

Available online at www.sciencedirect.com

Physics and Chemistry of the Earth xxx (2005) xxx–xxx

**PHYSICS
and CHEMISTRY
of the EARTH**www.elsevier.com/locate/pce

Forum for Integrated Resource Management (FIRM) in Ephemeral Basins: Putting communities at the centre of the basin management process

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Accepted 15 August 2005

Abstract

Increasingly there is need for efforts integrating natural resource management inclusive of water, land, and biodiversity with actions and developments of humans, particularly in heavily used, sensitive environments such as arid river basins. Integrated Water Resource Management (IWRM) provides the basis for this integration. One such approach used in Namibia is known as the Forum for Integrated Resource Management (FIRM), which aims to enable communities to take a central role in management and development processes in their areas. This approach has recently been tested in the Kuiseb Ephemeral River Basin with the active participation of basin stakeholders. The use of FIRM in basin management requires certain adaptations, especially in the context of ephemeral river basins. The main focus of discussion is how FIRM may be applied to basin management in ephemeral basins, highlighting a case study of the basin management process in the Kuiseb Basin in Namibia. An analysis of similarities and differences between FIRM and its application in basin management is also undertaken, illustrating how the concept is applied to basin management in ephemeral basins, particular lessons learnt and strengths of this approach. The paper concludes with recommendations on how FIRM may be established in basin management with the Kuiseb River basin providing empirical evidence of the positive potential of such an approach.

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Keywords: Basin management; Participation; Kuiseb; Integration; River basin forum

1. Introduction

FIRM joins the development world's extensive dictionary of acronyms and while its acronymic word's meaning is a good descriptor of this approach, the Forum for Integrated Resource Management is much more. The concept originated within farming conservancies and farmers' associations in Namibia, but is being found pertinent and valuable in many diverse contexts of natural resource management across the country. FIRM promotes two concepts—*integration* and *participation*—both of which can be applied to integrated land and water resources management (IWRM).

The FIRM approach is currently being tested within a variety of communal farming areas in Namibia through the establishment of forums for integrated resource management (Kruger et al., 2003). This article focuses on application of the FIRM approach in the Kuiseb River Basin where it has been used as one of the tools for implementing river basin management practices. It takes a brief look at the original development of FIRM in a communal farmers' association, the approach in practice, and its achievement and challenges. It discusses in depth, the way in which FIRM can be applied to basin management through the concept of a forum for integrated resource management in ephemeral river basins, using the Kuiseb River Basin as an example. An analysis is made of the similarities and differences between FIRM and its basin management permutation as FIRM in ephemeral basins. It takes a close

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look at the practicalities of the FIRM approach, as well as evaluating its achievements and challenges when applied by the Grootberg Farmers' Association and in the management of the Kuiseb River Basin.

2. Background

Namibia, as an arid to semi-arid country, experiences large variations in the amount of rainfall across the country and from season to season. The total rainfall averages about 250 mm ranging from less than 50 mm along the west coast to a high of approximately 600 mm in the north-east. Much of the rain that falls (83%) is lost through evaporation, especially in the more-arid western areas. There is an uneven distribution of water resources across the country and these are generally found far from demand centres (Heyns et al., 1998). The only perennial rivers in Namibia are shared, transboundary watercourses situated on the country's borders. These systems are important resources, supplying around 38% of Namibia's water requirements (Heyns et al., 1998). The remaining water requirements are met through dams on ephemeral rivers and through groundwater aquifers.

Apart from being dependent on these limited water resources, a large percentage of Namibians are directly dependent on other variable and highly sensitive natural resources for their livelihoods. Over time, there has been an increase in pressure on these resources, exacerbated by population growth. Namibia's present population of approximately 1.8 million people, in the opinion of some, already exceeds the carrying capacity of the land, the water and its resources.

Increasing pressure on natural resources has led Namibia to adopt a number of measures to address this through appropriate management. One mechanism employed has been the development of strategic political frameworks through policies and legislation that help to regulate resource use, development and management activities. Since independence, several natural resource-related policies have been revised and as a result now either directly or indirectly provide support for more integrated management towards sustainable development. These include, *inter alia*, Article 95 of the Constitution of Namibia, the Agricultural (Commercial) Land Reform Act (1995), Forestry Act (2001), Environmental Management Bill, Water Policy (2000), and draft Water Resources Management Bill.

The Namibian government has been making steady progress towards devolving control and management responsibilities over natural resources to local communities (Kruger and Kambatuku, 2003). The draft Water Resources Management Bill, amongst others, promotes community involvement and decentralisation through the appointment and training of community-based water point committees responsible for local-level water resource management. It also promotes the establishment of basin management committees to facilitate a more integrated approach to

planning and natural resource management of each surface or groundwater basin.

However, despite these new measures, the resulting situation is still very often that natural resources are managed in a multitude of ways by various organisations, government ministries and other interested parties. While all the groups have good intentions to monitor, better understand, promote awareness of and conserve natural resources, there has been very little coordination of such efforts. This lack of coordination stems from often-simple gaps in communication, lack of information sharing, limited integrated planning systems as well as individual agendas and approaches. In addition, many of these projects and programmes have sought to address natural resource management without collaboration with the persons who live with and use the natural resources. Many are top-down approaches. Even those approaches that claim to be bottom-up may not benefit the community directly despite including community participation (Kruger et al., 2003). It is these conditions that gave rise to the FIRM approach.

3. FIRM approach

FIRM was initiated to co-ordinate support from four independently funded national projects in the Grootberg communal area, in northwest Namibia (Kruger et al., 2003). The overall goal of the FIRM is to improve the welfare of rural Namibians by promoting sustainable management of renewable natural resources. The purpose is to develop a replicable model of inter-sectoral co-operation by implementing integrated management practices in a manner that ensures that renewable natural resources produce sustainable and equitable flows of benefits to communal area resource user groups. Kruger et al. (2003) report that some major reasons for the institution of the FIRM is to streamline development planning at the local level, harmonise priorities of stakeholders and transfer direct control over the process to local communities.

But how does all of this work in practice? The approach needs to be introduced to and accepted by the community, which then establishes a group, or uses an already established group, within the community to represent it in the FIRM, and to take charge of it. In many cases a farmers' union or association has taken the lead in this role. In the case of the Grootberg Community, the Grootberg Farmers' Association serves the community in the FIRM. Other members of the FIRM are service providers, stakeholders, the local #Khoadi //Hoas¹ conservancy which overlaps extensively with the Grootberg Farmers' Association membership, and other interested parties and bodies involved in the particular area.

All meetings of the FIRM, usually held on a quarterly basis, are called, organised and chaired by the community

¹ #Khoadi //Hoas means Elephant's Corner in the language of the Damara people of Namibia.

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representative group. This avoids the need for communities to meet separately with each service provider, project or programme as all service providers and representatives of the community come together to sit at one table. During these meetings reciprocal feedback is given and proposed developments are discussed, planned, and co-ordinated. One of the major advantages of this type of meeting is the opportunity for open, transparent discussion, joint planning, sharing of knowledge, experience and expertise, and co-ordination of efforts to avoid duplication as well as gaps. It also keeps the community in the loop and allows them to share their ideas, needs and thoughts on activities to take place in their area and for their benefit. The representative group chosen by the community serves as its mouthpiece to address identified needs at FIRM meetings, where the outside stakeholders are approached to help with tasks relevant to the nature and function of their project or service organisation. A holistic integrated annual work plan is devised with the participation of all stakeholders in the forum, driven by home-grown wishes and based on local development priorities. Regular monitoring, evaluation and adjustment need to take place to ensure that partners are following the work plan and that goals are being met as intended. This is undertaken in a participatory process to re-affirm commitment amongst the partners.

4. Developing a FIRM for basin management

The ultimate goal of FIRM is to successfully apply the FIRM approach in other areas, within and outside farmers' associations and conservancies (Kruger et al., 2003). In this section, we explore how the FIRM approach has been adapted for ephemeral river basin management with its particular needs, demands and factors.

The river basin community is central to the application of FIRM. The community may, however, represent a wide variety of bodies or situations, not necessarily a group of people who live together in a defined area sharing certain characteristics, activities and history. Within basin management, the concept of 'community' needs to be redefined. It cannot usually be referred to as a homogenous collection of people sharing *common* ethnic, socio-economic or cultural characteristics within a narrow geographical space. The term needs to be expanded to allow *common* to represent the sharing of a particular area, particular resources, issues and/or goals. In this wider definition, the persons belonging to a community may not perceive themselves as belonging but due to some *common* factor they form part of a wider community.

The main theme of FIRM is retained, it is simply the scope that must be adjusted when applied to basin management. Not only may it encompass a larger geographical area, but possibly a more diverse set of peoples, activities and issues as well. The main tenet of placing communities at the centre of their own development process continues to be pertinent; however, in this case, the entire basin community needs to take a leading role in making decisions on the

development, management and future of the basin and its resources.

As with other, more traditionally recognised forms of FIRM, in establishing a FIRM for basin management the basin community needs to organise itself into a body (or bodies) that is responsible for activities associated with the management of resources in an integrated way. In communities where FIRMs have been established or are being initiated, the role and responsibility in support of FIRM usually falls on previously established groups, such as a farmers' association, that directly liaise with, inform and receive feedback from the community at large. The basin community needs to establish an appropriate grouping that will be able to act in a similar capacity and be recognised as representing the wider basin community. Given the often large numbers of people involved and the diversity of backgrounds, economic activities, uses and ideas about the basin, some grouping is needed to support the rights, involvement and contribution of participants while remaining manageable, efficient and effective. The draft Water Resources Management Bill suggests a solution to this need through the proposed basin management committees. These committees of approximately 12 members represent different sectors within the basin and would act as the organised group to lead and facilitate the FIRM for the basin community.

The main adaptations of the FIRM approach to the basin management concept are

1. The redefinition of community to the wider, more diverse river basin community, and
2. The focus of development issues on water and water-related land and resource management, and development that takes place within this framework.

5. FIRM in the basin management approach in the Kuiseb Basin

5.1. Characteristics of the Kuiseb Basin

The Kuiseb Basin has as its backbone the Kuiseb River, one of Namibia's twelve westward flowing ephemeral rivers. This 'dry' river extends 503 km from the Khomas Hochland area just west of Windhoek, the capital city, in a winding path towards the coast, meeting, occasionally, the Atlantic Ocean at the town of Walvis Bay. The Kuiseb Basin covers an area of approximately 21,800 km², but more than a third of this area has such low rainfall that it produces little to no runoff. As an ephemeral river system, the Kuiseb is not characterised by constant or consistent surface water flow. Rather, the river usually only flows a few days a year, and not at all some years. The flow of the river is dependent on both the amount and intensity of rainfall in the upper catchment of the basin where rainfall is highest (300–350 mm per season in the eastern-most reaches). There is minimal input from rainfall in lower

parts of the basin as rainfall decreases to less than 20 mm/annum on the Namib coast. Data from the Gobabeb Training and Research Centre located on the river in the Namib Desert some 340 km from the river's source show variations in number of days of flow that range from 0 some years to 102 days, since 1962, but it most commonly flows for a mean of about 16 days per year (9 days a year median). Only in years of exceptional rainfall, does the river reach the sea; the water usually evaporates, seeps into the sandy bed of the river, or is caught in storage dams long before it gets to the lower reaches of the river. There is minimal input into the system from alternative sources such as fog.

The Kuiseb Basin can be divided into three parts based on physical and socio-economic characteristics—the upper, middle and lower Kuiseb. In its upper reaches, the Kuiseb River and surrounding well-drained land supports a community of farmers producing livestock and wildlife on a commercial basis, and a growing tourism industry. The middle Kuiseb receives little rain, but alluvial aquifers fed by the occasional flows of the river support a riparian woodland in an otherwise sparsely vegetated, desert landscape. Here, the river also supports a number of Topnaar communities of small-scale farmers, a training and research centre at Gobabeb, and much of the fauna and flora of the Namib-Naukluft National Park. Further west, towards the delta of the river, substantial groundwater aquifers supply the coastal town of Walvis Bay with all of its freshwater, and help other towns and various mining and quarrying industries in the area meet their freshwater needs.

The upper Kuiseb (9600 km²) receives relatively good rains (200–350 mm per year), and being mountainous and characterised with stony soils and hard surfaces, forms a well-developed drainage system. To support their livelihoods in the upper Kuiseb, farmers have built impoundments in the form of earth dams to take advantage of the run-off. Groundwater is limited with hard-rock aquifers characteristic of this upper area; however, boreholes are used to abstract water from fractures in the geological make-up to meet the water needs of these commercial farmers. There are approximately 109 farms in the Kuiseb River Basin, with an estimated 750 farm dams (Amomo et al., 2000). Concerns have been raised, especially by stakeholders downstream, that these dams reduce flow to the lower Kuiseb to such a degree that they affect recharge of the alluvial aquifers downstream. However, these dams are relatively small (less than 20,000 m³) and research suggests (Angula et al., 2001) that the reduction in river flow caused by farm dams is not as significant as was earlier surmised.

The middle (11,200 km²) and lower (1000 km²) Kuiseb areas are characterised by low rainfall (less than 200 mm per year) and sandy soils. The sandy riverbed supports alluvial aquifers, which are extensive in the lower Kuiseb. Between 300 and 500 of the 3000-strong Topnaar community are resident along the Kuiseb River most of the year. The majority lives in Walvis Bay. The communities along the

river use boreholes powered by solar energy to obtain water from the alluvial aquifers. In the past, they obtained water from hand-dug wells ranging from one to four metres in depth. The Gobabeb Centre abstracts a small amount of water from an aquifer in the river using a borehole. Wildlife and vegetation are supported by the aquifers in these middle and lower reaches.

The aquifers of the lower Kuiseb not only supply the communities living along the river, but also the town of Walvis Bay and its industries. Walvis Bay is one of the largest settlements in Namibia with an estimated population of 41,000 (Silverman, 2004). The town has an exceptionally high growth rate—approximately 5–6.5% per year over the last ten years (Billawer and Ekobo, 2002)—largely due to migration. The town offers hope of employment in secondary industries, such as fishing, manufacturing, mining and construction.

Walvis Bay receives little to no rainfall. The Namibia Water Corporation (Namwater), the government parastatal bulk water supplier, pipes water about 30 km to the town from the alluvial aquifers in the lower Kuiseb River around Rooibank to meet the town's freshwater needs—approximately 4.6 M m³ in 2002/03. The water is used for domestic (48%) and industrial (52%) purposes (Andre Brummer, pers. comm.). The Municipality recycles grey water for landscaping and is promoting this option to residents too. In the past, water was also supplied in substantial volumes to Rössing Uranium Mine and the towns of Swakopmund and Arandis. This no longer occurs, however, and only about 0.5 M m³ per annum is supplied to Swakopmund from the aquifers in the lower Kuiseb.

Abstraction in the lower Kuiseb is lowering the water table. The aquifers are only significantly recharged when exceptional rains in the upper Kuiseb produce substantial floods to these lower reaches—an event that has happened twice in the past 20 years. The vegetation along the lower reaches is showing signs of stress. This vegetation uses an unmeasured amount of water, thought to be significant, and which is becoming an important component for consideration in resource planning and development. The water sector and stakeholders are presently working to establish a programme that will investigate environmental water requirements for the basin.

5.2. Integrated management

The basin concept aims to include surface and subsurface water, an expansion of the previous concept of catchments, which sought only to demarcate areas of water input and surface water in the system. The basin concept now recognises the larger system containing subsurface storage and movement of water used by the people, flora, fauna and landscape of a particular geographical area—sometimes out of the catchment area itself. This basin concept recognises a basin as one system and that an action in one part of it can have positive or negative effects on other

parts, supporting the IWRM approach to integrated land and water use and management.

As previously mentioned, FIRM has been particularly successful in Grootberg (Kruger and Kambatuku, 2003) where it has seen major achievements in bringing together all stakeholders living and working in the area to combine forces in implementing the vision of the community. This has also been the case in the Kuiseb (Botes et al., 2003). A series of initial stakeholder meetings and subsequent basin management stakeholder forums were held over a three year period, from 2001 to 2004. These meetings drew together more than 120 stakeholders representing more than 20 different sectors within and associated with the Kuiseb Basin. At each meeting there have been on average 50 stakeholders representing close to 20 sector groups. These private and public sector groups represent users and service providers within and outside the basin boundaries. The groups include commercial farming, communal farming, coastal municipalities, Regional Councils, a wide cross-section of Government ministries, directorates and departments, non-governmental organisations, and Namwater, as well as scientists, researchers, donors and other interest groups. The varied stakeholders bring to the process high-level decision-making, advisory capacity, technical expertise and experience, extension services, research, and knowledge of the area.

5.3. Common vision developed by FIRM

The representative group for FIRM in the Kuiseb is the Kuiseb Basin Management Committee. Made up of ten sectors, this group grew out of the stakeholder body to tackle and more strategically handle the representation of the basin community in basin management. The wider basin community was responsible for the formation of this group. Through a number of participatory workshops, the stakeholders decided on criteria, terms of reference and membership structure of the committee. They also worked on the requirements of the committee, issues to be addressed as well as major activities to be undertaken. The committee was formed within the process rather than already being established at the start of FIRM.

The group of stakeholders met several times before forming themselves into a more formal Stakeholders' Forum. The Committee arose from the Forum after it was well-established and interacting on a regular basis. The Committee is now responsible for organising the meetings, chairing them, guiding the agenda, developing the goals and requirements for the community and bringing these before the larger forum for inputs and suggestions. While it was formed to be the advisory body for decision-making, planning and management for the basin at large, this is done in collaboration with the forum. The Stakeholders' Forum is an open body of stakeholders from the Kuiseb and includes people within the basin, users, service providers, interested persons, and organisations. The community

itself is represented by the Basin Management Committee. Commitment to the forum was established through the development of a memorandum of understanding with the stakeholder sectors. Currently, meetings are held on a quarterly basis but this may change given the need to have all stakeholders brought together for information exchange on the core activities of the committee.

It is evident from current thinking that top-down, pre-planned, rigid solutions or frameworks are not suitable. It is in this light that FIRM stands out as an appropriate mechanism to be applied. The flexibility that FIRM allows in being tailored to a particular group, context and set of needs further augments its role in bringing about an integrated approach to resource management on many levels. The importance of putting the community in the driver's seat for addressing particular resource management needs is key to its successful implementation and results.

5.4. FIRM within a FIRM

A community of Topnaar communal farmers live within the Kuiseb Basin. With a total population of close to three thousand persons, only about ten per cent live in the rural setting along the Kuisib River and the remainder live in the urban centre of Walvis Bay. The livelihoods of the rural portion of the population are based on small scale communal livestock agriculture and harvesting of an endemic plant, the *!nara*. The harvesting of the *!nara* was traditionally organised through an informal system of family ownership. The Topnaar community is also the focus of a number of natural resource management and development projects facing the similar fate of poor co-ordination, duplication, gaps and divergent goals that first motivated the formation of FIRM.

The Interactive Learning and Action in the Kuiseb (ELAK) project has worked to introduce the FIRM approach and support its implementation within the Topnaar community. While still not fully established, many of the principles of the approach are already being adopted. The project has supported the community through training and facilitation to undertake strategic planning for development and natural resource management in their area. The resultant strategic plan outlines the goals and objectives of the community and is translated into an annual work plan for the achievement of these. It is at this point that the interface between the basin-wide Kuiseb FIRM and the Topnaar community FIRM is realised. The Topnaar Community, through chosen representatives, presents its strategic plan as well as work plan of fellow basin community members, relevant service providers and other groups. At these meetings the Topnaar community use the basin FIRM to solicit and co-ordinate help, activities and developments to be undertaken in their community and its area. During this open, transparent dialogue the Topnaar community are able to ensure that the plans made are kept in line with the ideas, goals and desires of the Topnaar community.

Table 1

Overview of characteristics and issues from results of the evaluation undertaken with Kuiseb Basin stakeholders in October 2003 and with Grootberg FIRM members in October 2002

Characteristics, Issues	FIRM	FIRM in basin management
Level of organisation	Consists of representatives elected by individual households or voting members of farmers' organisations	Consists of representatives appointed by local-level organisations, government departments, regional government
Interest	Focused around common interests of relatively homogeneous farming community	Focused around common interests of diverse communities living in and using resources from a demarcated basin
Open framework and approach	Fairly regular attendance by specific elected representatives	Stakeholder sector representatives frequently change between meetings
Stakeholder participation and interaction	Members are elected representatives; expected to attend all meetings; invited <i>service not always in attendance</i>	Participation is voluntary in this case, thus some groups responsible for natural resources in basin may choose not to participate
Representation by involved stakeholders	Members are elected representatives of community and authorised to make decisions	Representatives often delegated to attend but not authorised to make decisions
Degree of representation	Members often not soliciting inputs from their broad constituency nor widely reporting back; may represent own opinions in some decisions	Members represent established organisations/ institutions; frequently have inputs for meetings and report back to their organisations
Transparency	Enhances transparency with respect to roles and responsibilities	Enhances transparency with respect to roles and responsibilities
Awareness of integrated natural resource management	More intense, wide-spread awareness necessary at community level	More public awareness necessary within organisations represented and broad public
Platform for information sharing and idea generation	Operates at individual level with organisational backing	Operates at organisation level through individuals
Centralised collection of information	Documented institutional memory of FIRM is weak; frequently depends on oral communication	Access to extensive basin FIRM documentation and wide array of archival and other sources of information
Platform for integrated planning avoiding duplication of activities; monitoring, evaluation and adjustment	Involves FIRM members and invited stakeholders and service providers; competition amongst service providers limited	Involves basin FIRM forum and committee members
Platform for generating shared, long-term vision	Part of planning process	Part of planning process
Support to activities	Focuses support where needed	Focuses support where needed
Community in the 'drivers' seat'	Local community takes ownership	Basin community ownership a new concept but growing
Understanding of demands by both users and environment; opportunity for developing holistic picture	Emphasis on demands by individual users but overall understanding of environmental needs exists	Emphasis on broad understanding of users and environment; greater understanding of regional and national perspective
Pooling of different knowledge and expertise	Relatively homogeneous expertise within community; diversity augmented by service providers	Diverse expertise and knowledge on several levels
Enhancing efficiency (human and financial resources) and capacity of stakeholders	Capacity enhanced through FIRM activities	Capacity enhanced through basin FIRM's activities
Long-term institutional and financial sustainability	Impacted by withdrawal of donors and other direct support	Less dependent on donors and external support; support by government mooted but mechanisms not established

service providers

487 The community has also received training in project
 488 planning and proposal writing and have been supported
 489 to write proposals towards natural resource management
 490 and enhancement of livelihoods for their community.
 491 Through the basin FIRM the community has been able
 492 to network and find opportunities to present these propos-
 493 als as a result of partnerships amongst stakeholders and in
 494 some cases the basin FIRM may assist in finding funding
 495 sources.

496 6. Assessing the success of FIRM and FIRM in the 497 basin management approach

498 During October 2002 a survey was conducted to assess
 499 the different elements of FIRM as implemented in the
 500 Grootberg area. The survey was carried out amongst stake-
 501 holders at local, regional and national levels through inter-
 502 views. The interview was framed in three main parts to
 503 obtain thoughts on the achievements and challenges, major
 504 outputs and products of FIRM, and how the approach
 505 could be applied in other areas.

506 In a workshop of stakeholders of the Kuiseb Basin in
 507 October 2003 a similar evaluation of the process of basin
 508 management through their stakeholder forum was also car-
 509 ried out. This evaluation took the form of a participatory
 510 activity using cards where ideas were written anonymously.
 511 These cards were then grouped into clusters of similar
 512 ideas. The stakeholders were asked to identify things that
 513 were good about the approach as well as to provide any
 514 suggestions for improvement or future actions. The results
 515 are shown in Table 1.

516 7. Conclusion

517 Implementing FIRM within the basin management pro-
 518 cess in the Kuiseb provides a model for how other basins
 519 could use this approach as a mechanism to support the
 520 process of basin management and create an avenue for par-
 521 ticipation by stakeholders.

Box 1. Recommendations—How to establish a FIRM in the basin management approach

To effectively use the FIRM approach within the
 basin management process a few steps are suggested
 below to achieve this. These are not intended to be ri-
 gid directions but rather guidelines and recommenda-
 tions, which should be used in the context of a
 particular ephemeral basin. This process is iterative
 and ongoing.

- Step 1: Bring stakeholders of the basin together
- Step 2: Share information
- Step 3: Introduce concepts of basin management and
integrated water resource management

Step 4: Stakeholders come together to look at issues
within the basin and activities for the Forum
and the Basin Management Committee to
focus on

Step 5: Make decisions on structure of committee, cri-
teria for membership, requirements and
objectives

Step 6: Form basin management committee

Step 7: Continue Forum meetings to keep stakehold-
ers involved and informed

Step 8: Basin management committee and forum to
work together towards management of the
basin

The recommendations provided in the box above have
been derived from the specific process undertaken in the
Kuiseb but are designed for scaling out to other areas.
They are intended as a starting point for other basins that
will adopt the basin management approach. While imple-
menting the suggested steps, consideration should be given
to a particular basin's context and characteristics aiming to
adapt the process to these as much as possible to create a
unique experience rather than a carbon copy. The use of
FIRM within the basin management approach is meant
as a facilitation tool for intended actions and plans, provid-
ing the opportunity for multi-stakeholder participation,
networking and coordination. Based on the evidence of
the Kuiseb Basin case study described above, it appears
to us that FIRM provides a solid foundation for the
achievement of common goals for the benefit of all.

Acknowledgements

The authors would like to extend great appreciation to
the Kuiseb basin community and its many diverse and
committed stakeholders without whom this process would
not have taken place. A very special thanks is also extended
to those who worked hard to initiate and support imple-
mentation of FIRM with special note of contributions
from GTZ. A special acknowledgement is given to all
members of the ELAK team especially Andre Botes,
Vivian Hoveka, Salomon Boois, Thomas Parr and Bertus
Kruger for implementation of the project. Thanks must
be given to those persons and partners who helped in the
development of the concept behind the ELAK project, with
special mention of Dr. William Hamilton III and Guido
van Langenhove. Thanks to Sharon Montgomery and Car-
ole Roberts who contributed to earlier versions of this pa-
per. Appreciation is extended also to the European Union
for funding of this project and the European Commission
and its staff for administering the funds for the project,
and their guidance. And to all those who played a role in
some way in the realisation of the FIRM mechanisms,
the basin management process in the Kuiseb and this
paper, a hearty vote of thanks to you.

561 **References**

- 562 Amoomo, H., Elago, P., Gaseb, N., Hoveka, V., Khairabes, M.,
 563 Mbangula, E., Maharukua, V., Mukuya, S., Ndjela, G., Noongo,
 564 E., Shinedima, R., Zaaruka, B., 2000. In: Hamilton, W.J., Klintenberg,
 565 P., Montgomery, S., Seely, M. (Eds.), Determining the water reserve
 566 for the Kuiseb River. DRFN: Summer Desertification Programme
 567 Number 8 (Occasional Paper No. 11). DRFN, Windhoek.
- 568 Angula, H., Goreseb, J., Haimbodi, N., Iiputa, G., Katshuna, M., Matros,
 569 A., Muduva, T., Muvi-Tjikalapo, M., Nakale, T., Nakthingo, H.,
 570 Nampila, J., Nantanga, K., Nashipili, N., Shigweda, L., Thomas, T.,
 571 2001. Influence of farm dams on water balance in an ephemeral river
 572 system: the Kuiseb basin/catchment. In: Hamilton, W.J., Seely, M.,
 573 Van Langenhove, G. (Eds.), DRFN: Summer Desertification Pro-
 574 gramme Number 9. DRFN, Windhoek.
- 575 Billawer, H.W., Ekobo, M.S., 2002. A Human Geography Atlas of Walvis
 576 Bay: Beyond the Reintegration. Gamsberg Macmillan, Windhoek.
- 577 Botes, A., Henderson, J., Nakale, T., Nantanga, K., Schachtschneider, K.,
 578 Seely, M., 2003. Ephemeral rivers and their development: testing an
 approach to basin management committees on the Kuiseb River, 579
 Namibia. *Physics and Chemistry of the Earth* 28, 853–858. 580
- Heyns, P., Montgomery, S., Pallett, J., Seely, M. (Eds.), 1998. Namibia's 581
 water. A decision makers' guide. The Department of Water Affairs, 582
 Ministry of Agriculture, Water and Rural Development and The 583
 Desert Research Foundation of Namibia, Windhoek. 584
- Kruger, A.S., Gaseb, N., Klintenberg, P., Seely, M., Werner, W., 2003. 585
 Towards Community-Driven Natural Resource Management in 586
 Namibia: The FIRM Example. Paper presented at the VIIth Interna- 587
 tional Rangeland Congress, Durban, South Africa. 588
- Kruger, A.S., Kambatuku, J.R., 2003. FIRM—The Forum for Integrated 589
 Resource Management: Putting Communities at the Centre of their 590
 own Development Process, A case study in the establishment of 591
 FIRM, based on the Napcod experience (Napcod project of Desert 592
 Research Foundation of Namibia, SADC-DRFN Desertification 593
 Interact). DRFN, Windhoek. 594
- Silverman, M., 2004. Between the Atlantic and the Namib: An environ- 595
 mental history of Walvis Bay. Namibia Scientific Society, Windhoek. 596
 597