Preface

The Hydraulics Research Center (HRC) is the largest research institute in Sudan working on water related research programs. It is the main research institute of the Ministry of Water Resources, Irrigation and Electricity. HRC has the mandate of:

- *Implementing applied (solution-oriented) research in areas of: Hydraulics, hydrology, irrigation and water resources management;*
- *Carrying out consultancy studies for the water sector at large, with clients from inside and outside Sudan; and*
- *Conducting capacity building programs (short courses, training workshops, and on the job training related to the water sector.*

This abstract book contains summary of the research projects implemented in year 2018. It includes very wide set of research and consultancy projects, covering hydraulics and river morphology; water resources; hydrology, among others. The projects vary from small projects of 3 to 4 month, to large projects of 2 to 3 years.

For further and detailed information, you are welcome to visit HRC – Sudan website (www.hrc-sudan.sd), consult HRC library, or contact info@hrc-sudan.sd .

Editors:

Yasir A. Mohamed

Abu Obieda Babiker

Maweya Dafalla

Contents

Mapping of Cropped Areas in Gezira Irrigation Scheme Using Remote Sensing and GIS techniques

(Rwnag M. Adam, Amgad A. Khalifa, Julia A. Mustafa, & Yasir A. Mohamed)

Irrigation schemes in Sudan face many challenges. One of these challenges is to determine the actual cultivated area for the crops, in particular for large schemes such as Gezira (880,000 ha). Mapping of cropped areas using a classical approaches based on ground information becomes complex and expensive. The main objective of this project is to generate crop maps for Gezira scheme using satellite images. This is for winter crops, i.e., images of January/February and summer crops, with images of September/October.

The Landsat 8 and sentinel 2 satellite images were used for mapping the cropped area in Gezira through map classification of three selected agricultural blocks as a sample of the Gezira Scheme. Three canals from each block were selected for ground truthing through precise field survey to assess accuracy of the classification. Then, assuming average classification error from the three blocks to be valid for the whole scheme.

Two methods of supervised classification process were used namely: the maximum likelihood classifier (MLC) and the object-based image analysis (OBIA)

The dominant crops in this season (summer season 2018/2019) were: sorghum, Groundnut, and Cotton, The results (error and area in Feddan) were (±8%, 363,061), (±6.7%, 181,057) and (±7%,

158,977) respectively. The total cultivated area in Gezira scheme was estimated as 706,000 Feddan with an error of ±4%.

This project will continue to map all the crop types that might be cultivated during the winter season of 2018/2019. These outputs are critical not only for proper water management but also for other agricultural processes within the scheme.

Selection of the Nile gauging site upstream High Aswan Dam

(Yasir M. O. Hageltom, Ebaa E. Elsmmani, Rawnag M. Adam, Islam S. Suliman, Rami Kawas, Omer M. Nour, Taha M. Dafalla, Mohamed Y. Abbas, Abu Obieda B. Ahmed, & Yasir A. Mohamed)

As per a request from the Permanent Joint Technical Commission for Nile Water (PJTC), The Hydraulics Research Center (HRC) conducted a study to investigate a suitable location of a discharge measuring station within the reach upstream of the High Aswan Dam (HAD) reservoir and downstream the proposed Dal dam. The new station is planned to provide net outflow discharges data of the Nile River that needed for operating HAD. Currently, the outflow measurements to Egypt is taken from Dongola station (established in 1962). However, the distance from Dongola up to the tail end of the HAD reservoir reaches more than 300 km. In addition, such station may not be functional any longer in the future after constructing the new proposed dams of Dal and/or Kajbar in Sudan. Therefore, it is important to find another location, instead of Dongola, as a permanent measuring site.

The study includes investigation of the hydrology and morphology of the Nile River in the neighborhood of the proposed gauging site, as well as the topographic and bathymetric surveys.

A one-dimensional model has been built in SOBEK to study the influence of the backwater curve caused by HAD. The model has been calibrated and validated with historical records from nearby stations. The model results showed that the recommended reach as given by the terms of reference of the PJTC (20 to 40 km downstream Dal), is within the backwater curve of HAD, and may not be suitable for a

discharge measuring station. This reach is also characterized by scanty villages, and difficult accessibility to the river due to the hill ranges on both sides of the river.

The evaluation of the river morphology of the study area (20 to 40 km downstream Dal) derived from satellite imageries for the last three decades showed that the reach is very stable, and experienced no morphological changes (no meandering).

The hydrographic survey comprises the land and bathymetric surveys to define river cross-section within the study area were conducted. The topography of the river channel bathymetry combined with DEM was used to generate contour maps of the river topography in the vicinity of the proposed sites.

The study concluded that within the reach of Dal – HAD there is no suitable location for discharge measurement because of the backwater curve effect. The backwater results in lowering the water surface slope, therefore, a smaller discharge passes through the gauging station for the same stage. In addition, the presence of backwater does not allow the use of a simple unique rating curve. Accordingly, it was not recommended to establish a discharge measurement station within the reach downstream Dal.

Water Balance Study and Validation of Reservoir Releases from Merowe Dam

(Younis A. Gismalla, Amgad A. Khalifa, Khalid E. Hassaballah, Hiba A. Musa, Ebaa E. Elsmmani.& Yasir A. Mohamed)

Realizing the importance of accurate determination of water balance components in reservoir operation and planning, Merowe Dam Electrical Company (MDEC) has requested HRC to conduct this study. The objective of Merowe reservoir water balance Study is to verify the accuracy of all water balance components. These are, inflows at Elkuro, reservoir evaporation losses, seepage into ground water, and outflow releases to the downstream at Elhesai and eventually conduct a reservoir water balance.

The methodology followed in this study consists of collection of historical data, field visits and limited discharge measurements for verification. The collected data includes manual and automatic hydrological data, climatic data, reservoir characteristics and operation data with limited discharge measurements conducted at Elkuro and Elhesai. The measurements have shown that MEDC and HRC at both stations are identical. Analysis has also shown that the method used in deriving the rating curves at both Elkuro and Elhesai is compatible with HRC method. The daily evaporation rates from the reservoir agreed well with those computed from climatic data of Gumaiza and Merowe Dam-Axis stations using Penman (1948) equation. Dam gates discharges were validated using the downstream discharge series at Elhesai. Power gates discharges were validated first for the periods when all releases are passed through turbines followed by the sluice and sediment gates. The water balance for the reservoir

was conducted for different time steps viz. daily, monthly and annually.

The study also includes an on-the-job training of the dam's engineers and developing a Graphical User Interface (GUI) for daily operation of the dam. The main objective of the developed GUI is daily hydrological data management. The interface consist of three main components, viz. input module for real time monitoring of data and create/append the database automatically, calculation module and output and visualization module for graphical representation and reports. The Merowe Dam GUI was fully developed and tested.

The Sediment Monitoring Program– Season 2018

(Nazik A. M. Ahmed & Younis A. Gismalla)

The Blue Nile River and Atbara River that originate from the Ethiopian Plateau are the major source of sediment load in the Nile River. These two rivers brings about 180 million ton of sediment annually. Sediment deposition in the reservoirs and in the irrigation and drainage networks are the major operational problems in Sudan. Knowing the sediment load and its characteristics in different river reaches and that entering irrigation schemes is very crucial for sediment management.

The sediment monitoring program is a continuous program operated by HRC since 1988. The former Ministry of Irrigation and Water Resources has started it in the Gezira Scheme and the Blue Nile system to assist in managing reservoir and canal sedimentation. The main objective of the program is to estimate the annual sediment yield and its distribution within the Nile system and in selected irrigation schemes, particularly the Gezira Scheme. Also to establish a correlation between the rate of inflow and sediment concentration within the river Nile system and the irrigation schemes, beside establishing a sediment database for the Nile and irrigation scheme systems.

Dissemination of the program findings will definitely contribute in defining the optimum existing reservoirs filling dates and planning of sediment removal within irrigated schemes.

The sampling process started on the 1st. of June and ended by 30th of September 2018. All samples were analyzed using the turbidity-meter method, while 10% were also analyzed using classical method for the

sake of calibration. The calibration results showed good correlation between the two methods ($R^2 \approx 0.88$).

The sediment concentration pattern of the Blue Nile stations (Wad Elais, Downstream Sennar Dam, Hantoub, Police station (this station was established this year only to verify the data of Hantoub station it stopped at the end of August and Khartoum) show normal sediment concentration trend. The peak of the sediment concentration at these stations registered on the 12th of July with the highest sediment concentration recorded Downstream Sennar dam as 12,257 ppm for the main Nile stations (Tamanyiat / Shambat and Dongola), the sediment concentration peak was registered on 26th of July at Tamanyiat/Shambat station with concentration of 9146 ppm. The sediment concentration record at Dongola station shows very low values. This may be attributed to the damping effect at Marowe dam. For Atbara River station downstream Khashm Elgirba dam, the sediment concentration peak appeared on the 31st of July also the sediment concentration is very low, which is strange and needs further verification.

To monitor the sediment entering the Gezira scheme, the station is at the Gezira main canal at Sennar. The sediment concentration peak appeared on the 12th of July with concentration of 10420 ppm at Gezira main at Sennar. To monitor further more downstream the Gezira Scheme the station is at the Gamousia major, the sediment concentration peak on the major appeared on the 20th of July with concentration 10829 ppm higher than in the Gezira main canal may be due to the sediment deposition downstream the Gezira main canal or upstream the major canal.

The monitoring program revealed that, the sediment concentrations as well as the sediment loads for this season 2018 are lower than those for last season 2017. This could be attributed to the fact that the Blue Nile flows are lower than last year.

The sediment passing downstream Sennar dam this year is 154 million ton (Blue nile), while the total sediment load entering the Gezira scheme this season (2018) is estimated as 7.5 million ton compared to 8.3 million ton last season (2017).

River Basin Simulation for Improved Transboundary Water Management in the Nile. Case Study: Tekezze – Atbara Sub-basin

(Yasir M. O. Hageltom, Hana A. Mohammed, Sarah Seifeldin, Yasir A. Mohamed, Abubaker M. Saeed, Mohamed A. Mohamed, Maweya D. Abdelgader, EiWR-AAU, IHE-Delft)

Tekezze Atbara (T-A) sub-basin is a transboundary river basin originates from Ethiopian highlands and traverses through the eastern plains of Sudan to join the Nile at Atbara Town. A small part of the catchment is located in Eritrea. Competition over water resources in the T-A basin is increasing to respond to the rising demands for hydropower and irrigation in both Ethiopia and Sudan, and further downstream in Egypt. Three dams were built in the basin: Girba (1966) and Atbara Dams Complex (2015) in Sudan, and Tekezze Five (2010) in Ethiopia, while several others are on the drawing board. However, these storage reservoirs are operated independently, not necessarily because of conflicting interests, but possibly due to lack of information of the added value of coordinated operation of the system.

The Hydraulics Research Center (HRC-Sudan), the Ethiopian Institute for Water Resources (EiWR-AAU), and IHE Delft (Netherlands) have been conducting applied research on the needs and potentials of transboundary water resources management in T-A basin. The main goal of this research project is to evaluate the costs and benefits of coordinated versus non-coordinated operation of the reservoirs system in the T-A sub-basin.

For that, a river basin simulation model is developed to respond to demands of irrigation, hydropower and environmental flow. The project is also directly contributing to strengthen the capacity and enhance trust among Ethiopian and Sudanese researchers through the joint development of models and analysis of operation scenarios. Furthermore, this project fits the research agenda of Ethiopia-Sudan Technical Advisory Committee (ESTAC), who are well informed of the project and its progress.

The research project lasts for 2 years started in February 2017 with an inception workshop implemented during 22- 23 May 2017 in Upper Atbara Dams complex, Sudan where the activities and the research plan were discussed among the stakeholders.

The intermediate workshop has been conducted at EiWR in Addis Ababa on 2-3 May 2018, a one-year after the inception workshop. The intermediate workshop is a milestone step in project implementation, whereby the two modelling teams of HRC-Sudan and EiWR exchanged data and models. The workshop marked the completion of the data validation exercise, as well as model development at the sub-basin level (Phase 1).

Thereafter, each team developed the model for the whole Tekeze-Atbara basin separately (Phase 2), which preceded the work of the joint team (Phase 3), started on September 1, 2018.

The project has published a documentary film for the T-A sub-basin. The objective of the film is to give more information about the river to the public, from the source at the Ethiopian highlands, down to the outlet in Sudan. The film focusses on the landscape, natural resources, people and their livelihoods. It uses personal stories of people along

the basin, backed up by material from the ongoing research project to indicate similarities, differences, and potential of collaboration and benefit sharing within the basin.

Africa to Asia and Back Again: Testing Adaptation in Flood-Based Resource Management Project

Modification of on farm water management in Gash Agricultural Scheme (GAS), seasons 2015/2016 to 2017-2018

(*Amira A. Mekawi, Almutaz A. Abdelfattah, Ahmed A. Elamin, Omer M. Nour, Mohammed A. Mohammed, Taha M. Dafalla, Yasir A. Mohamed, Abu Obieda B. Ahmed & Abraham M. Haile)*

The "Africa to Asia and Back Again: Testing Adaptation in Flood-Based Resource Management Project" has started in April 2015 in eight countries, including Sudan. The project is funded by the International Fund for Agricultural Development (IFAD) and European Commission (EC) Grant to the Water, Land and Ecosystem (WLE) program of IWMI. The research project is implemented by MetaMeta (The Netherlands) and ICRAF. The duration of the project is from April 2015 to March 2019. The implementing organization in Sudan is the Hydraulics Research Center (HRC-Sudan) of the Ministry of Water Resources, Irrigation and Electricity. The project targets the spate systems in Sudan with special emphasis on the spate system in the Gash Agricultural Scheme (GAS), and in particular modification of the on-farm water management system.

The research work "On farm water management in Gash Agricultural Scheme (GAS)" has taken place over the period 2015-2017, and is being continued for the season 2018/2019. The research has basically aimed to evaluate the performance of the existing irrigation system in GAS at the farm level (called Mesga in GAS) and then to introduce a newly irrigation scheduling instead of the current practice where spate water is diverted to Mesgas of 2000 feddans size over 25-30 days.

In phase I, investigation of baseline condition in season 2015/2016, measurements of flood water entering a selected pilot Mesga, soil moisture measurements within the entire Mesga area through the

whole growing season, and assessment of water productivity have been carried out. Based on results of phase II, the modelling simulations using WinSRFR, a certain set of interventions was determined to be executed on the ground. The adopted interventions basically consist of dividing the irrigated area equally and horizontally in addition to construction of a Mesga canal (tertiary canal) of half of the total Mesga length to convey spate waters directly to the downstream half while the upstream half supplied from the feeding main canal.

In phase III (season 2017/2018), a pilot farm was selected in Kassala Block in GAS (Mesga 14E). The farm size is 1000 feddans. The field work has followed the same procedure of phase I. The only difference was the construction works of the adopted interventions at farm level. Intensive field measurements (flow and soil moisture) were carried out at the selected Mesga during 2017/2018 growing season, which starts from June to March 2017. The total irrigation water, diverted to Mesga 14E during the flood season, was estimated as 3.0 Mm^3. Also, the total number of irrigation days decreased from 15 days (current practice in GAS for irrigating 1000 feddans) to 11 days (the experiment case). This means 27% of irrigation duration (4 days) is saved in terms of irrigation water.

The soil moisture measurements, covered 40 points in the Mesga, were taken at three layers (0-30, 30-60 and 60-90 cm). Soil moisture measurements were taken at specific intervals: before flooding, immediately after flooding, and then every 3 to 4 weeks until end of the cropping season, i.e. until soil moisture matches pre-season condition. The available water (AW) in season 2017/2018 was 14.9 cm. This is beyond the theoretical range of the water holding capacities for Silty clay (12-14 mm/dm).

Productivity in season 2017/2018 was estimated at 10 sacks per feddan on average for the two Sorghum varieties. The production of Aklamoy (local variety in Gash basin) was almost doubled.

The research has been continued for the fourth year (season 2018/2019) where the irrigation scheduling and associated set of interventions as determined in the modelling phase are executed on the ground. In season 2018/2019, two pilot mesgas were selected in GAS namely Mesga 12W (1400 Feddans) in Kassala Block and Mesga 39W (2000 Feddans) in Degain Block.

Unfortunately the experiment at the two pilot mesgas (12W, and 39W) could not be completed because of not sufficient spate entering the mesgas in spite of high flooding of Gash River in year 2018. As reported from the field, total irrigated areas in Degain and Kassala have not exceeded 400 Feddans. This is about 20% and 30% of the total mesgas' areas of the two pilot sites, respectively. Hence, the research goal could not be realized on the ground.

It was recommended to replicate the experiment during 2019/2020 season again in two mesgas.

Impacts of GERD on the Hydrology and Water Resources Study (Phase III)

(Yasir A. Mohamed, Abdelnassir K. Osman, Hiba A. Musa, Hana A. Mohammed & Ebaa E. Elsmmani)

The research work of Phase III on the impacts of the GERD on the downstream hydrology and water Resources, focusses on two parts: (i) The impacts of initial filling on the operation of Sudanese reservoirs and the High Aswan Dam, and (iii) the impact of different sizes of GERD on the downstream water resources.

All analysis has been carried out using river basin simulation modelling (RIBASIM), after been verified with observed data of the system at 10-daily time step.

The results of the initial filling showed high impacts on the operation of Roseires and Merowe dam, if filling of GERD takes place in months outside the flood season, i.e., other than in July and August.

The results of downstream impacts if GERD has the storage capacity similar to Border Dam (14.47 BCM), showed that the power generation at Border dam will be about 6200 Gwh/year. The irrigation demand in Gezira scheme will be fully met in case of average years (1988 to 1997), but will be affected in case of dry years (1979 to 1987). The hydropower generation in Sudan showed no effect during average years, but reduced for the sequence of dry years. The High Aswan Dam (HAD) dam will be affected in the case of average years or dry years.

دراسة معايرة طلمبات ضخ المياه بمشاريع الري الكبرى

Ahmed A. Ibrahim, Abu Obieda B. Ahmed, Omer M. Nour, Mohamed Y. Abbas, Mukhtar M Elbasier, Merghani H. Elzain & Yasir A. Mohamed

تأتي ضرورة معايرة طلمبات الضخ بمشاريع الري من أجل تحسين كفاءة إستخدام مياه الري من جانب، و تزويد متخذي القرار بالمعلومة عن ما إذا كانت الطلمبة المعنية تحتاج إلي صيانة أو إحلال. عليه فقد تبني مركز البحوث الهيدروليكية برنامجاً دورياً لمعايرة طلمبات ضخ المياه المنتشرة بمشاريع الري الكبرى إسهاماً منه في إدارة الموارد المائية المتاحة بصورة مثلي و تحقيق الأهداف التنموية لمشاريع الري القومية الكبرى القائمة.

إستهدفت هذه المرحلة من الدراسة في هذا العام: (1) معايرة الوحدات التي لم تتم معايرتها في الدراسات السابقة فى كل من بيا رتى مينا و السوكى، شملت الوحدات: 1 ، 2 ، 5 ، 6 ، 9 و 11 ببيارة مينا و الوحدة 4 ببيارة السوكى. كما تضمن هذا المكون أيضاً معايرة تفصيلية لوحدات الديزل ببيارة نور الدين، ممثلةً لطلمبات الديزل، لمعرفة الكفاءة في الطاقة المستهلكة و كفاءة الماكينة و الطلمبة، (2) مقارنة طلبيات المياه بمشروع الرهد الزراعى مع المنفذ فعليا خلال العروة الشتوية 2018/2017م بإستخدام تقنيات الإستشعار عن بعد لحصر المساحات المزروعة و برنامج Cropwat و جداول Farbrother (البحوث الزراعية) لحساب الإحتياجات المائية للمحاصيل (3) مقارنات مبدئية لتكلفة ضخ وحدة المياه بواسطة طلمبات الكهرباء مقارنة مع الديزل.

تمخضت نتائج الدراسة في أن متوسط الكفاءة الانتاجية للوحدات ببيارة مينا بلغت ب87% بزيادة 5% عن نتائج الدراسة السابقة (أبريل 2017م)، كما بلغت الكفاءة الكلية (الكفاءة الإنتاجية x الكفاءة التصميمية) 75% بنقصان 1%. أما فيما يتعلق ببيارة السوكي، فقد بلغت الكفاءة الإنتاجية للطلبة 4 92% بزيادة 5% عن متوسط الوحدات 1، 2 و 3.

و بناءاً علي نتائج صور الأقمار الصناعية، فقد قدرت المساحة المزروعة بمشروع الرهد الزراعي للعروة الشتوية 2018/2017م بحوالي 111,514 فدان بزيادة 7 % عن المساحة المرصودة بواسطة إدارة المشروع. كما أن كمية المياه المنفذة تزيد على الإحتياجات المائية بحوالي 30%، في المتوسط.

فيما يتعلق بتقديرات تكلفة ضخ المياه، فقد بلغت تكلفة الضخ الكهربائي 0.006 جنيه/م3، بينما بلغت تكلفة الضخ بوحدات الديزل 0.06 و0.17 جنيه/م3 في المتناولات والطلمبات النيلية، بالترتيب. تجدر الإشارة هنا إلي أن نسبة تكلفة الضخ الكهربائي إلي الضخ بالديزل عالية جداً إذا ما قورنت بالمتوسطات المحلية و العالمية التي تتراوح نسبها بين 1 إلى 3% معتمدة على سعر الكهرباء و الجازولين (3.7% في الدراسة البرازيلية لمشاريع الولاية الشمالية بالسودان).

هذا و قد خلصت الدراسة بأهم التوصيات التالية: (1) إعتماد المعايرة كمنهج علمي و عملي لتحديد كفاءة و إنتاجية الطلمبات – خاصة بعد عمل الصيانات الكبيرة لأى وحدة و كذلك فى فترة الطلبيات القصوى (الإسبوع الأخير من إكتوبر أو الإسبوع الأول من نوفمبر). (2) إتباع الإسلوب الفنى فى تقدير الإحتياجات المائية الفعلية على طول المواسم الزراعية. (3) إعتماد وحدة الماء بدلاً عن ساعات الدوارة في طلب و تنفيذ المياه (4) السعى لإحلال وحدات الديزل بوحدات كهربائية أو طاقة شمسية بهدف تقليل تكلفة الإمداد المائي (5) زيادة كفاءة الرى من المصدر (البيارة) إلى الحقل (الحواشة) لتقليل تكلفة الضخ (6) إجراء المسح المائي للذنابية قبل و بعد التطهير لتحديد كميات الطمي و قياس كفاءة التطهير.

أثر مياه النيل على العلاقات السودانية المصرية ما بعد سد النهضة

(Abdelaziz A. Balila & Osman Eltoum)

تناولت الدراسة بشيء من التفصيل والتحليل أثر مياه النيل علي علاقات السودان ومصر ما بعد قيام سد النهضة الأثيوبي، وكان ذلك في أربع فصول يحوي كل عدة فصل محاور. تحدثت الدراسة عن التحكم المصر علي مياه النيل حيث حاولت دولة مصر لعب أدواراً متعددة للسيطرة علي مياه النيل وتقنينها بالاتفاقيات والمعاهدات إضافة إلي التدخلات المباشرة أو غير المباشرة للسيطرة علي منابع النهر لضمان وصول المياه بالكمية والتوقيت المناسبين لها، كذلك تطرقت الدراسة لتطلعات الهيمنة الأثيوبية التي ظهرت بوادرها تلوح في الأفق منذ ستينيات القرن الماضي والتي توجت بقيام أكبر سد في القارة الأفريقية لتوليد الطاقة الكهرومائية (GERD Dam) وأيضاً تناولت الدراسة أهمية مياه النيل لكل من مصر والسودان وأثرها على العلاقات السياسية بين البلدين خلال فترة ما قبل سد النهضة وبعد سد النهضة، ثم ختمت الدراسة بنتائج وتوصيات.

وخلصت الدراسة بالنتائج التالية: استطاعت مصر أن تتحكم في نهر النيل منذ فترات الاستعمار وحاولت أن تقنن تلك السيطرة بعدد من الاتفاقيات والمعاهدات وجعلها حق مكتسب، في سبيل ذلك لعبت مصر أدواراً مختلفة في نهر النيل كالخلاف حول التوسع في مشروع الجزيرة في الخمسينات من القرن الماضي، التخوف المصري ليس نابع من قيام سد النهضة بل من الميزة التي يوفرها سد النهضة للسودان (تنظيم انسياب مياه النيل) حيث يمتلك أكبر أراضي ري على النيل الأزرق و يمكنه أن يستهلك كميات كبيرة من المياه مما يسبب نقص حقيقي في المياه التي تذهب لها فوق حصتها المحددة، على الرغم من التذبذب في علاقات السودان ومصر فيما يتعلق بمياه النيل الا أنه يتوقع ألا تصل حد المواجهة او الصراع المباشر.

وتوصي الدراسة بالآتي:

- ضرورة التفكير بعقل استراتيجي والابتعاد عن المواقف التكتيكية التي قد تضر بعلاقات البلدين.
- العمل الفني المشترك (أبحاث، تدريب، مشاريع...الخ) مما يساعد في عملية التنسيق والتعاون إضافة إلى دعم متخذي القرار السياسي بين البلدين.
- على النطاق الداخلي في السودان ينبغي إعادة النظر في كيفية تشغيل السدود والخزانات القائمة والمستقبلية لمواكبة الأوضاع الجديدة والاستفادة القصوى منها. كما ينبغي إعادة النظر في تصميم وتشغيل المشاريع المروية لتواكب الأوضاع الجديدة والتوفر المستمر للمياه طوال العام.

تشييد سد النهضة والقانون الدولي

(Mohamed M. Mohamed, Yasir A. Mohamed & Ahmed Adam)

دراسة تشييد سد النهضة والقانون الدولي، تقوم على مقارنة بين المبادئ التي اتفقت عليها الدول الثلاث (مصر ، السودان، أثيوبيا)، بغرض تشييد سد النهضة الأثيوبي العظيم، بمبادئ القانون الدولي للمجاري المائية الدولية لسنة 1997م. كما هو معلوم لدى الأوساط القانونية والسياسية، أن تشييد سد النهضة الأثيوبي أثار جدل قانوني وسياسي، ويرجع هذا الجدل إلي الآثار المتوقعة لسد النهضة، التي ربما تكون كبيرة سلبياً أو إيجابياً على دول أسفل النهر، نسبة لكبر السعة التخزينية لسد النهضة البالغة 74 مليار متر مكعب، هذا الأمر هو أحد أوجه الاختلاف حول فترة ملء بحيرة السد. والخلاف المتوقع بين الدول الثلاث حول الاتفاق على إدارة السد وعلى أسس التشغيل.

أيضاً الانتقادات الموجهة لنصوص الإتفاقية، بزعم أن صياغتها لم ترق إلى الإلزام المانع الجامع، وأن لغة الخطاب الموجهة إلى أثيوبيا تحديداً لا تحوز القوة القانونية. لوضع حلول قانونية لهذه المشاكل البحثية أعلاه من الضروري أن تتبع هذه الدراسة المنهج المقارن، وذلك لمقارنة مبادئ سد النهضة بالقانون الدولي، التي تبين منها وجود توافق واضح بين إعلان مبادئ سد النهضة، ومبادئ القانون الدولي للمياه، وهذا يعني أن الدول الثلاث إسترشدت بمبادئ القانون الدولي للمياه، بإعتباره الحاكم للمجاري المائية الدولية. ولكن رغم ذلك هنالك وجود بعض القصور القانونية التي من الممكن أن تُعكر صفو هذا الإعلان. والذي يمكن التغلب عليها من خلال الإقتداء بتجارب الدول المشتركة في أحواض الأنهار الدولية على مستوى العالم، التي أثبتت أن الأسلوب الوحيد لتحقيق المكاسب المشتركة، وتجنب الإضرار بمصلحة أي طرف هو: التعاون، والحوار، والبناء التدريجي للثقة، وتفهم إحتياجات دول المنبع ودول المصب، وترجمة كل ذلك في وثائق قانونية ملزمة لا تترك مجالاً للتأويل أو التنصل، بما فيها من حقوق وإلتزامات الدول الأطراف. بالرغم من ذلك يمكننا القول: أن إتفاقية إعلان المبادئ، تعتبر وثيقة توافقية ملزمة بين أطرافها، ويمكن معاجلة القصور القانونية التي إعترت الإطار العام لمبادئ سد النهضة، في الإتفاقية اللاحقة لإعلان المبادئ، التي نأمل فيها التوصل إلي حلاً وسطاً بين مواقف الأطراف الموقعة عليها، وليست بالضرورة تحقق الأهداف الكاملة لأي طرف.