

Towards sustainable management of water resources in Sudan

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Abstract

This research aimed at investigating the essence of the water management in Sudan and its role in boosting the speed-up of the sustainable management, and to develop an approach to sustainable water resource management in Sudan. The research also tries to recommend several guidelines for the future strategy of the Sudan sustainable water resources planning and management, and to emphasize to the policy-makers and technicians the need to consider the Sustainable Water Resources Management approach in the planning and implementation phases.

The research adopted an interdisciplinary approach due to the intricate and interrelated nature of the subject of the Development of Approach for Sustainable Water Resources Management in Sudan, in term of different disciplines, where both historical, descriptive and analytical approaches were used. The research also relied on exploration and identification of the requirements. This, in addition to conducting of interviews and fill questionnaire forms with the experts and the persons working in the fields serving the water management, besides analysis of the available documents from the seminars and workshops.

The research reached the conclusions that the Sudan is a large country, with varying standards of living, culture and climate. When these facts superimposed on the multi-sectoral nature of water, coordination of activities in sustainable water resources planning, management and development becomes essential. The formation and activation of National Council of Water Resources NCWR is an important step in that direction. The specialized committees in the council have to explore the means for optimal usage of water and the tools and regulations to guide and control those means. It might be helpful to have affiliated councils or branches at state levels, where water availability and quality are major issues. Monitoring of the application of policies and strategies should be

institutionalized. When this is done, the Council could play a great role to sustain water resources management in Sudan through its executive body “Water Resources Technical Organization WRTO”.

The research recommended maintaining the spirit of cooperation and close coordination with national states and countries sharing the same water resources should continue, preferably through an institutional cooperative framework for each shared basin. The guiding spirit should be equitable, legitimated, integrated, sustainable and environmentally sound utilization of the common water resource, without significant harm from one state to another state or from country to another. The overall target should be tolerance and understanding of each other’s aspirations and difficulties, with a search for optimal usage and mutual benefit.

الخلاصة

يهدف هذا البحث إلى التحقق من جوهر إدارة المياه في السودان ودورها في تعزيز تسريع الإدارة المستدامة، وتطوير نهج لإدارة الموارد المائية المستدامة في السودان. كما يحاول البحث التوصية بعدة مبادئ توجيهية للاستراتيجية المستقبلية لتخطيط وإدارة الموارد المائية المستدامة للسودان، والتأكيد لصانعي السياسات والفنيين على ضرورة الأخذ بنهج الإدارة المستدامة للموارد المائية في مرحلتي التخطيط والتنفيذ.

تبنى البحث منهجاً متعدد الاختصاصات بسبب الطبيعة المعقدة والمتراطة لموضوع تطوير نهج الإدارة المستدامة للموارد المائية في السودان، من حيث التخصصات المختلفة، حيث تمت الإستعانة بكل من المنهج التاريخي والوصفي والتحليلي. اعتمد البحث أيضاً على استكشاف وتحديد المتطلبات. هذا بالإضافة إلى إجراء المقابلات وملء استمارات الاستبيان مع الخبراء والأشخاص العاملين في المجالات التي تخدم إدارة المياه، إلى جانب تحليل الوثائق المتاحة من الندوات وورش العمل.

خرج البحث إلى أن السودان بلد كبير، بمستويات مختلفة من المعيشة والثقافة والمناخ. عندما يتم اعتبار هذه الحقائق على الطبيعة المتعددة القطاعات للمياه، يصبح تنسيق الأنشطة في تخطيط وإدارة الموارد المائية المستدامة أمراً ضرورياً. لذلك تشكيل وتفعيل المجلس القومي

للموارد المائية يعد خطوة مهمة في هذا الاتجاه. يجب على اللجان المتخصصة في المجلس استكشاف وسائل الاستخدام الأمثل للمياه والأدوات والوسائل لتوجيه تلك الوسائل والتحكم فيها. قد يكون من المفيد وجود مجالس أو فروع تابعة على مستوى الولايات، حيث تمثل وفرة المياه وجودتها من القضايا الرئيسية. عليه ينبغي إضفاء الطابع المؤسسي على رصد تطبيق السياسات والاستراتيجيات. عندما يتم ذلك، يمكن للمجلس لعب دور كبير للحفاظ على إدارة الموارد المائية في السودان من خلال الجهاز التنفيذي للموارد المائية.

أوصى البحث بضرورة أن تسود روح التعاون والتنسيق الوثيق فيما بين الولايات والدول التي تشترك في مورد مائي، ويفضل أن يتم ذلك من خلال إطار تعاوني مؤسسي لكل حوض مشترك. وينبغي أن تكون الروح التوجيهية عادلة وشرعية ومتكاملة ومستدامة وسليمة بيئياً للاستفادة من الموارد المائية المشتركة، دون إلحاق ضرر كبير من ولاية إلى ولاية أخرى أو من بلد إلى آخر. يجب أن يكون الهدف الإجمالي هو التسامح وفهم تطلعات وصعوبات الآخر، مع البحث عن الاستخدام الأمثل والمنفعة المتبادلة.

1. Introduction:

Sudan is situated in northern Africa, with a 853 km (530 mi) coastline bordering the Red Sea. It has land borders with Egypt, Eritrea, Ethiopia, South Sudan, the Central African Republic, Chad, and Libya. With an area of 1,886,068 km² (728,215 sq mi), it is the third largest country on the continent (after Algeria and Democratic Republic of the Congo) and the sixteenth largest in the world. Sudan lies between latitudes 8° and 23°N. The terrain is generally flat plains, broken by several mountain ranges. In the west the Deriba Caldera (3,042 m or 9,980 ft), located in the Marrah Mountains, is the highest point in Sudan. In the east are the Red Sea Hills. The Blue and White Nile rivers meet in Khartoum to form the River Nile, which flows northwards through Egypt to the Mediterranean Sea. The Blue Nile's course through Sudan is nearly 800 km (497 mile) long and is joined by the Dinder and Rahad Rivers between Sennar and Khartoum. The White Nile within Sudan has no significant tributaries. There are several dams on the Blue and White Niles. Among them are the Sennar and Roseires Dams on the Blue Nile, and the Jebel Aulia Dam on the White Nile. There is also

Lake Nubia on the Sudanese-Egyptian border. Rich mineral resources are available in Sudan including asbestos, chromite, cobalt, copper, gold, granite, gypsum, iron, kaolin, lead, manganese, mica, natural gas, nickel, petroleum, silver, tin, uranium and zinc.

The amount of rainfall increases towards the south. The central and the northern part have extremely dry desert areas such as the Nubian Desert to the northeast and the Bayuda Desert to the east; in the south there are swamps and rainforest. Sudan's rainy season lasts for about three months (July to September) in the north, and up to six months (June to November) in the south. The dry regions are plagued by sandstorms, known as haboob, which can completely block out the sun. In the northern and western semi-desert areas, people rely on the scant rainfall for basic agriculture and many are nomadic, travelling with their herds of sheep and camels. Nearer the River Nile, there are well-irrigated farms growing cash crops. The sunshine duration is very high all over the country but especially in deserts where it could soar to over 4,000 h per year.

Desertification is a serious problem in Sudan. There is also concern over soil erosion. Agricultural expansion, both public and private, has proceeded without conservation measures. The consequences have manifested themselves in the form of deforestation, soil desiccation (erosion), and the lowering of soil fertility and the water table.

The nation's wildlife is threatened by hunting. As of 2001, twenty-one mammal species and nine bird species are endangered, as well as two species of plants. Endangered species include: the waldrapp, northern white rhinoceros, tora hartebeest, slender-horned gazelle, and hawksbill turtle. The Sahara oryx has become extinct in the wild.

Increasing plant diversity via agricultural expansion within Sudan can lead to decreased nutrients / water, prey and dead organic matter, respectively. This would be a negative effect on Supporting Eco-systems Services, which are defined as nutrient cycles and crop pollination. However, in turn, implementation of such agricultural availability would have a positive impact on Provisioning Ecosy-stem Services, such as production of food, as well as water as the proposed food security solution includes water retention and irrigation in order to allow for agriculture

throughout drought months in the year in Sudan. Desertification and soil erosion are an issue that Sudanese deal with every year, ceasing their crop yields and enforcing nomadic behavior, therefore not lending itself to sustainable agriculture or human well-being. The question of sustainable well-being comes into play as it is of utmost importance for the people of Sudan to have available food sources via more sustainable agriculture. Typically, when faced with eco-systems being put at risk we would consider interventions to counteract these negative affects – like a mitigation strategy. Once we begin to see supporting eco-systems in place we will ensure we mitigate their deterioration by implementing the following: we will rotate the crops once harvested so the earth does not become stagnant in producing one particular nutrient to grow one particular food item; we will not introduce foreign species into the eco-system that do not come from that geographical location in order to prevent too much animal diversity in the location, of which would be unnatural and finally we will use the water reserves to ensure the area does not become under nourished from the water it needs, therefore keeping both the supporting and provisioning eco-systems alive and flourishing.

2. Statement of the Problem:

In this study the present and future status of the Sudan water resources, supply and demand, is discussed. The strong relationship between the Sudan water resources development and the Nile River waters, as a main source of water for Sudan is highlighted. The status of irrigation, drinking water, sanitation, and other uses are discussed in conjunction with surface and ground water protection. A way forward through utilizing of the potential water resources of the rainfall (442 billion m³ annually), by adopting the rainwater harvesting techniques in an integrating approach is discussed. Sustainable Water Resources Management as an important holistic approach, the study attempts to recommend several guidelines for the future strategy of the Sudan sustainable water resources planning and management. The main questions of this paper looking for answers are follows: How could water resources be developed sustainably? Other questions developed from this main question: What are the challenges to the

sustainable water management? And how could water be used more efficiently and sustainably?

3. Research objectives:

- To develop an approach to sustainable water resource management in Sudan
- To recommend several guidelines for the future strategy of the Sudan sustainable water resources planning and management, and
- To emphasize to the policy-makers and technicians the need to consider the Integrated Water Resources Management approach in the planning and implementation phases.

4. Research methodology:

Intensive a background Literature review analysis of the available documents from the national workshops, technical reports, media articles and books.

The research speculates on Sudan Water Resources Assessment, supply/demand on valuing using the available water resources for different utilizations and the impacts on the various sectors. What is the optimal strategy for using the available water resources in time and space? The proposed questionnaire (interview) could be based on experience of the interviewers about: Modelling & Nile DSS (Nile Basin Decision Support Syste) for the best scenarios for utilization, and.

The research is based on an expert-interview methodology; including academics, advisers and experts working on water field with relevant ministries and Sudanese council of ministers.

The researcher assessment does not present a governmental position in his research. The research methodology depends on assessing independently the views of the experts and then analyze the input of Sudan guidelines and policies in other sectors on sustainable water resources management.

Findings and Recommendation:

Findings

The research reached the conclusion that the Sudan is a large country, with varying standards of living, culture and climate. When this is superimposed on the multi-sectoral nature of water, coordination of activities in sustainable water resources planning, management and

development becomes essential. The formation and activation of National Council of Water Resources NCWR is an important step in that direction. The specialized committees in the council have to explore the means for optimal usage of water and the tools and regulations to guide and control those means. It might be helpful to have affiliated councils or branches at state levels, where water availability and quality are major issues. Monitoring of the application of policies and strategies should be institutionalized. When this is done, the Council could play a great role to sustain water resources management in Sudan through its executive body “Water Resources Technical Organ (WRTO)”.

Recommendation

- The water permits and licenses will be granted under specific conditions including feasibility study of the project, type of use, maximum amount of water permitted, timings of withdrawal, and in accordance with environmental protection and sustainability measures.
- As rainfall harvesting is an essential water resource technique applicable in large areas in the country, the strategy should support its early development to mitigate the hardships, especially in rural areas, and ease the political and social implications.
- Expansion of water harvesting projects to benefit from lost rainwater.
- Study the possibility of transferring sugar plan in the south to benefit from rainwater to reduce pumping of the limited Nile resource, and about 500,000 feddans can be added to the proposed projects
- By streamlined irrigation to produce sugar, when added to existing projects become the total area allocated for sugar is about 800 thousand feddans to produce approximately 3.4 million tons of sugar annually.
- Inventory of the cultivation of oil grains in the area of savanna poor, for example: rain projects, the island, Al-Rahad, Halfa Jadida, Aldender and the Upper Atbara agricultural project.
- Studying the possibility of exploiting large areas in the Greater Kenana project for the benefit of animal production and enhancing

- this by harvesting water to provide drinking water for humans and animals during the summer.
- Increasing the efficiency of water use in irrigated agriculture and reducing loss of waste in irrigation is of utmost importance in the coming period.
 - Enhancing cooperation with Upper Nile countries to increase Nile revenues and reduce evaporation for expansion in future agriculture in Sudan
 - Encourage modern rainfed agriculture and intensify scientific research in the field of water harvesting to exploit the large amounts of rainfall in the savannah areas and work to raise its productivity to cover most of the needs of local and Arab food.
 - Review previous approvals of projects that are irrigated from Nile water to be compatible with available water and approved agricultural expansion plan.
 - Encouraging investment in proposed national agricultural projects and existing projects after rehabilitation and agricultural intensification.
 - The necessity of consistency of the projects of food security plan for the Arab world with the guidelines of this plan and its proposals above regarding the transfer of the sugar plan in the south to benefit from the rain, and the allocation of savannah for oilseeds and wheat from the groundwater in the north as well as the allocation of areas of Kanana and non-Nile basins for animal production and gardener.
 - Training and qualifying engineering cadres and supporting applied research in the field of water resources.
 - Good policy formulation and implementation needs competent staff and knowledgeable stakeholders. Therefore, capacity building, research and development is vital in the process.
 - The issue of institutional and human resources capacities is of great importance and it needs to be revisited in terms of policies and regulations, and well-coordinated with the high education institutes.
 - There should be a legal mechanism to resolve conflicts among different water users in different states in case of friction on trans-national-states waters.

- It is recommended to establish an authority to govern and manage the withdrawal of shared waters and also national waters as well. This authority should constitute part of the responsibilities of the MWRE.
- The proposed Authority will be responsible for issuing water permits and licenses for both surface and groundwater.

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