

Chapter 6



Implementing integrated water resources management locally in rural catchments: Lessons from eastern Sudan

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ABSTRACT

Sudan is a vulnerable and challenging environment as a result of its climate, hydrology, and hydrogeology. Other entrenched human factors, such as authoritarian rule, limited historical investment in rural water services and the gradual decline of national institutions make it particularly difficult. This has manifested itself today into low levels of water supply coverage particularly amongst rural communities. Trust between rural communities in Kassala and government institutions has also declined for those left behind in rural hinterlands. Providing sustainable and resilient water services in rural Sudan is difficult work, not least because of high rainfall variability, inadequate infrastructure and the lack of continuous external support to communities when problems arise. This paper describes efforts to strengthen links between water resources management and WASH, and the challenges faced when national institutions responsible for water resources and water supply are weak. It documents recent efforts to ensure water supply services can provide water year round and increase collaboration between rural communities and mandated government authorities. It is intended to be read by government personnel, non-governmental organisations and other staff that are directly involved in implementing integrated water resource management programmes in complex environments.

Keywords: water resources management, arid environments, community-based.

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Over the past decade or so there has been growing interest in water resources management in humanitarian and development programming in Sudan. External donors (such as UK Aid), national institutions and multilateral agencies are increasingly focussed on sound stewardship of water (and land) resources in the knowledge that parts of Sudan (such as Darfur and Kassala) are prone to increased water scarcity and drought. This focus has been influenced by a number of reports and articles that have argued for better integration between water resources management and WASH in an effort to support peace and recovery (see [Tearfund, 2007](#)).

Sudan is a particularly challenging environment. One of the key requirements is to determine how sound stewardship of water resources and greater community resilience can be achieved in such difficult working contexts. The most obvious aspect, perhaps, is the arid environment and the remote nature of rural villages with their multi-dimensional poverty, as a result of limited access, weak infrastructure and poor communications. However, the challenges posed by human-induced factors are also problematic. This includes: armed conflict and displacement; authoritarian government rule and disruption to traditional governance arrangements; limited investment in development programming over many decades, which hinders access to water supply and sanitation services; the decline of national institutions; and subsequent widespread mistrust between rural communities and government. Sudan's challenges go way beyond the natural environment and the unfavourable political and institutional arena means the commitment and capacity to deliver resilient and sustainable services are absent.

The recognition of the multiple uses of water in Sudan, for use at home as well as for agro-pastoralism, immediately places the spotlight on the importance of water resources management. [Perry \(2008\)](#) provides an informative summary of the five key elements required to ensure sound stewardship of water resources. The first requirement is the availability and quantity of water resources needs to be known and understood with a reasonable degree of accuracy. This can be achieved through local hydrometric monitoring of rainfall, surface water and groundwater; and based on past experiences of how water resources respond to rainfall. The second aspect is that different and competing water users have arrangements in place to share water at many levels – sub-catchment, catchment and transboundary. This requires water usage to be prioritised and a bargaining process between upstream and downstream users so water is shared equitably. The third aspect requires any understandings over water allocation and usage to be bounded by agreed rules. This can take the form of operating principles at local or community-level, bylaws at catchment level or more formal water laws at national and transboundary levels. The fourth aspect – that institutional roles and responsibilities are clearly defined – is common in policy and practice. Multiple institutions at many levels need to be involved in managing water

resources and this includes community-based groups. The fifth aspect is concerned with the provision of physical infrastructure to harness, store and supply water in an efficient manner. In order to apply these five elements successfully the wider systems or networks of policies, laws, people, institutions, infrastructure and finance need to be performing well. If they are absent then interventions will need to be adapted and tailored carefully to the local context. This is an important consideration because state institutions in Eastern Sudan are perceived as having limited capability and resources.

Over the past three decades, the concept of integrated water resources management has been the dominant paradigm in international and national water policy for managing water and land resources. It is a broad and all-encompassing approach and inevitably it needs to be unpacked so it can be applied appropriately – according to the challenging nature of the local context. This is particularly important in a fragile and conflict affected setting, like Sudan, where the enabling conditions for integrated water resources management are absent. For example, the first aspect of Perry approach which we have highlighted, focuses on assessing water resource availability. In real terms local hydrometric monitoring networks are often absent in Sudan and capacity within mandated institutions to collect, analyse, process and publish hydrometric data is weak (in the sense of limited skills, knowledge and resources). This means it is difficult to assess water resources availability on a continuous basis. Furthermore, physical water storage and recharge infrastructure is often absent or in a state of disrepair. The case study in this chapter highlights efforts by Plan International to introduce integrated water resources management in challenging contexts. It focuses on experiences from Kassala, eastern Sudan.

6.1 CONTEXT ANALYSIS

Sudan is the third largest country in Africa, with an estimated area of 1.88 million km². In the far north-east, Sudan is bordered by the Red Sea and it shares common borders with seven other countries, namely: Eritrea and Ethiopia in the east, South Sudan to the south, Central African Republic and Chad in the west, Libya in the far northwest, and Egypt in the north. Regional insecurity and the porous nature of Sudan's borders has had a significant historical impact on its internal security. One devastating factor, for example, has been the influx of firearms from Libya and the resultant localised conflict between different ethnic groups – fuelled by the previous regime in Khartoum.

Kassala state (Figure 6.1) is one of 18 states in Sudan and it is divided into 11 localities. Rainfall in Kassala, typically occurs during the months of June to mid-September and average annual rainfall is low. For example, in the Hamesh Koreib catchment average annual precipitation is <200 mm and accompanied by

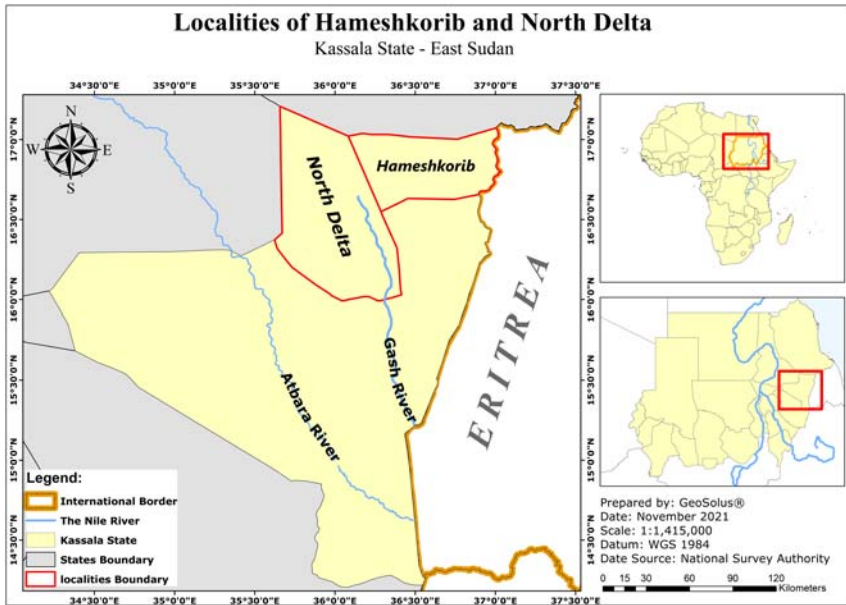


Figure 6.1 Kassala state and intervention areas.

high evapotranspiration rates (around 90%) with corresponding low groundwater recharge.

Pastoralism was once the dominant livelihood in Kassala state, but this has been gradually reduced due to successive droughts, causing the loss of animals and in some cases entire herds. The expansion of agro-pastoralism and farming along transhumance routes has also limited access to grazing land and reduced pastoralist activities. It is estimated that the nomad population has reduced from 50% of the population in the 1950s to around 10% in the 1990s. However, people still do not fall into the neat categories of urban and rural dwellers. In these remote rural areas, some pastoral and agro-pastoral communities still move locations according to season and pasture availability.

The Gash river is the dominant water supply source for Kassala state. It originates in central Eritrea and is transboundary, flowing into Sudan from the east. The river is also seasonal and the flood waters typically retreat in August, allowing the progressive sowing and cultivation of sorghum during the months of December and January. This is a vital period for rural communities for food production and marketing products ahead of the extensive dry season, which lasts from late September to June.

Both the Hamesh Koreib and North Delta catchment areas and the people within are characterised as suffering from: widespread food insecurity, high rates of malnutrition, poor access to health services, limited access to water and sanitation services and limited access to education. There is also high social inequality

between men and women, and many girls and women are restricted from accessing basic education and income generation services. This is particularly true in Hamesh Koreib, which is a more conservative and traditionalist locality.

While resilience challenges are multi-faceted, the real water security concern for rural populations in Hamesh Koreib and North Delta is the risk of consecutive low rainfall years leading to declining groundwater and reduced water access. Historically, this has resulted in increased water disputes between agropastoralists and nomadic pastoralists, and an unwillingness to share water resources between upstream and downstream communities.

Across Kassala state, the disparity in access to water services between urban and rural communities is also well documented and borne out by the resentment of communities towards state institutions that are mandated to supply rural areas. Population growth rates are increasing in both urban and rural areas and this places increased pressure on water resources. Despite the steady population increases in rural areas, often the younger and more mobile members of society migrate to towns or cities in search of employment and new opportunities. This has created further challenges as the elderly and more vulnerable members of society remain left behind in rural hinterlands, forced to operate and manage water supply services. Marginalised groups often suffer from extended periods of water scarcity, where water demand exceeds available supply.

Specific problems related to water resources management in rural Kassala include: high climatic variability leading to drought or risk of seasonal flooding, water source pollution, growing water demands and climate change. Limited hydrometric monitoring, coupled with inadequate capacity within state institutions that are mandated to monitor and manage water resources is a further pressing concern. This means any infrastructure programming is often not well targeted. This is an indication as to how the policy environment for integrated water resources management approaches needs to be strengthened in order to sustain programme interventions by international non-government agencies (INGOs).

Anecdotal information recorded by Plan International suggests that people in Hamesh Koreib and North Delta are observing increased climatic variability and greater seasonal variations in groundwater levels. For example, boreholes and wells are 'perceived' to becoming seasonal – where previously they provided water the year round. Seasonal water fluctuations, whether due to increased demand or climate change, has a direct and adverse impact on domestic and multi-purpose water usage. Limited recharge capacity and reduced access to water has led to intense competition over fertile land and reliable water sources. This threat has also perceptibly increased following the decline of traditional governance systems in some localities caused by political interference. Consequently, planned interventions by INGOs need to be aware of these growing environmental, political and societal pressures in order to ensure their interventions are appropriate to the local, national and regional context. An

important consideration in such challenging environments is that water resources management should not be undertaken for its own sake and the ultimate aim is to ensure more sustainable and resilient water supplies for all users. This is no easy task given the human factors that hinder sound development practices.

6.2 INSTITUTIONAL CHALLENGES

Much needed efforts to address water security problems have been hindered in the recent past as a result of authoritarian rule from Khartoum. One example, often highlighted in conversation with water sector professionals, is the deterioration of institutional capacity when the Rural Water Authority (RWA) that was dissolved in 1996. This issue is discussed here. Previously, the RWA was managed centrally in Khartoum with the overarching mandate to regulate, plan, raise funds, and maintain water supply services for rural villages. Historically, the policy intent of the central government was to give state governments more power in terms of managing their own resources which included the provision of urban and rural water supply services. However, one of the main challenges that emerged since 1996 was the increasingly limited and inadequate decentralised financial and technical support received from central government. Consequently, the responsibilities of managing water successfully were handed-over to state governments, but control over financial and human resources remained with the federal government in Khartoum. To highlight the flawed financial policy, taxes and tariffs collected at state level were transferred back to central government, to then be 'redistributed' again based on the federal government's priorities. This, perhaps unsurprisingly, led to increasingly late and inadequate financial disbursements to state institutions as money was retained by the central government. Furthermore, the priorities of an authoritarian government, desperate to remain in power, were rarely aligned to people's development needs at the state level. This led to increased poverty, weakened institutional capacities and the loss of trust between government and its citizens. For example, historical interventions reportedly operated for five years before the state government, participated in providing any meaningful financial support for the construction, rehabilitation, or maintenance to rural water supply services. External technical support has continued to be limited, and no local staff from the new State Water Corporation (SWC) were assigned to assist rural communities in the Hamesh Koreib catchment area. This led to growing inequity between urban and rural areas and increased mistrust between government agencies and people living in remote rural hinterlands.

Indeed, the lack of engagement between state agencies and rural populations has led to widespread resentment and mistrust, which continues to this day. Rural households and communities, when discussing their development priorities with Plan International, initially refused to include government representatives in the meetings. In some extreme situations, government involvement is seen as a

hindrance to building sustainable and resilient water supply services. This reflects the low level of trust that exists. A commonly held view by some water sector professionals in Sudan is that the replacement of the federal RWA with the SWC has not achieved the desired impact. The SWC now predominantly focuses on urban and peri-urban populations with minor consideration for rural areas. Indeed, INGOs and NGOs are expected to fill this service delivery gap, however, such interventions are often relatively short lived and unable to take a long-term sustainable water approach. This means once funding declines or programmes focus elsewhere, there is justifiable concern as to how development progress will be sustained. Consequently, rural populations feel left behind and there has been a continuous decline in access to basic water and sanitation services. Ongoing external support for community-based maintenance (CBM) of rural water supplies has also declined.

For some donor partners, there are also other institutional aspects in Sudan that are controversial. The Sudanese Government's Water and Environmental Sanitation Department (WES) is part of the Public Water Corporation, which in turn is part of the Federal Ministry of Irrigation and Water Resources. They play a prominent role in rural water supply implementation and monitoring as well as humanitarian assistance. However, there is the very real risk that institutional roles and responsibilities are duplicated as WES works at federal level and SWC operates at state level. WES undertakes important work but some external donors believe there is a necessity to reform institutional arrangements for integrated water resources management and rural water supply, not least to improve accountability to rural populations.

6.3 WAR AND CONFLICT

In 2003, a devastating civil war erupted in the eastern region of Sudan. Kassala was one of the major battle fields for the rebel forces and the government. Conflict and violence destroyed much water supply infrastructure and punctuated any development progress. The impact of the civil war can still be felt today with unexploded landmines and ordinance in many places that hinders movement and access across vast rural areas.

In 2006, a Comprehensive Peace Agreement (CPA) was signed between federal government and rebel groups. It included an ambitious plan to rehabilitate and develop physical water supply infrastructure for both rural and urban people. However, these ambitions have not come to fruition. Yet again development focus shifted from rural to urban populations with no corresponding improvement in the government water management structure or updated mandate for SWC.

In 2011, largely due to the secession of South Sudan and the corresponding economic instability that followed, the Government of Sudan's expenditure on rural water supply virtually collapsed. Today this finance gap is partially filled by external donors who implement projects led by UN agencies and INGOs.

However, finance (capital expenditure) is limited and inadequate and government makes negligible contributions for ongoing recurrent finance. This means the responsibility for all post construction finance falls on communities.

As a result of these factors and the absence of a clear strategic vision to manage water resources in Kassala state, rural water supply performance remains weak. The remainder of this paper describes efforts to pilot integrated water resources management in the Hamesh Koreib and North Delta catchment areas and to share lessons. It concludes by sharing thoughts on future work and opportunities following the Sudanese revolution in 2019.

6.4 AQUA FOR SUDAN

To help address some of the water security challenges mentioned above, UK Aid supported a multi-agency programme that promotes integrated water resources management in Sudan. This included Red Sea state, Kassala and Gadarif states, as well as northern, southern and western Darfur. The main objective of this programme was to pilot water resource management interventions as part of conventional water, sanitation and hygiene (WASH) programming. Lessons learnt were documented and shared across the consortium.

WASH programmes are primarily focused on delivering water supply and sanitation services to rural communities and bringing about changes in hygiene behaviours. CBM models are widely promoted in Sudan, because they are considered to be the most viable option for keeping rural water services functioning. However, the CBM approach is not without its detractors because service breakdowns often exceed local capacities, which results in people returning to more distant and unprotected water sources. Nevertheless, in fragile and conflict affected states there are strong reasons for pursuing with this approach. Three in particular stand out. First in Kassala state there are many remote communities that are far removed from state institutions let alone private providers who can support rural water supplies. The external support arrangements that are desired to keep water supplies working are virtually absent. Second, rural communities often have great strengths and resilience. They live in harsh environments and face continuous hardship and threats, such as drought. Communities use water for both domestic and productive use to support their livelihoods and often they have developed their own informal water management arrangements and practices that should be better understood and supported where appropriate. Third, service providers can do much more to ensure rural water services implemented are relevant to the local context and implemented effectively in order to minimise the potential for service disruption.

To manage water resources effectively requires a different set of skills, but there are still many actions that can be performed by local community-based institutions. For example, farmers can be active participants in monitoring local water resources and communities need to be active participants in bargaining over water allocation

in catchment areas. Rules, or operating principles, for water usage and management need to be grounded in practical realities by those that can police usage on a day-to-day basis. Institutions at many levels need to be active participants in managing water resources, but they should also be subservient to 'lower' level institutions. For the reasons stated related to CBM, rural communities also need to be active participants in managing and maintaining physical water infrastructure (such as recharge dams and wells).

This chapter covers experiences in two sub-catchments in Kassala state (namely Hamesh Koreib and North Delta) that were implemented by Plan International alongside local community-based institutions and government agencies. Both sub-catchments are located within the boundary of Al-Gash River. The Al-Gash is a seasonal river that typically flows between July and October, however on rare occasions river flows may start earlier or run later. The river serves as the main source of groundwater recharge for many adjacent wells and boreholes and is the main source of water for Kassala city and other towns in Kassala state.

The Al-Gash catchment is transboundary, and its water resources are shared between Sudan, Ethiopia and Eritrea. However, there is little transboundary cooperation between respective state institutions for processing and sharing river flow data. The size of the catchment is 31,000 km² and is characterised by low average annual rainfall, and high evapotranspiration. The catchment area also includes vast areas of fertile soil, which is used to cultivate vegetables and fruits for Kassala city.

North Delta sub-catchment is located in the delta of the Al-Gash River. At peak flood the Al-Gash water floods adjacent arable land. People in North Delta rely on seasonal agriculture as their main source of livelihood. Animal husbandry is practiced and includes both cows and camels. Water sources within North Delta rely on shallow groundwater storage that are fed through a series of canals constructed as part of the Al-Gash Agriculture Scheme. Geological features of the North Delta catchment do not allow for deep groundwater recharge.

The more remote Hamesh Koreib locality sits within a sub-catchment of Al-Gash River basin, but beyond the upper reaches of the river. Agro-pastoralists in this area are reliant on natural resources and typically grow basic food stuffs like sorghum or practice animal husbandry, mainly camels. These livelihoods are dependent on groundwater for their survival and people are often forced to migrate during periods of seasonal water scarcity.

The most recent water security threat associated with the Al-Gash river basin is as a result of the civil unrest in the transboundary countries and frequent border tensions that arise. Human displacement and migration from Eritrea and Ethiopia into Sudan places significant pressure on the water and land resources of host communities. This has led to a situation whereby there is the perception that water resources are being exploited beyond their natural limits and beyond the capability of government institutions to effectively monitor and manage the resource. This has also increased competition over natural resources (fertile land,

wood and water) between different ethnic groups. Furthermore, the decline of traditional governance arrangements as a result of deliberate political interference and displacement, coupled with entrenched mistrust between rural populations and government authorities, makes the enabling environment for water resources management extremely challenging.

6.5 APPROACHES FOLLOWED

Given these multiple problems, and the potential solutions offered by integrating water resources management and WASH approaches, the consortium decided to conduct pilot activities across Sudan. The intention was to strengthen the 'water' component in WASH by improving water availability year-round. The interventions were also focused at sub-catchment scale rather than isolated villages within the catchment area, to build a mentality that ensures equitable and sustainable use across communities sharing the same catchment resource. The process involved forming a multi-agency consortium so lessons could be shared widely in order to influence national policy and practice, and attract further investment. The consortium was overseen by ZOA but partner agencies (Practical Action, Plan International, International Aid Services, SOS Sahel and Islamic Relief) were encouraged to follow a systematic approach that could be adapted to the local context. This would help to ensure interventions were relevant to the needs of rural communities. Indeed, a community-based approach was pursued based on evidence showing that in conflict affected areas basic services are better managed at the community level. One of the intentions of the Aqua for Sudan project was to determine whether this could be achieved using an integrated water resources management approach.

The approach adopted by the consortium is set out below with justification following:

- Map and document key characteristics within target catchment areas.
This was undertaken to identify the key hydrological, hydrogeological, meteorological parameters in order to assess the local water balance, as well as identifying relevant socio-economic and ethnic characteristics of communities living within the catchment area that drive choices around water consumption and management.
- Identify the specific water security problems in all target catchments
To ensure interventions were relevant and effective, Plan International explored the needs of all water users across the catchment areas. The pressures are multiple, but clearly growing demands on dry season water availability is one of the most pressing concerns.
- Establish catchment level management committees
This was needed to start building capacity of, and trust between, rural communities sharing water resources over a catchment area. They were

then used to facilitate planning of programme interventions and build linkages with government representatives.

- Launch a Water Resources Committee in Kassala state

In building stronger links between rural communities and government agencies, a new committee was established to foster dialogue and promote sound stewardship of water resources.

- To construct and rehabilitate physical water supply infrastructure

Based on the water resource diagnostics and subsequent catchment committee preferences, physical water supply infrastructure was built to improve storage and supply of water, including simple groundwater recharge structures to extend the availability of groundwater into the dry season.

- To promote corresponding improvements in sanitation and hygiene promotion

In order to maximise health benefits, efforts were made to minimise open defecation, promote sound hygiene practices, safe water handling, storage and consumption.

To document lessons learnt, share findings and influence national policy-making.

Despite not having the necessary human, equipment and financial resources to re-establish water resources management at multiple levels, this project did want to showcase what was possible in improving water security and resilience for remote and vulnerable communities in rural Sudan. It is hoped this will serve to lay the foundations for similar work in the future.

6.6 PROGRAMME ACHIEVEMENTS

6.6.1 Forming of catchment management committees

As a starting point integrated water resources management interventions must make a difference to people's lives. The process followed was highly participatory to ensure interventions are relevant and there is real demand because it requires significant commitment to behavioural change by host communities. The approach followed was to engage with key stakeholders and community representatives in both Hamesh Koreib and North Delta catchments from the outset. Meetings were conducted in local dialects and focused on understanding what tasks rural populations could realistically perform. This approach paved the way to mobilise communities towards the establishment of catchment management committees with sound knowledge and concrete understanding of the planned intervention benefits. Committee representatives were selected by the communities themselves and member profiles required the following attributes: possessing negotiation and inter-personnel skills; awareness of multi-water usage;

knowledge of basic water management concepts; ability to devote time to water security issues and trusted by other community members. The catchment committee also included representation from marginalised groups (disabled) and local government. In Hamesh Koreib, a separate women's water management committee was established due to the conservative nature of ethnic groups that maintained male/female segregation practices. In North Delta, catchment management committees consisted of 30% female representation, although active and meaningful participation of those women was recognised as a real challenge.

It can be easy to conclude that once catchment committees are formed they function well. However, two requirements in particular stand out. The first is that integrated water resources management should not be undertaken for its own sake and committee members need to see the benefits and relevance of programme interventions. Some interventions are clearly more popular than others. Infrastructure (such as recharge dams) was a priority in Kassala state because people felt infrastructure improvements were necessary to improve water availability and access. Committee members are living and working in difficult environments and development needs to lead to positive change, otherwise their participation will decline. Infrastructure interventions need to be implemented professionally to ensure impact, but they also need to be accompanied by a process of evaluation and learning so improvements in water availability can be quantified. This can serve to build up evidence of what works and reassure rural communities that interventions are relevant to their water security priorities. The second is that state institutions who are mandated to manage water resources are starting from a low base and it takes time to develop their capabilities. Where government funding and support is inadequate, external funders need to collaborate to ensure these institutions can provide a basic external service to catchment committees. An example of the support tasks to be performed is provided in [Table 6.1](#). This is suggested as a checklist of what external support to catchment management committees could look like.

When government institutions provide effective external support there is extensive evidence of community-based approaches working well. However, years of mistrust and limited engagement cannot be overcome rapidly. There must be faith that government actions will have a tangible beneficial impact on communities' needs and they are willing and able to provide development assistance routinely. Trust will not be achieved if government interventions are lacking or not relevant to people's needs.

6.6.2 Provision of physical infrastructure

Following discussions with community representatives, it was also evident that project interventions should focus on increased access and availability to water. Indeed, physical infrastructure (recharge dams) were seen as being the best way to stimulate change and improve local water security and resilience.

Table 6.1 Responsibilities of catchment management committees and state institutions.

	Responsibilities of Catchment Management Committees	Responsibilities of State Institutions
Assessing water availability	<ul style="list-style-type: none"> • Monitor and record daily rainfall • Monitor and record groundwater levels • Together with state institutions thoroughly discuss the results and implications for dry season 	<ul style="list-style-type: none"> • Approve and install monitoring instrumentation • Support data processing, analysis and publication • Discuss interpretation of results with catchment management committees
Water allocation	<ul style="list-style-type: none"> • Ensure water is used equitably within the catchment. • Prioritise water usage. • Engage with large-scale abstractors. 	<ul style="list-style-type: none"> • Supporting for engagement between upstream and downstream water users. • Ensure a bargaining process is adhered to. • Thoroughly discuss water availability based on available monitoring data.
Water laws	<ul style="list-style-type: none"> • Establish rules or operating principles for water usage. • Established systems for dispute resolution. • Enforcing graduated sanctions for rule violations. 	<ul style="list-style-type: none"> • Support the development of local governance arrangements. • Ensure national water laws are published and implemented. • Ensure external support for enforcement.
Institutional roles	<ul style="list-style-type: none"> • Managing water locally. • Policing day-to-day water usage. • Insist that Catchment Management Committees formerly recognised in national policy and law. 	<ul style="list-style-type: none"> • Ensure recognition of roles and responsibilities at national, state and community levels. • Provide continuous capacity building support to Catchment Management Committees.
Water infrastructure	<ul style="list-style-type: none"> • Active participants in technology choice and siting infrastructure • Provide labour and material during construction • Financial contribution (if possible) • Minor operation and maintenance duties 	<ul style="list-style-type: none"> • Support for design, construction • Support for procuring equipment. • Ensure high-quality supervision during construction • Hand over infrastructure to community.

In order to learn ‘what works’ the programme considered a number of potential groundwater recharge mechanisms. This included: rehabilitation of existing small dams; building check dams or wing dams to reduce sediment build-up; and, construction of new sand dams and sub-surface dams. When determining what is the most suitable intervention, the programme took into consideration the available expertise to build these structures effectively, and the ease with which they can be maintained by the community, given the prospect of external support from government was extremely limited.

As part of the initial planning it was identified that the construction of new small dams in remote rural Kassala was overly complex. Both in terms of design, ensuring construction quality and the ease with which construction materials could be transported to site. The technical skills required were considered to be beyond the capacity of the few local contractors prepared to work in Hamesh Koreib and North Delta. The dams would be subject to high sediment loads and maintenance requirements. The programme also critically questioned the impact of small dams in terms of restricting wadi flows for downstream communities. It was felt this may not constitute good change as the risk of local water disputes was high. However, during this process two existing dams were identified for rehabilitation. An impact assessment on nearby groundwater wells indicated that, as a result of the groundwater recharge infrastructure constructed, the seasonal range or fluctuation of groundwater had reduced by around 0.6–0.8 m, which provided an indication of increased water availability. This rehabilitation work was complimented by the addition of check dams to reduce sedimentation load.

Other examples of programme interventions included the construction of sand dams, artificial recharge basins, plus improved access to hand dug wells and water distribution yards. Due to the remoteness and difficult nature of the working contexts, many discussions with community representatives were held to ensure the interventions were relevant to the local context. Manual well digging and the construction of sand dams and recharge mechanisms made them particularly relevant to shallow unconsolidated geological formations. Private water yard operations were also deemed a good fit for a context where the population has a large number of livestock and people aspire to access fertile grazing land and water. However, it is important to ensure the selected or appointed water yard operator is regulated by the community through a set of operating principles and a willingness to ensure service levels are both agreed upon and maintained.

6.6.3 Documenting and sharing learning

Another important process followed was to document and share learning. This was achieved by documenting case studies and engaging with a wide range of stakeholders at local and national levels. As part of Plan International’s programme work, it was decided that integrated water resources management

programmes need to focus attention on five aspects: first, to determine the critical water security problem that people experience and ensure subsequent interventions are relevant. Second, to ensure interventions are both relevant and effective in order to bring about improvements in people's water security. This means programmes need to focus attention on physical infrastructure, but also determining impact with regards to improved access, availability, quality and reliability of water. Third, intuitively integrated water resources management programmes should generate learning concerning water resources. For example: how quickly does groundwater respond to rainfall? What is the seasonal range of water level variation? How fast does groundwater recede? How does the catchment area respond to rainfall? How can communities and local authorities monitor water resources? How can raw data be transferred to analysed information? What are the main water security risks to address? With hindsight the measurement of water resource impacts around new infrastructure (such as check dams) should have been prioritised sooner to demonstrate impact. There are clearly dangers in trying to do too much through a short programme intervention but a priority must be to generate learning on water resources and local hydrology. The fourth fundamental requirement is to document what happens when problems arise, such as water disputes or the breakdown of water supply infrastructure. What actions can catchment committees realistically undertake and what rapid external support can mandated authorities provide? These inevitable problems need to be considered with hard-headed reality. The fifth aspect concerns wider systems strengthening work. Inevitably it will take years, even decades, to build effective local, national and transboundary systems for monitoring and managing water resources. Three short-term fundamentals for systems strengthening are as follows: first, to support a decentralised approach for water resources management so local authorities can better fulfil their mandate and ensure accountability to rural communities. This is particularly important given Sudan's recent history. Second, to establish increased and assured budget locations for capital and recurrent finance so institutions can support catchment management committees; and third, to focus on institutions performing essential functions routinely. Later in this chapter we set out what some of these functions are.

6.6.4 Preparation of localised water security plans

Given the considerable water security problems in Hamesh Koreib and North Delta catchment areas, collaborative partnerships also needed to be established between catchment committees and key government agencies.

The Kassala Water Resources Commission (WRC) was established in 2019, and members included representatives from both catchment committees, Groundwater and Wadis Department, SWC, NGOs and INGOs. In order to ensure the commission plays a useful role it needs to be committed to address technical and

social matters by undertaking its own studies and interventions locally. However, the commission must also consider how it can advocate for more technical, financial and human resources from external donors and the state.

Having brought stakeholders together our programme experiences show it is vital to build trust and demonstrate that the partnership can resolve water security problems that people experience. The WRC needs to work directly with both catchment committees to stimulate a good change. This requires time and effort from all parties. Specific problems need to be unpacked, relevant interventions need to be identified and agreed upon and they need to be implemented professionally. There also needs to be a strong focus on trustworthiness and attention is required for the following: joint planning and decision-making; agreeing on the role and contribution of all stakeholders; setting realistic and attainable goals; sharing information openly; a commitment to transparent decision-making; keeping promises, and helping partners to demonstrate competency.

Where trust between partners has been historically low then significant time needs to be spent to make these collaborations effective. If this is not undertaken then there is a real risk these well-intentioned vehicles for change will deliver low impact and key stakeholders will lose interest or withdrawal from the development process.

6.6.5 Outcomes

The Aqua for Sudan was implemented over a five-year period. Communities in Hamesh Koreib and North Delta now have improved access to water year-round as a result of the groundwater recharge structures and improved water points. People see improvements in physical infrastructure as one of the best ways to improve water security and a fundamental aspect of integrated water resources management. Households and communities speak about increased water availability as a direct result of these interventions.

However, it was also evident that water management in rural Kassala is becoming increasingly difficult, due to growing demands and pressures; and the breakdown of trust between communities – both within the catchment area and with government counterparts. Issues of trust include an adherence to agreed water management principles between upstream and downstream communities, which depends on a level of confidence that people will adhere to local rules when they are not being observed. Other reasons why communities struggle to manage their water resources included the absence of external support from state institutions over many years.

During the programme intervention it was discussed that communities had previously practiced traditional water management, although people's knowledge of the science of groundwater recharge and recovery was basic. Members of the recently formed catchment management committees in both Hamesh Koreib and

North Delta now have better knowledge and appreciation of water security. They now speak about the requirement for better hydrometric monitoring, sound water allocation, appropriate water laws and provision of physical infrastructure. They also recognise that water security cannot be achieved unless trust is developed between communities and government institutions. However, these partnerships require significant capacity building if communities are to receive new infrastructure and adequate external support when problems exceed their capabilities. These are problems that cannot be easily resolved, because many of these issues are entrenched. This means integrated water resources programmes in challenging environments need to focus on interventions that will achieve maximum impact. This challenges the view that the full scope of integrated water resources management can be achieved and local level interventions should focus on the most relevant and effective interventions. In simple terms practitioners must 'ensure the most appropriate or relevant intervention, based on local context' and implement effectively as a result of high-quality design, construction and supervision.

6.7 KEY LESSONS

6.7.1 Integrated water resources management needs to be unpacked when working in challenging environments

Integrated water resources management has been the dominant paradigm for many decades. However, it has been questioned for being overly complex and not necessarily focussing on solving real water management problems that people experience (Giordano & Shah, 2014). In order to make a difference it is necessary to unpack the approach in detail so it matches the context. There are dangers in focussing solely on the integrated water resources management principles and less on the actual water security problems that people face. The enabling conditions for sound water resources management are absent in Sudan and this means intervention approaches need to be simplified. The reality is INGOs need to pursue interventions that will achieve greatest impact and communities will likely undertake day-to-day work with minimal external support, until wider government support systems are strengthened.

6.7.2 Interventions must solve real water management problems that people experience

The challenges highlighted above means that implementing agencies must focus on solving water management problems that directly affect people's livelihoods. The only real way to build resilience and stimulate change is to ensure interventions are relevant to the local context and implemented to high professional standards to ensure effectiveness.

6.7.3 Developing a conceptual framework is an integral part of the integrated water resources management process

There are dangers in how integrated water resources management is implemented if practitioners are unable to visualise the key components of the approach being implemented. It can be a new approach for many organisations and practitioners, and 'full' integrated water resources management will be too ambitious for many fragile state contexts. Interventions may also overly obsess with the four guiding principles of integrated water resources management rather than focussing primarily on the local water security problems that people experience.

These risks can be avoided by developing a conceptual framework that identifies the key factors that need to be considered during implementation. Six key guiding principles identified as part of this work include:

- (1) Address real water security problems that people experience – in order to ensure real demand. A first priority in Kassala is to increase water availability and access in the dry season months.
- (2) Programme design and intervention should consider the key components identified by [Perry \(2008\)](#) and tailor them to the local context. Taken together they provide a systematic approach for implementation.
- (3) Recognise what actions community-based institutions can realistically perform and be clear what exceeds their capabilities (see [Table 6.1](#)).
- (4) Build trust and trustworthiness between community-based institutions and government agencies.
- (5) Linked to Point 3, try to ensure appropriate and effective external support (technical, financial and management) to communities and catchment management committees.
- (6) Focus on interventions that will achieve maximum impact. Given the inherent problems with responding to water service breakdowns and disruptions, high-quality infrastructure design and implementation is fundamental.

6.7.4 Community participation is essential but demands continuous external support

Community-based maintenance forms a central component of national water policy in Sudan. However, over the past 10–15 years the approach, which is widely applied in WASH service delivery, has been criticised globally for its ineffectiveness and the breakdown of rural water supplies. Despite the well-documented challenges community-based management remains relevant when working in particularly difficult and challenging contexts. In Kassala community representation and participation was fundamental in establishing catchment management committees

from the outset. This is often because there is no other credible alternative. The critical issues are twofold: first, to ensure roles and responsibilities are clearly defined and appropriate to the internal capacities of community-based groups. Second, to try to ensure continuous external support when major problems arise. The following 12 categories represent areas of support required:

- periodic and refresher training on integrated water resources management by relevant state institutions;
- building trust between communities and government counterparts;
- mapping and analysing water security problems within the catchment area;
- hydrometric monitoring – collating, analysing and processing monitoring data to understand water availability and effectiveness of interventions;
- engagement with upstream and downstream water users to discuss water allocation and resolving any water disputes/conflict;
- defining local and catchment level water laws and rules for ongoing usage and prioritisation;
- determining roles and responsibilities across a range of stakeholders;
- technical assistance for planning water supply infrastructure (such as planning, design and high-quality construction);
- rapid technical assistance when physical infrastructure fails, including provision of spare parts;
- external support for when externalities arise (flooding or drought)
- continued financial support for water resource management activities and sustaining water supply infrastructure;
- support in documenting learning and sharing experiences.

6.7.5 Wider systems strengthening will take considerable time

To manage water resources effectively many institutions at multiple levels need to be involved. Community-based organisations can play an active role and should form part of wider catchment management committees. However, other ‘professional’ institutions at local, basin, national and transboundary levels also need to be involved and play their part responsibly. In fragile and conflict-affected settings, government institutions have often suffered years of under investment and technical support. This means they may possess knowledge and appreciation of water resources management, but they lack ability and practical experience. It also means any programmes that focus on systems strengthening are starting from a low base. There are numerous examples of institutions receiving well-intentioned ‘capacity building’ training, but this does not necessarily lead to improvements in the way institutions or agencies perform. In fragile state contexts training needs to focus on relevant interventions that will lead to some tangible difference in solving real water management problems that

people experience. The only way to make a difference is to ensure the right training is provided professionally and technical support is continuous (multiple engagements), rather than short-term projects. Sudan has received decades of humanitarian and development support, and yet in many cases the development of national institutions has been limited.

6.7.6 Build trust and trustworthiness between stakeholders

Integrated water resources management at local, national and transboundary levels requires ongoing multi-stakeholder collaboration. Many organisations at multiple levels need to be involved. This can be a difficult process for many reasons: different water users at a local level may be competing for access to scarce water resources; there may be deep mistrust between communities and government institutions, water security problems are seldomly explicitly discussed; longer term planning is not put in place to build trust; organisational behaviour may not adequately change to build trust; and people may be unwilling to rely solely on another group's actions for their water security.

6.7.7 Communities and resilience

There are many rural communities in Sudan that receive limited support from federal or state levels of government. There are limited new rural water supply programmes, inadequate rehabilitation of water supply services and insufficient external support for CBM when infrastructure breaks down. At state level in Kassala, SWC are responsible for the provision of water supply services to urban, peri urban and rural communities. However, late and inadequate financial disbursements from federal government in Khartoum has led to SWCs growing inability to serve rural populations. Due to public pressure SWC mainly focus on areas with higher population densities (towns and cities); with INGOs and NGOs attempting to fill the service provision gap in rural localities. This could be considered a dereliction of duty by SWC and federal government.

Rural communities definitely need ongoing external support to operate and manage their water supply services. They also require continuous assistance to monitor and manage water resources. Despite these challenges, programme interventions must work with communities in order to improve water security. Key actions identified are summarised in [Table 6.1](#).

6.8 CONCLUSION: BUILDING RESILIENCE AT COMMUNITY LEVEL

It would be naïve to think that short-term integrated water resources management interventions can solve all water security challenges in rural Sudan. There are multiple challenges in keeping water supply services working indefinitely and

ensuring sound stewardship of water and land resources. However, this chapter highlights that community-based interventions are a necessity and should be persisted with. Here, we conclude with four key reasons.

First, rural populations, particularly those in remote hinterlands, remain particularly vulnerable to drought, water scarcity and increased poverty. There is a sheer absence of managerial, technical and financial support for rural populations and in such context's community-based interventions for both water resources management and water supply will remain the most feasible option for the foreseeable future.

Second, in the absence of external support, programme interventions must ensure they are relevant to the local context, and their implementation is effective. This can be summarised as *doing the right thing and doing it well*. These two key aspects will provide interventions with the best opportunity for success in the absence of external government support.

Third, there is ample evidence that community-based institutions can play an active role in monitoring and managing water resources. However, there are limits to the tasks that they are able and willing to perform. Wider systems strengthening across government institutions will take decades to achieve and there is a requirement to focus on the critical external support activities that will help to improve water security for rural populations.

Fourth, in complicated and complex settings there is a tendency to bypass government institutions. This is because there are risks associated with funding and government systems are not considered transparent. But at some point, humanitarian and development programmes must begin to engage with relevant government institutions so they can support community-based approaches. Many government institutions are in need of significant support but they are willing to play an important role. Despite a multi-year programme intervention the capacity of the Groundwater and Wadis Department in Kassala has changed very little. Much needs to be learnt about engaging with state and national level institutions and managing risk in post conflict settings if better resilience is to be achieved.

DISCLAIMER

The authors alone are responsible for the views expressed in this chapter and they do not necessarily represent the views, decisions or policies of Plan International or FCDO.

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