline information prior to alternatives being assessed	☺
Environmental flow requirements	☺
Baseline social conditions	☺

☺: All components of the MMTS-1 Scheme largely complied

😐: Compliance was less than optimal

☹: Compliance absent or insufficient.

It is broadly agreed that when appraising a development activity one rule that is clear is that the social and economic benefits of the activity must exceed its costs. (UNDP Guideline, 1992). While a cost benefit analysis for the MMTS 1 project has not been completed social impacts and benefits were taken into consideration through the Social Impact Assessment (SIA) of the project. The SIA identified the baseline social conditions and provided a tool for involving the stakeholders and affected parties in decision making. It should be noted however that decision making in water resources development is heavily influenced by the National DWAF and cannot be considered as equal. Operating rules, which reflect social and environmental concerns, have been developed for the dams and are documented in the Operational Management and Maintenance Manual. Operating rules for the transfer are being refined taking into consideration the social and environmental impacts of the initial transfers. The latest inter-basin transfer took place from April 10th 2003 to June 10th 2003.

CONCLUSIONS AND RECOMMENDATIONS

For the inter-basin transfer project reported on in this paper the water resource developers have endeavoured to follow the IEM approach, as stipulated in South African environmental legislation, as closely as possible. Their efforts also compare favourably with relevant international guidelines. Although there were a number of stumbling blocks along the way with the processes that were followed, it is clearly evident that this approach has minimised, and possibly even improved in some cases, the impact on the environment.

Whilst an IEM approach is recommended for all water resource developments, regardless of size and complexity, a few important points should be noted:

- This requires a commitment by the developer to ensure compliance is always achieved, and a willingness by all concerned – those directly affected, the developer and other relevant stakeholders to work together towards a common goal rather than self-interest.

- Specific guidelines are required in terms of long term planning, as the current IEM approach only provides guidance to project level investigations.

- Careful consideration needs to be given to the integration of the various scheme components, and their linkages when they are being reviewed. Further, if different processes do exist, they must be carefully examined and an appropriate way forward plotted to ensure alignment before the project advances too far into the planning phase.

- More often than not, the process is owned and managed by the engineers on the project who only recognise the complexity and potential impacts of the environmental and social issues on the programme at the implementation phase when certain activities can only be delayed at great cost

and often at great risk. It is thus imperative that environmental planners who have a comprehensive knowledge and relevant experience become involved from the onset in compiling the project programme.

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ACRONYMS

DAEA	Department of Agriculture & Environment Affairs
DEAT	Department of Environment Affairs & Tourism
DWAF	Department of Water Affairs & Forestry
EIA	Environmental Impact Assessment
EMP	Enviro nmental Management Plan
ECA	Environment Conservation Act (No. 73 of 1989)
IBT	Inter basin transfer
IEM	Integrated Environmental Management
IFR	Instream Flow Requirements
IWRM	Integrated Water Resources Management
MMTS-1	Phase 1 of the Mooi-Mgeni Transfer Scheme
NEMA	National Environmental Management Act (No. 107 of 1998)
PLO	Public Liaison Officer
RoD	Record of Decision
ROIP	Relevant Environmental Impact Prognosis
WCD	World Commission on Dams