
GROUNDWATER MANAGEMENT IN KENYA; THE NEED FOR IMPROVED LEGISLATION, DELEGATION OF AUTHORITY, AND INDEPENDENT DECISION-MAKING

B. H. Bakker

*DHV CONSULTANTS, Laan 1914 nr 35, Postbus 1399, 3800 BJ Amersfoort
(email: we@cons.dhv.nl)*

Introduction

Since the early eighties, the Dutch Ministry of Development Cooperation (DGIS) has been supporting a water resources management project in Kenya. Today, the project is known under the name of WRAP (Water Resources Assessment and Planning Project). This project has yielded a wealth of information about actual groundwater management in Kenya.

WRAP's aim is to strengthen the institutional capacity of the Kenyan Ministry of Land Reclamation, Regional and Water Development in:

- Preparing regional water resources assessment studies that consider both surface water and groundwater;
- Formulating District Water Development Plans that are based on those water resources assessment studies;
- Establishing national and regional water resources databases; and in
- Developing water resources management models.

The project is based at Ministry Headquarters in Nairobi; the study and planning areas are located outside Nairobi, and consist mainly of arid and semi-arid lands.

The project has a limited scope and mandate, in the sense that it operates in specific districts and within the existing organizational set-up and structure of the ministry. In operating within this framework, the project has experienced the limitations of the present set-up and structure of water resources management.

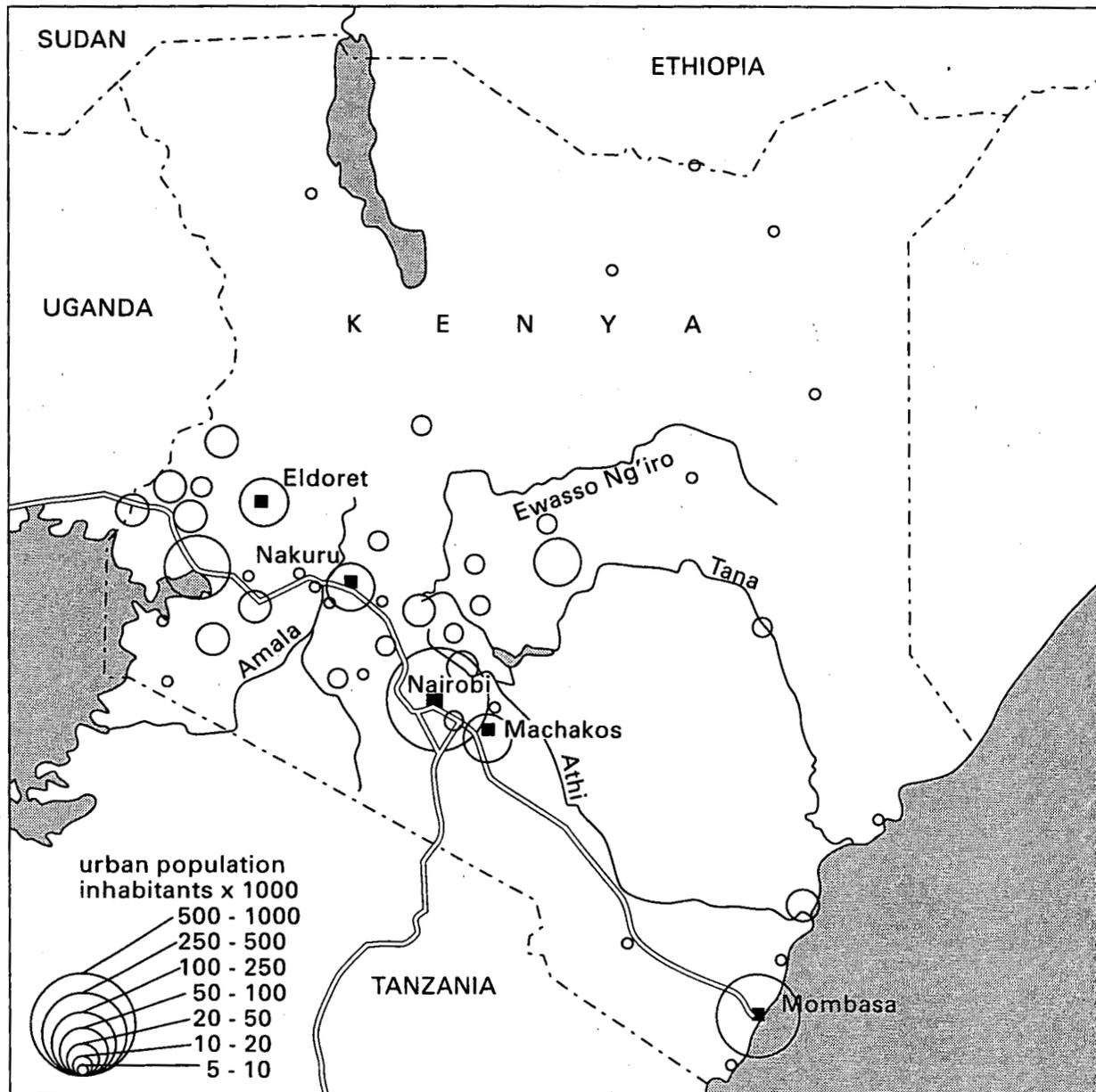
This paper is based on experiences obtained within the WRAP project. It describes and analyses how groundwater in Kenya is managed and the role played by WRAP in influencing groundwater management practices. The paper describes first Kenya's groundwater resources. It continues with a discussion on the formal rules and regulations for groundwater management. The next sections focus on groundwater management in practice and on the direct and indirect effects of prevailing practices. Subsequently the successes and failures of WRAP and the impact that WRAP could have are discussed. In the last section of the paper a number of recommendations on how groundwater management in Kenya could be improved are formulated.

Groundwater resources in Kenya

Kenya is a large country (about 17 times larger than the Netherlands). Some 80% of the estimated population of 30 million, however, live in a narrow zone running from west to east,

from Kisumu and Eldoret along the borders with Uganda towards Mombassa along the Indian Ocean (see Figure 1).

Figure 1. Population distribution in Kenya

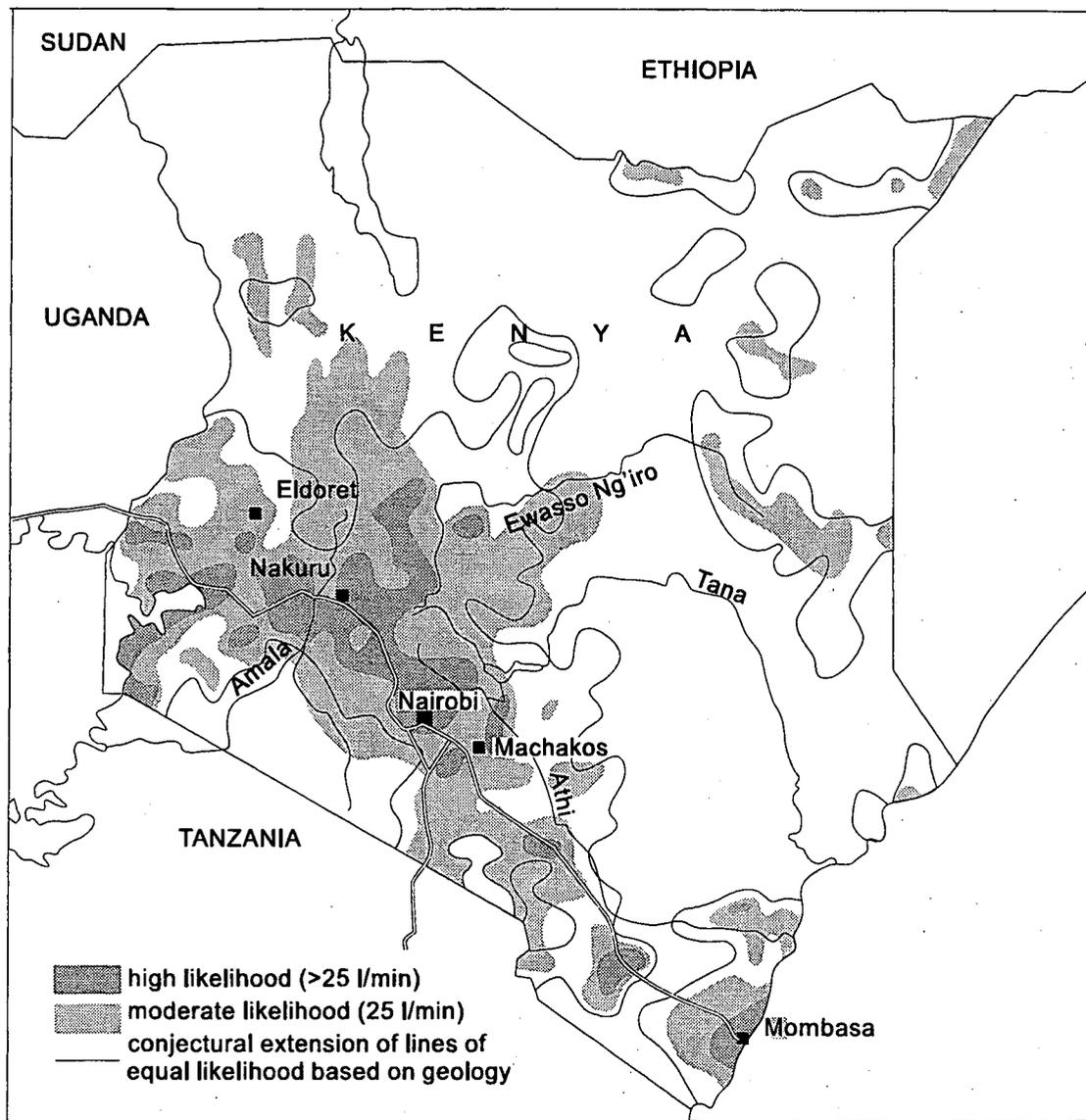


This zone is very fertile and there is sufficient water to sustain agricultural development. In this zone, particularly along the downstream sections of the rivers where a lot of water is used for irrigation, there is huge competition for water. In some areas, this has caused rivers to dry up for part of the year. Most of the available surface water is turbid, heavily polluted with biodegradable substances, and contaminated. Erosion, agriculture-based industries (e.g. coffee factories), and a fast-growing population with inadequate sanitary facilities have created a situation in which complex water-treatment systems are needed to make the

abstracted surface water suitable for domestic or industrial use. Water-quality standards have become stricter; there is a rising demand for "high quality" clear water which can, for instance, be used for horticultural purposes (e.g. for drip irrigation). Most of the piped water supply systems in the country are unreliable. This applies particularly to piped supplies with extensive distribution systems and to pumped water supplies.

Another phenomenon, which can be observed around the major towns, is the inability of the water supply company to cope with the expansion of the towns; areas located further away from the main water supply lines do not get enough water. The demand for reliable and independent point-source water-supply systems is rising

Figure 2. Groundwater production areas in Kenya



Under these circumstances, it is very attractive to sink a private bore-hole. Its owner will be assured of a reliable source of water (not drying up), a proper source (not contaminated; limited need for water treatment), and an independent source (not shared with other users).

Despite the great demand for the development of groundwater resources, there is only a small group of consumers capable of sinking a bore-hole. Moreover, surveying and drilling activities are controlled by a very small group.

Shallow groundwater, which could be developed through hand-dug or hand-drilled wells, is only found along some rivers and in areas with major sedimentary deposits. In most areas, the bore-holes needed to abstract groundwater would require a depth of as much as 260 m. The cost of sinking such a bore-hole is high; a rotary drilling rig is needed to sink the hole. Moreover, extensive surveys are needed to identify a site where a bore-hole can be sunk with a reasonable chance of success. And even then, there are no guarantees that the bore-hole will be able to supply the required yield; the bore-hole could even be dry. This has resulted in a situation in which only a small group of financially powerful individuals and private organizations are able to pay for a bore-hole. The survey work is done by a small group of Ministerial experts and the bore-hole is sunk by one of the few capable contractors.

Groundwater management in Kenya

The Water Act and the Water Board

Water resources management in Kenya is vested in the Water Act. The Water Act, Cap 372 of Laws of Kenya, is "An Act of Parliament to make better provisions for the conservation, control, apportionment, and use of the water resources of Kenya, and for purposes incidental thereto and connected therewith". The present act, which repealed The Water Ordinance of 1929, commenced on 7 May 1952, after which minor amendments have been made.

Under section 4 and 5 of the act, the control of every body of water shall be exercised by the minister in accordance with the act. ("The minister" is the Minister of Land Reclamation, Regional and Water Development). The act also confers various powers to the minister.

Under the act, various authorities, boards, and committees are prescribed with various duties, powers, and functions. Responsible at the national level is the Water Apportionment Board, which has a supervisory and decision-making task. The Water Apportionment Board is advised at catchment level by six Catchment Boards (one for each drainage area). Apart from the Catchment Boards, the minister has used his authority to install District Water Boards (one in each of the 80 districts of the country). The responsibilities of the Catchment and District Water Boards are rather limited and are basically restricted to advising the Water Apportionment Board on water resources matters.

According to the act, all applications for a water permit, transfer, cancellation, or renewal of a permit must be considered by the Catchment Board before being considered by the Water Apportionment Board. Whereas the Water Apportionment Board usually accepts recommendations by the Catchment Board, it is not bound to accept every recommendation made by a Catchment Board; it may accept, reject, or modify any recommendation. Like the Catchment Boards, the District Water Boards have an advisory task.

The Water (Apportionment) Board is an old institute, which was already established in 1935. At that time, it was a totally independent agency. The Ministry of Water Development was still a division within the Ministry of Agriculture. The Catchment Boards also date back from the colonial period. The District Water Boards are a new phenomenon. They were established in 1992.

According to the provisions of the act, any of the powers, duties, or obligations vested in the Water Apportionment Board by resolution of the Water Apportionment Board, may be delegated by it to any authority, board, committee, or person, subject to limitations which the act may provide. Consequently, the board, under various resolutions, has delegated some of its powers, duties, or obligations to various officers of the ministry.

The main water resources management tool is the water permit. A water permit is required in all cases of proposed diversion, abstraction, obstruction, storage, or use of water from any body of water unless declared not to be a watercourse or as exempted. An application for a water permit must be made in the manner prescribed by the act and in compliance with standing requirements of the Water Apportionment Board.

Permits are issued by the Water Apportionment Board, which should base its decision on advice given by the relevant Catchment Board. In a similar way, the Catchment Board should be advised by the relevant District Water Board.

None of the institutions responsible for water resources management (neither the Water Apportionment Board, nor the Catchment Boards, nor the District Water Boards) has the capacity to independently implement basic activities of water resources management (e.g. water resources monitoring, water resources data analysis, and planning of the available water resources). These activities are all done by staff of the district water engineer's office, the provincial water engineer's office, and the Water Resources Divisions of the Ministry Headquarters. The district water engineer is Secretary to the District Water Board. The provincial water engineer "advises" the Catchment Board. The heads of the Divisions of Surface Water, Groundwater, and Water Quality, and Pollution Control of the Ministry Headquarters form the secretariat to the Water Apportionment Board.

Groundwater management in practice

The Water Apportionment Board has delegated most of its powers of issuing groundwater permits to the Groundwater Division of the Water Resources Department of the Ministry of Land Reclamation, Regional and Water Development. In this way, the Groundwater Division, which was already responsible for groundwater surveys and groundwater monitoring, became responsible for all matters related to groundwater management. The head of the Groundwater Division is a geologist.

In the following cases (i.e. in most of them), no permit is needed to abstract groundwater:

- "If such abstraction is made without the employment of works, that is non-mechanical means such as direct watering a permit is not required." This means that for most shallow wells with buckets, there is no need for a permit;
- "When the works for the development of groundwater are not situated within one hundred yards of any body of surface water, provided the well (or bore-hole) is not within half a mile of another well or within a conservation area. However, a notice on Form WAB 26 must be submitted to the Water Apportionment Board." This means that in most cases there is no need for a permit, while the notice on Form WAB 26 is frequently not submitted.

The Groundwater Division has staff at both provincial and district levels. The district and provincial geologists are responsible for all issues related to groundwater management, including groundwater monitoring, bore-hole site location, supervision of drilling works, and advice on requests to sink a bore-hole. This means that all groundwater matters, both water resources development and management-related, are done by one and the same officer.

The staff posted to the province and district headquarters report to both the provincial and district representatives of the ministry (the District Water Engineer and the Provincial Water Engineer), as well as to the head of the Groundwater Division.

Acting on behalf of the district and provincial water engineers, the district and provincial geologists are the main advisors to the District Water Board and the Catchment Board. Having staff at district and provincial levels advising the District Water Board and Catchment Boards on groundwater matters, the head of the Groundwater Division has a dominant role in groundwater management.

The established procedure for getting approval to sink a bore-hole is as follows :

- A request to sink a bore-hole is forwarded, in writing, to the head of the Groundwater Division;
- Headquarters-based staff of the Groundwater Division first of all check whether the planned bore-hole site is not located within 100 yards of a river, nor within 800 m of an existing well or bore-hole, nor within a conservation area; only in those cases is a permit needed;
- The staff of the Groundwater Division (based at Ministry Headquarters, at the Provincial office, or at the District Office) will then implement a groundwater survey to assess whether groundwater is available at the indicated site, how deep the groundwater will be, and how much the expected yield will be;
- The results of the groundwater survey are indicated in a survey report, prepared by staff of the Groundwater Division;
- Once more, the applicant has to forward his request to sink a bore-hole, together with the survey report, to the head of the Groundwater Division, who, on behalf of the Water Apportionment Board, decides whether the bore-hole can be sunk.

Approved bore-hole site locations, together with the bore-hole completion numbers, are recorded on topographical map sheets (Section "Maps and Records"). Other data (e.g. the depth of the aquifer) are stored in data sheets, which can only be retrieved via the bore-hole completion number. There is no direct linkage between the survey report (survey report number) and the bore-hole completion number.

Approval is only required to sink a bore-hole. There is no need for approval to build a septic tank or to sink a shallow well.

Groundwater exploitation

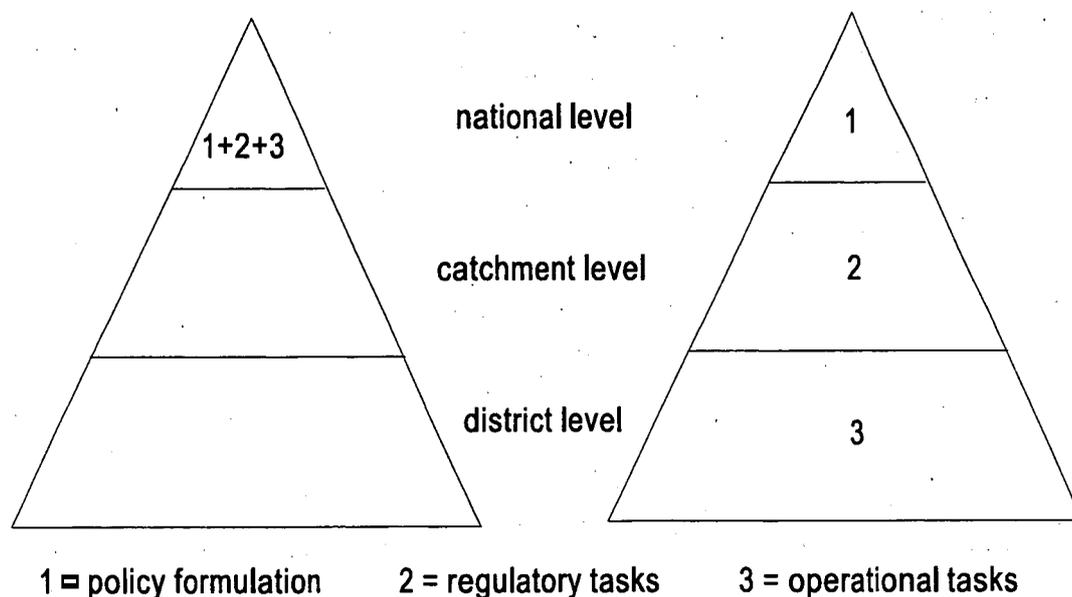
Groundwater management in Kenya means groundwater exploitation. The amount of money spent on groundwater monitoring, groundwater data analysis, and groundwater development planning is very limited; almost all funds are spent on groundwater exploitation. The only restrictions on a massive development of groundwater resources are the difficulty in finding sufficient groundwater and the cost of sinking a bore-hole. Otherwise, there are hardly any restrictions. So, even though there is a huge demand for the development of groundwater resources:

- Legal requirements are fairly limited (in most cases there is no need for a permit, while a simple request to the Groundwater Division is sufficient to get the required approval documents);
 - Applications are submitted by powerful/influential individuals;
 - Negative impacts of abstracting too much groundwater are (still) limited and are of a localized nature.
-

The perception that the amount of water which can be abstracted is limited and is determined by the groundwater recharge is accepted but not translated into management tools. This is clearly reflected in the criteria that are used to decide upon the need to apply for a groundwater permit. A bore-hole can be sunk as long as there is no negative impact on an already existing groundwater abstraction (i.e. not within 800 m of an existing bore-hole). Sustainability criteria (i.e. how much groundwater is already being abstracted from a certain aquifer) are not taken into consideration.

Another indication of the dominant role that groundwater exploitation plays is the way water resources management activities are organized. Water resources surveys, water resources monitoring, analyses of water resources data, and advice on water resources matters are not done by the District Water Board, the Catchment Board, or staff of the Water Apportionment Board, but by staff of the district water engineer, the provincial water engineer, and the Water Resources Department of the Ministry, who all fall under the Director of Water Development of the Ministry of Land Reclamation, Regional and Water Development.

Figure 3. Water resources management - Top-down or bottom-up?



Top-down management

In water resources management, there is a need for policy formulation, regulatory tasks, and operational tasks. In Kenya, all these matters are controlled from ministry headquarters. Groundwater management in Kenya is very much a "top-down" activity, with policy formulation and regulatory tasks done at the national level and operational tasks controlled from the National level. In particular, the donor community and non-governmental organizations have pleaded for a far more community-based and bottom-up organization of the water resources management system.

Operational tasks can be done at the community/district level; regulatory tasks should be done by the Catchment Boards, while the national level should only be involved in policy formulation. This will require a delegation of responsibilities to lower administrative levels, which will be very hard to realize. As much as possible, things are done from Nairobi. The arguments for this are:

- Funds and equipment are scarce and should be used in the most efficient way, which means from a central level;
- Only at the central level does one have the required data to make decisions on water resources management matters;
- Only at the central level is the required expertise available to analyse and interpret the survey data.

These arguments are only partly valid. Probably one of the most important "background" reasons is to control (and benefit from) the development of groundwater resources.

Separated management of surface water and groundwater

According to the Water Act, the Water Apportionment Board is responsible for issuing permits for both surface water and groundwater. The Water Apportionment Board, however, has delegated its authority on groundwater matters to the Groundwater Division of the Ministry. In a similar way, the Surface Water Division deals with requests for abstracting surface water. (Unlike groundwater, the District Water Boards and Catchment Boards are still involved in advising the Water Apportionment Board on surface water matters.) There is no exchange of information or consultation on water resources matters between the Groundwater Division and the Surface Water Division; each Division has its own mandate. It is very difficult, however, to separate groundwater and surface water. In particular, in the arid and semi-arid areas in which WRAP operates, surface water becomes groundwater and groundwater becomes surface water. Surface water infiltrates and becomes groundwater while groundwater constitutes the base flows of the rivers.

It appears to be very difficult to integrate the activities of the Surface Water and Groundwater Divisions. WRAP has put a lot of effort into integrating the two disciplines in its integrated water resources assessment studies. But:

- Right from the educational training stage, surface and groundwater are considered to be two "independent" entities. The Department of Geography of the University of Nairobi is responsible for the training of hydrologists; a hydrologist only deals with surface water. The Department of Geology is responsible for the training of geologists, who, among other things, deal with groundwater matters. Hydro-geologists or geo-hydrologists belong to a very scarce species;
- There is a clear tendency to "build kingdoms". An exchange of water resources information is often considered not useful because of the strategic role information plays in sustaining these kingdoms;
- In most areas, there are no regional aquifers that would enable a certain bore-hole to be categorized as belonging to a certain hydrological system; multi-layered systems and faults and fractures complicate modelling. As a result, it is difficult to relate surface water and groundwater to each other.

Lack of planning

Kenya has a National Water Master Plan, which was prepared with the support of JICA (Japanese International Cooperation Agency) and approved in 1992. This National Water Master Plan focuses closely on water resources development issues. There is no National Water Resources Management Master Plan. The National Water Master Plan is not used for purposes of water resources management.

Within the framework of WRAP, District-Scale Water Resources Assessment Studies have been prepared and, based on these studies, District Water Development Plans (DWDP's) have been compiled. These DWDP's are based on the sustainable management of the available water resources.

Despite being approved by the Ministry and the District Development Committee, the planning as indicated in the DWDP's is not being implemented. Most groundwater development activities are taking place autonomously and unplanned.

Conclusion: In most cases, any medium-term or long-term planning for the development and management of groundwater resources is missing. Even if such a plan exists, it often lacks the general support needed for it to be used as a guiding document.

Administrative units as planning units

Most of the staff of the Water Resources Department have been posted to the district and provincial offices. Each district has a district geologist and a district hydrologist; each province has a provincial geologist and a provincial hydrologist. This set-up has been chosen in order to be able to advise the district and provincial water engineers on water resources development matters. The district- and province-based geologists and hydrologists, however, should also advise on water resources management issues. The areas of jurisdiction are confined within the province/district boundaries. In some cases, these province/district boundaries coincide rather well with the catchment boundaries; in most cases, they do not. Only at central Nairobi level has the Surface Water Division assigned coordinators for certain drainage/catchment areas.

Sector development policies

Most of Kenya's ministries have a sector-development task. Apart from having a Ministry of Land Reclamation, Regional and Water Development, there is a Ministry of Planning and National Development, a Ministry of Marketing, Agriculture, and Livestock Development, and Ministries of Tourism and Industry, which also focus on sector development. There is a Ministry of Environment and Natural Resources, but this ministry is very young and weak.

Neither the Ministry of Environment, nor the Ministry of Land Reclamation, Regional and Water Development, nor the Ministry of Planning and National Development have the tools to set boundary conditions to these sector development plans. There is, for instance, no feed-back between, say, the Ministry of Industry proposing industrial development in a certain area - development that will make heavy demands on water resources availability - and the Water Resources Department of the Ministry; the consequences of such a development are not discussed. Discussions do take place at district level on the preparation of the District Development Plans, but not at central level, where decisions on sanctioning and the allocation of money are made.

No funds - no monitoring - no data - no management

Governmental funds are limited. Funds are allocated based on the revenues generated by a ministry for a certain activity. As a result, more money will be allocated to the operation of governmental water supplies (which generate income via the water fees) than to water

resources management, which generates hardly any income. The treasury's budget allocation for water resources management is therefore very limited.

Funds allocated for water resources monitoring are centrally controlled by the heads of the Surface and Groundwater Divisions and allocated through the offices of the District Water Engineer (DWE). Apart from controlling the operational funds, the DWE also controls the means of transport to be used. Most of the limited funds that are available for water resources management are therefore used at central level or at district level for other purposes.

Water resources management is a costly exercise. A poor infrastructure and limited availability of equipment means that even a simple flow measurement will cost a considerable amount of money. A flow current metre needs to be brought to the site (requiring a 4WD car with a driver). Measurements need to be taken by a hydrologist or assistant hydrologists with some assistants. All need field allowances because they probably have to camp/sleep outside their duty station.

The final result of this trend has been that, from 1992 onwards, water resources monitoring has almost come to a standstill. In most cases, District-based staff are idle because there are no funds to allow them to go to the field. Without updated information, it becomes impossible to plan and manage the water resources development.

Instead of "sharing responsibility for an open access resource", groundwater management in Kenya can rather be characterized by: "a small group of experts controlling the access to a resource which is difficult and costly to develop, a resource which is in principle considered to be "unlimited"".

The direct and indirect effects of poor groundwater management

Before describing the effects of poor groundwater management, two introductory remarks need to be made. Firstly, only some of the effects of uncontrolled groundwater development are visible. Groundwater levels are hardly monitored; indications are that groundwater levels are dropping because of over-pumping, but supportive data are scarcely available. And secondly, at this moment, the effects of poor surface water management are considered to be much worse (being much more visible) than the problems due to poor groundwater management. In particular, the massive abstractions of surface water for irrigation are such a "hot issue" that the smaller, "better distributed", and less visible abstractions of groundwater are considered to be of less importance.

To describe the effects of poor groundwater management, a sub-division can be made between direct and indirect effects. Direct effects are: over-pumping, drops in groundwater levels, salt water intrusion, and groundwater pollution. Indirect effects are: no representation or involvement of other beneficiaries of groundwater management, no planned development of groundwater resources, corruption, and a huge gap between the stored information on water resources and the real field data.

Direct effects

Over-pumping

A pumping test is done immediately after the bore-hole has been drilled. Based on the results of this test, a permissible yield is indicated. In a lot of cases, this permissible yield appears to be less than that needed by the applicant. A larger pump is then installed with a large draw-down and a larger chance of the bore-hole filter being clogged. Design changes (e.g. omitting an overhead storage tank because of no money) lead to reduced pumping heads and as a consequence to larger abstractions. The total absence of adequate monitoring of groundwater abstractions leads to a short lifetime of bore-holes and pumps.

Drops in groundwater levels?

In some areas, shallow groundwater levels have dropped. This has led to a situation in which low-cost, groundwater-based, water-supply systems (e.g. shallow wells, springs, and water holes) can no longer be used. The locations of most of these low-cost shallow groundwater resources have not been documented. Nobody knows whether a planned bore-hole will be in the immediate vicinity of an existing spring, well, or even bore-hole (if not documented or sunk without a permit).

But, in many areas, there are substantial seasonal fluctuations of groundwater levels. Question: "Have the groundwater levels dropped because of the dry season or because of groundwater abstractions from high capacity bore-holes?" In most cases, no conclusive answer can be given.

Saltwater intrusion

Apart from falling groundwater levels, over-pumping, particularly along the coastal strip, has led to saltwater intrusion. Small fresh water pockets floating on brackish or salty sea water can easily be depleted. Along the coastal strip, many bore-holes, but also shallow wells, have had to be abandoned for this reason.

Groundwater pollution

Groundwater is considered to be a safe and reliable source; groundwater is hardly ever treated with chlorine, aerated to reduce the iron content, or treated to reduce the F content. But bore-holes are sunk almost everywhere (as long as water can be found), also in areas that are not protected and which lack basic sanitary/waste disposal facilities. It is even attractive to sink a bore-hole as close as possible to the distribution areas (limited cost of transmission). As a result, even groundwater abstracted from a bore-hole is no longer an absolutely safe water resource.

Indirect effects

No public debate on groundwater matters

At regional level, there are sufficient opportunities to discuss groundwater matters: via the District Water Board, the District Executive Committee, the District Development Committee, Non-Governmental Organizations, other ministries and politicians.

Also at catchment level, there is public representation to discuss groundwater matters. There are representatives of each district present at the Catchment Board meetings.

At the central level, however (where decisions are made), public debate is hardly possible. Representatives of other ministries participate in the Water Apportionment Board. Their influence, however, is very limited. This applies in particular to groundwater matters, which have been delegated to the "experts" of the Groundwater Division.

No planning

A planned development of the available water resources requires a multi-sector approach, with adequate input from the different water users. The main water users in most areas are agriculture (irrigation) and livestock development. The development of the agricultural and livestock potential is planned by the Ministry of Agriculture and Livestock Development, which is not involved in water resources management. As indicated above, "other" water users are not involved in decision-making on groundwater abstractions. Under these circumstances, it appears to be almost impossible to develop and implement a planned groundwater development.

No public control

As a result of centralized decision-making and the limited number of qualified and capable drilling contractors, a situation has arisen in which a very small group of people decide on a request to sink a bore-hole. Such a situation is prone to mis-use.

Apart from the fact that objective decision-making is no longer taking place, it also has a very frustrating effect on the "other" institutions involved in groundwater management. The District Water Boards and the Catchment Boards have stopped discussing groundwater abstractions, and staff involved in water resources monitoring are frustrated.

Virtual reality

Groundwater management decisions are made in Nairobi and are based on data available at the groundwater database (maps and records). As indicated earlier, only some of the groundwater abstractions are registered. Moreover, Kenya has a poor communication system. Information exchange is done via data forms, which are filled in by hand and posted to Nairobi. At regional level, there are no organized data storage systems or computers. Field monitoring data are sent directly to Nairobi, without proper processing or analysis. Internet, although available and possible, is not allowed. There is therefore a huge difference between data available at central level and the real situation in the field. Inaccurate bore-hole completion records are only one of the results of completely centralized decision-making and data storage.

Wrap: successes and failures

WRAP has had a certain impact on water resources management, including groundwater management. WRAP, however, was not initiated to improve groundwater management. WRAP was established to train staff of the Ministry of Land Reclamation, Regional and Water Development;

- In the implementation of integrated water resources assessment studies;
- In the implementation of District Water Development Plans; and
- In the dissemination of Water Resources Information for purposes of water resources development.

Moreover, the project operates in specific areas and does not have a nation-wide mandate for the implementation of Water Resources Assessment Studies and District-Scale Water

Development Planning. Even within the WRAP framework, however, there have been opportunities to make some changes in the system.

A multi-sectoral approach

Much effort has been put into establishing - at national level - a Multi-Sectoral Steering Committee composed of representatives of the different ministries involved in water-related matters. Through the project, this committee would give guidance in setting policy for the water resources assessment studies and for the district water development plans to be prepared in the areas of project operation.

The joint Kenya-Netherlands Formulation Mission for the Water Resources Assessment and Planning Project, Phase IV (WRAP IV), included in its recommendations, under point 10, as follows:

"It is recommended that, at the national level, an Inter-Ministerial Steering Committee be established to review the activities and preliminary findings of the project on a quarterly basis. This Inter-Ministerial Steering Committee will consist of the Ministries of Water Development (Chairman), Culture and Social Services, Environment and Natural Resources, Health, Livestock Development, Planning and National Development, and Reclamation and Development of Arid Areas and Wastelands."

Between February 1992 and September 1993, the WRAP IV Inter-Ministerial Steering Committee met three times and made one field visit to West Pokot District.

The tasks of the committee were formulated as follows:

- The WRAP IV Steering Committee advises the Ministry of Water Resources (later changed into Ministry of Land Reclamation, Regional and Water Development), with respect to policy matters regarding water resources assessment and district water development planning;
- The WRAP IV Steering Committee has to co-ordinate the Water Resources Assessment Studies and District Water Development Plans to related plans of the other Ministries involved in the development of water resources;
- The WRAP IV Steering Committee can be used as a forum to discuss the involvement of other Ministries in the implementation of the studies and plans.

It appeared to be very difficult to get Ministerial representatives with sufficient clout to make decisions. Moreover, even within six months, there were many changes in representation from each ministry. After the 1993 mid-term evaluation, it was decided to revive the Steering Committee, but to limit the composition only to representatives of the donor and the Ministry of Land Reclamation, Regional and Water Development.

Integrated water management

One of the project's aims was to institutionalize, at national level, a Water Resources Assessment Section. This section would be responsible for Integrated Water Resources Assessment Studies, implemented by teams of hydrologists, geologists, and chemists. The section was indeed established and existed for a few years. During the last institutional reform, however, it was abolished. The section had never received the support it needed; it was clearly "tolerated" because of the project input into the section. Cooperation from the Groundwater Division was always at a minimum. On the one hand, the Water Resources Assessment Section was seen as a threat to the existence of the other sections/divisions. On the other hand, the need for integrated water resources assessment studies was never really felt. At

district level, the integration of surface water with groundwater and water quality aspects has not created many problems.

The project has also been fairly successful in establishing a National Water Resources Database, which gives the opportunity of combining surface and groundwater data.

Strengthening the district level

Most of the project activities, particularly those related to the preparation of District Water Development Plans, are done at district level (District Water Office). Institutional strengthening at district level is possible and is badly needed. On the one hand, WRAP has succeeded in establishing a Water Resources Section to build Regional Water Resources Databases and, together with the district staff, to prepare District Water Development Plans. On the other hand, the project had to make a very substantial effort in getting this done. But in fact, the district level is too low, has insufficient capacity, and, perhaps even more important, depends too much on the central level to sustain this task. Another limitation, of course, is the district approach and the inability to go beyond the district boundaries in planning.

Strengthening the catchment approach

The project has attempted to get direct support to the Catchment Boards, but this was not accepted by the Ministry. Under the present phase V, however, the project is preparing water resources management models for two catchment areas where the demand for surface and groundwater had reached such a level that conflicts have arisen. The models will be used for scenario analysis, the results of which will be presented to the Catchment Boards to give them better tools for decision-making.

Water resources monitoring (system and finding)

Within its areas of operation, the project has revived surface and groundwater monitoring. More recently, the project started the operation of a national monitoring network. Establishing a regular monitoring system, however, appears to be a difficult exercise. Monitoring is costly; as long as project funds are available, there will be no problem. Handing over the monitoring network to the government at this stage will almost certainly lead to the collapse of the monitoring. Budget allocations for water resources monitoring purposes are too low by far.

The project has tried to solve this problem by developing a system of direct funding. Organizations or individuals who want to get water resources information from the WRAP-supported National Water Resources Database of the ministry have to pay for this information. The funds generated in this way are then used for water resources monitoring.

This approach was both a success and a failure. There is sufficient interest in obtaining reliable water resources information. Funds generated are at least such that, along with external support, a limited water resources monitoring network could be sustained. However, the control of funds is almost impossible; it appears to be very difficult to use the funds generated by selling water resources information for the purposes of water resources management. Another negative effect is that the fees set by the ministry are too high; having very limited funds, the ministry raised the fees for supplying bore-hole completion records to extraordinarily high levels. Formalizing the process of issuing water resources information has, on the one hand, led to improved data security. On the other hand, the project has received a lot of

complaints from the field that it had become impossible to use the established informal ways of getting the required data - data for which, moreover, people had to pay.

Conclusion: suggestions to improve water resource management

It is very difficult to prescribe, as an outsider, how water resources management in Kenya should be organized. The African context is quite different from European or American conditions. Delegation of power and authority, for instance, is very hard to realize. Nevertheless, it is possible to indicate in which direction water management should develop. It is also possible to indicate which steps might be feasible and which are not.

There is a need for improved legislation, delegation of authority, and independent decision-making.

Improved legislation

The Water Act should be modified. All activities related to the mechanical abstraction of groundwater, as well as to the disposal of waste water to the underground, should be subject to approval by the issuing of a permit.

Delegation of authority

The centralized system of water management, in which all decisions are made at one central level, should be changed. Policy issues should be dealt with by an independent Water Apportionment Board.

Operational issues should be dealt with at "catchment level", or even "sub-catchment level". The number of "trans-boundary" aquifers in Kenya is limited; it is therefore proposed to use surface water catchment boundaries to delineate the areas of authority for groundwater management.

The present number of six Catchment Boards should be increased. The area of jurisdiction of the Rift Valley Catchment Board should be subdivided into a number of smaller units.

There is hardly any scope for the "District Water Boards". These boards are completely "development-oriented"; they will not be able to deal with catchment-based water resources management.

Changing the water resources management system can best be done by strengthening the Catchment Boards. Strengthening the Water Apportionment Board, with the aim of changing it into an independent water resources management policy-setting institution is, under the present political situation, considered to be not "feasible".

Public decision-making

Strengthening the Catchment Boards should be done by giving them the tools for proper decision-making. Within this context, WRAP aims to develop water resources management models, which can be used for scenario analysis. One of the main features of these models will be a "powerful" presentation of the effects of increased surface and groundwater abstractions on water resources availability - a presentation that can be understood by "non-experts".

The mobilization of influential "non-experts", such as local politicians, is considered to be the best approach in reaching a more balanced decision-making process. At present, the scarce know-how is only available at the central level. Very few people have access to the decision-makers at this level.

The Catchment Boards already have public representatives. The potential power of these representatives should be mobilized. The Catchment Boards should become more independent from within. Board members should be given more know-how and better tools to work with. Only then will they be able to make the sound decisions that are required to safeguard the precious water resources of Kenya.
