

The governance of transboundary aquifers: towards multicountry consultation and cooperation, the case of the Stampriet transboundary aquifer system

1. Introduction and context

In recent decades, the use of groundwater stored in aquifers has been increasing around the world, in response to the rising demands for drinking water supplies and food production for a growing global population. Today groundwater is estimated globally to provide 36% of potable water, 42% of water for irrigated agriculture and 24% of direct industrial water supply. In many places this has led to overexploitation of local and regional aquifers owing to poorly informed management of these resources. A comprehensive understanding of aquifers, their characteristics and uses are the basis for science-based and informed decision making and planning. This is of special importance in the case of transboundary aquifers (TBAs) that are shared between two or more countries.

UNESCO is playing a leadership role in improving the governance of TBAs. UNESCO's global multi-partner initiative the Internationally Shared Aquifer Resources Management (ISARM) program is conducting an inventory of TBAs globally which will guide Member States towards the sustainable management of shared groundwater resources. In 2012 the Global Environment Facility (GEF) endorsed the implementation of the "Transboundary Waters Assessment Programme" (TWAP). The objective of TWAP is to apply indicator-based assessment methodologies to conduct a global assessment of TBAs. The UNESCO IHP project "Groundwater Resources Governance in Transboundary Aquifers" (GGRETA), funded by the Swiss Agency for Development and Cooperation is carrying out a more detailed assessment than the TWAP including a larger set of indicators and using spatially and temporally distributed data.

2. GGRETA project components and methodology

The GGRETA project is taking place over the period 2013-2015. The project includes three case studies: the Trifinio aquifer in Central America, the pre-Tashkent aquifer in central Asia and the Stampriet transboundary aquifer system in southern Africa.

The GGRETA Project, adopts a two stage approach to multi-country aquifer management. The first stage builds recognition of the shared nature of the resource, and mutual trust through joint fact finding and science based analysis and diagnostics. This first phase begins with collection and processing of hydrogeological, socio-economic, environmental, legal and institutional data at the national level using a standardized set of variables developed by the International Groundwater Resources Assessment Center (IGRAC). This is followed by harmonization of national data using common classifications, reference systems, language and formats, and derivation of indicators from the variables. The variables and indicators include a gender based component, the first time a systematic gender based analysis of the transboundary aquifer has been attempted. Harmonized data on the transboundary aquifer is fed into an aquifer information management system (IMS) developed by IGRAC.

In the second stage the harmonized data provides the basis for an integrated aquifer assessment which assists the case study countries to set priorities for further collaborative work on the aquifer and to reach consensus on the scope and content of multicountry consultation mechanism aimed at improving the sustainable management of the aquifer. Consultation with stakeholders provides feedback on proposals for multicountry cooperation mechanisms. This stage of the project includes training for national representatives in international law applied to transboundary aquifers, and the development of tools for

improving water diplomacy and cooperation to prevent or ameliorate water conflicts. These tools have been developed in the framework of UNESCO's Potential Conflict Cooperation Potential (PCCP) program.

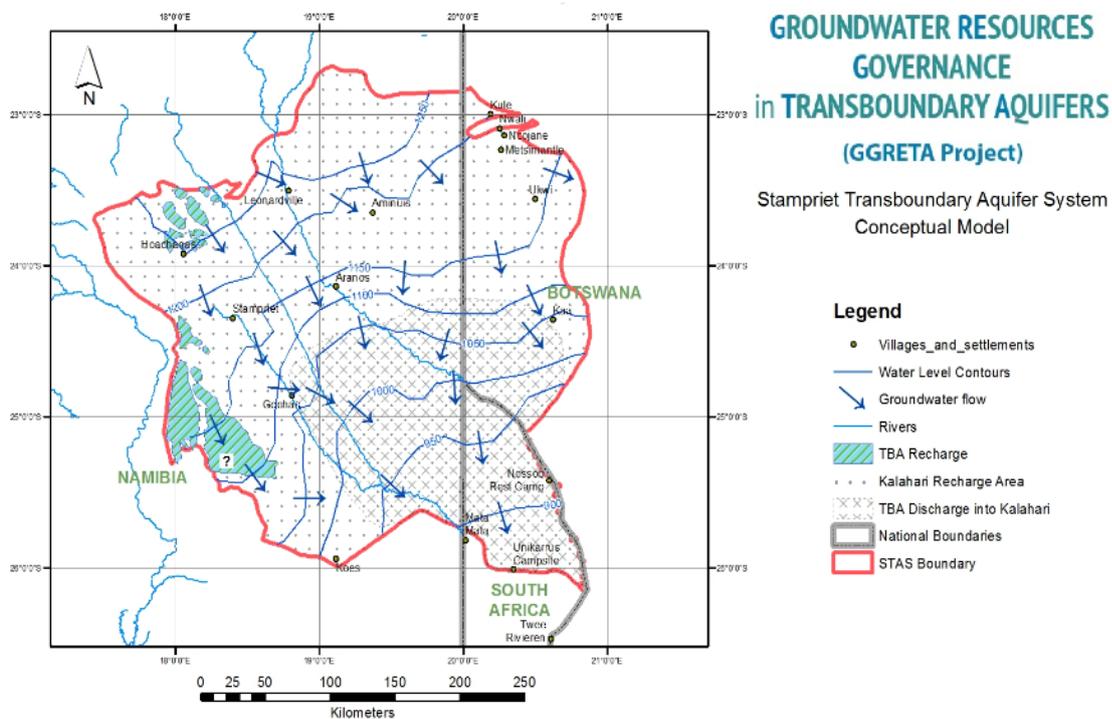
3. Key elements of the Stampriet transboundary aquifer system (STAS)

A draft integrated aquifer assessment has been prepared for the STAS. The draft assessment sets out key elements of the STAS, together with policy, legal and institutional challenges and possible policy and management responses.

3.1 Hydrogeological elements

The STAS stretches from Central Namibia into Western Botswana and South Africa's Northern Cape Province, and lies within the Orange River Basin. The STAS covers a total area of 86 647km², of which 73% of the area is in Namibia, 19% in Botswana, and 8% in South Africa. Figure 1 shows the Conceptual model for the STAS.

Figure 1: Conceptual model of the Stampriet Transboundary Aquifer System



The STAS is made up of two deep confined artesian transboundary aquifers in the Karoo sediments (Auob and Nossob aquifers), overlain by an unconfined aquifer system in the Kalahari sediments (Kalahari aquifers). The STAS is located in an arid area with an annual mean temperature varying between 19 and 22°C. The mean temperature hides substantial underlying variability - temperature in summer can reach 50°C. Average rainfall in the STAS area is of 150 to 310 mm/yr. Recharge to the Kalahari aquifer during years with average precipitation is estimated at 0.5% of rainfall.

Recharge to the Auob and Nossob aquifers in normal rainfall years is negligible but considerable recharge occurs during extreme rainfall events that occur every ~30 years. The general groundwater flow in the STAS is from northwest to southeast. Groundwater quality

generally decreases towards south-western Botswana and the north-western Cape in South Africa for all the three aquifers.

3.2 Socioeconomic and environmental elements

The STAS area is lightly populated with population concentrated in small rural settlements. The population of the area is estimated to be about 45,000. Major settlements are Aranos, Koes and Stampriet in Namibia, and Ncojane and Kule in Botswana. The total population of the area is difficult to estimate because it includes an itinerant population that move into and out of the area.

Groundwater is the only source of water in most of the STAS to provide potable water to the people, livestock and for irrigation. Neither industrial nor mining activities take place in the STAS area. Over 20 million m³/year are abstracted in the STAS most of which occurs in Namibia (over 95%). The largest consumer of water is irrigation (~46%) followed by stock watering (~38%) and domestic use (~16%).

Groundwater pollution threat is localized around settlements, notably around bores and wells. The main sources of this groundwater pollution are pit latrines, wastewater facilities, and waste dumps. High levels of nitrate in the Kalahari aquifers are found in some places in Namibia, where the majority of water abstraction occurs. These are attributed to anthropogenic activities such as irrigation and stock watering at boreholes. Further threats arise from deficiencies in the protection of boreholes, including lack of enforcement of exclusionary areas, poorly constructed bores or poor management and maintenance of bores. More generally over-pumping or water spillages may lead to water quality deterioration.

3.3 Legal, policy and institutional elements

Namibia, Botswana and South Africa all possess the main elements of a legal framework that provides essential controls on groundwater use and pollution. The implementation and enforcement of groundwater quantity and quality regulations raise more challenges as described below.

4. Policy, legal and institutional challenges

The possible future large scale development of settlements, irrigation and mining poses the biggest threat to the STAS, but there are a number of more immediate management challenges. These include gaps in data about the aquifer, groundwater pollution in the Kalahari aquifer system and challenges in implementing groundwater policies and regulations across the three countries

4.1 Data deficits

There is a major deficit in key hydrogeological, socioeconomic and environmental data in all three countries which threatens to undermine good management of the transboundary system. For example, there is a serious deficiency of data, notably time series data, on groundwater abstraction, groundwater levels and groundwater quality. Where data exists, it is incomplete, not well organized or edited, and can be difficult to retrieve particularly with regards to more recent data. This is a severe problem in all three countries, although Namibia has a somewhat better data record than the other countries.

4.2 Groundwater levels and pollution

Historically the deep transboundary aquifers have experienced some decline in water levels. Now water levels have stabilised (at a lower level). There are some indications of high levels of pollution in the Kalahari aquifers in some locations in Namibia and Botswana. There is little risk of pollution in the South African part of the STAS because it is mainly within the Kgalagadi Transfrontier Park. There is insufficient data to measure the extent of groundwater pollution in the relatively deep and confined transboundary Auob and Nossob aquifers.

4.3 Regulatory design and implementation of laws and policies

Although Botswana, Namibia and South Africa have each established the main elements of a legal framework that provides for the regulation of groundwater quantity and quality there are a few legislative gaps related to the implementation of policies. For example in Namibia and Botswana water quality standards for discharge into water bodies are not well defined. In Namibia interference with natural groundwater recharge is not covered in land use/development regulations.

The implementation of groundwater quantity and quality regulations is more problematic. There are large remote areas in all three STAS countries where water abstraction and pollution is not subject to regular inspections or controls. The STAS includes large areas where water abstraction and pollution is not subject to regular inspection and controls. Some groundwater users do not have permits, and many permit holders do not report their abstractions to responsible authorities. In Namibia regulations to support enforcement of the water law have been drafted but are not in place yet.

5 Possible policy and management responses

There are a wide variety of possible policy and management responses to the issues outlined above. Some responses can be made by national governments or other national organizations, while other actions would benefit from the multicountry cooperation. In the framework of the GGRETA project greater emphasis is given to multicountry approaches. Botswana, Namibia and South Africa already have a history of water diplomacy and cooperation through regional institutions such as SADC and ORASECOM. All three countries have expressed their strong support for work towards a multicountry consultation mechanism for the STAS.

The draft assessment of the STAS, together with initial responses from Botswana, Namibia and South Africa suggest that the establishment of a joint monitoring and data collection program for the STAS is an important priority in order to fill gaps in knowledge about the aquifer and improve information for decision-makers. In addition further boreholes are required to monitor and measure the deep transboundary aquifer, and additional scientific work is needed to give more precise answers to key questions such as the acceptable level annual take from the aquifer, standardization of the assessment of GW vulnerability to pollution, descriptions of recharge mechanisms and surveys to validate estimates of water use and water quality. It is also important to populate the information management system for the STAS with data and to bring it into full operation.

Other priorities that have been identified during discussions of the draft assessment are a comprehensive evaluation of the transboundary aquifer, development of scenarios to indicate the effects of mining and irrigation development, investments to improve water supply and water use efficiency in remote areas, and capacity building in research institutions in Botswana, Namibia, South Africa.

6. Options for a multicountry consultation and cooperation mechanism

A multi-country consultation and cooperation mechanism for STAS (MCCM) would enable the three STAS countries to transition from GGRETA project-driven cooperation to institutionalized cooperation beyond the life of the project. In the short-term, the specific objective of the MCCM is to institutionalize the joint collection and exchange of data and information among the STAS countries by generating a steady flow of agreed updated data and information feeding the STAS information management system which is hosted and maintained by IGRAC. In the long-term, as cooperation matures, the MCCM's objective may expand from data collection and exchange to joint strategic assessment and advice to STAS countries on management issues relating to the STAS groundwater resources.

A MCCM would add value to existing national management arrangements for the STAS by bringing:

- a joint STAS vision, purpose and management direction;
- coordination of STAS management with African regional water management bodies (e.g. African Ministers Council on Water, Southern African Development Community);
- joint collection and control of the flow of data and information feeding the IMS, including The application of available and relevant SADC guidelines to the STAS.

Discussions under the auspices of the GGRETA project have led to a shortlist of two potential MCCM options which are currently under consideration by the three countries. These are:

- Option 1: a coordinating STAS committee consisting of a Steering Committee of senior government groundwater officials acting as Focal Points. The Committee would meet at regular intervals on a rotating basis in the STAS countries. It would be supported by the government groundwater administration of the STAS country hosting the meeting, which would provide necessary resources for the meeting. There would be no separate Secretariat facility. The Committee would be supported by a research institution in each STAS country, providing scientific input.
- Option 2: a Orange-Senqu River Commission (ORASECOM) committee for STAS. This option involves upgrading the Hydro-geology Sub-committee that already exists in the ORASECOM structure to a standing committee with STAS country representatives. Member countries would bear the costs of their representatives in the committee. The committee would be supported by national research institutions as in option 1.

7. Conclusions

The project has prompted the three countries to identify water scarcity and water quality challenges and policy and institutional responses. The joint integrated aquifer assessment has enhanced cooperation between the three countries to improve joint knowledge and management of the Stampriet Transboundary Aquifer System. Strong steps have been achieved towards the establishment of a multi-country consultative mechanism for the STAS and the identification of activities for transboundary cooperation. These activities will reduce the vulnerability of STAS communities to water stress and pollution leading to beneficial effects on the health and well-being of local communities.

A further benefit of the project has been testing and proving a detailed integrated aquifer assessment methodology to prioritize actions and investments on transboundary aquifers. This methodology has been enhanced by the addition of gender specific analysis, and tools to enhance water diplomacy and prevent conflict. This enhanced methodology and tools can be adapted and replicated globally.

8. References

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