Government of Sudan
Ministry of Irrigation and Water Resources

Water Harvesting Projects

Sudan Experience

COUNTRY BACKGROUND

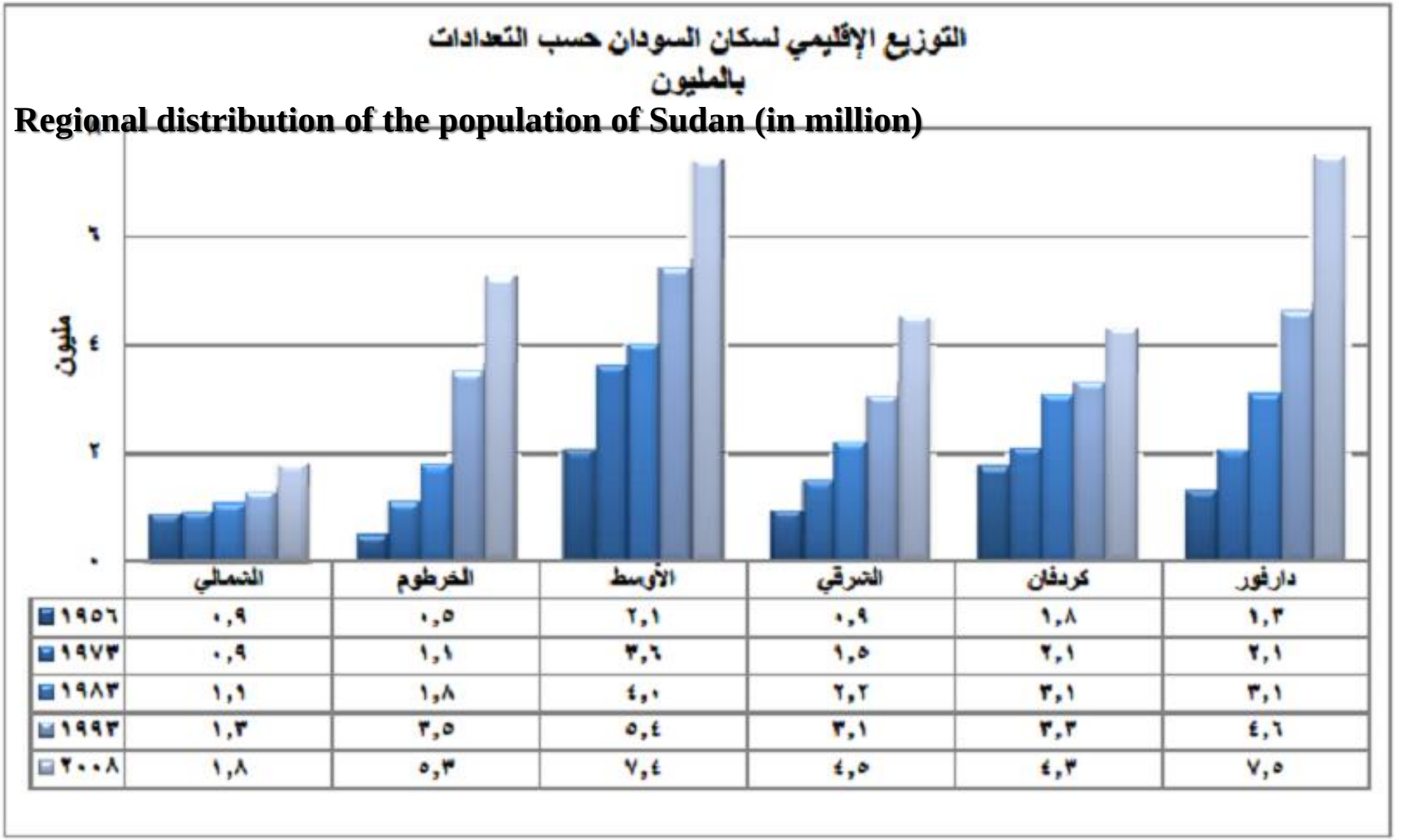
Location: In North Africa bordering Red Sea and 7 African countries

Area: **1.88 million km^2, 2nd in Africa and 3rd in Arab World.**

➢Population:

The population of Sudan was estimated at **33.4 million in 2009** with an estimated annual **growth rate of 2.8%.**

Regional distribution of the population of Sudan (in million)



	الشمالي	الخرطوم	الأوسط	الشرقي	كردفان	دارفور
١٩٥٦	٠,٩	٠,٥	٢,١	٠,٩	١,٨	١,٣
١٩٧٣	٠,٩	١,١	٣,٦	١,٥	٢,١	٢,١
١٩٨٣	١,١	١,٨	٤,٠	٢,٢	٣,١	٣,١
١٩٩٣	١,٣	٣,٥	٥,٤	٣,١	٣,٣	٤,٦
٢٠٠٨	١,٨	٥,٣	٧,٤	٤,٥	٤,٣	٧,٥

Source : Central Bureau of Statistics

المصدر : الجهاز المركزي للإحصاء

Livestock:

<u>134 million:</u> Camels (3M), Cattles(40M), Sheep (49M), goats(42M).

Source : Central Bureau of Statistics

WATER RESOURCES IN SUDAN

- **Surface Water:**
  - Nile Water Contribution is around ***20.5 Billion m3*** Other non Nile System around

    5 Billion m3

- **Groundwater:**
  - Renewable groundwater is estimated at ***4 Billion m3***

Thus total water available for use is about *30 Billion m3*

- **Rainfall:**

The average annual total is estimated at **400 Billion m3**. The annual potential evaporation (4mm/day) in the most country regions.

Water Harvesting in Sudan
(An Overview)

OBJECTIVES

- **Strategic Objectives of Water Harvesting Project**
  - Development of the rural areas, socially and economically (poverty alleviation)
  - Development of water resources away from the Nile Corridor
  - Enhance animal and agriculture production through improved water access
  - Conserve and protect the environment
  - Supporting The national security
  - developing of the border areas and lessening conflict over water within Sudan and with bordering countries

Water Harvesting Techniques

- The water harvesting techniques in Sudan aims at Collecting and storing rainwater and runoff in the period (July-Oct) for use in various life purposes during the period of shortage (Dec-Jun).
- The main storage facilities of Water Harvesting are either:
  - **Natural facilities:-**
    - Natural depressions (Turda, Rahad ..etc)
    - Groundwater basins
    - Certain types of trees and fruits (Baobab and watermelon)
  - **Artificial facilities:-**
    - Hafir (shallow ground reservoir with water treatment plant)
    - Small dams,
    - Contour Bunds
    - House Scale: Roof top, Family Tanks

SUDAN EXPERIENCE

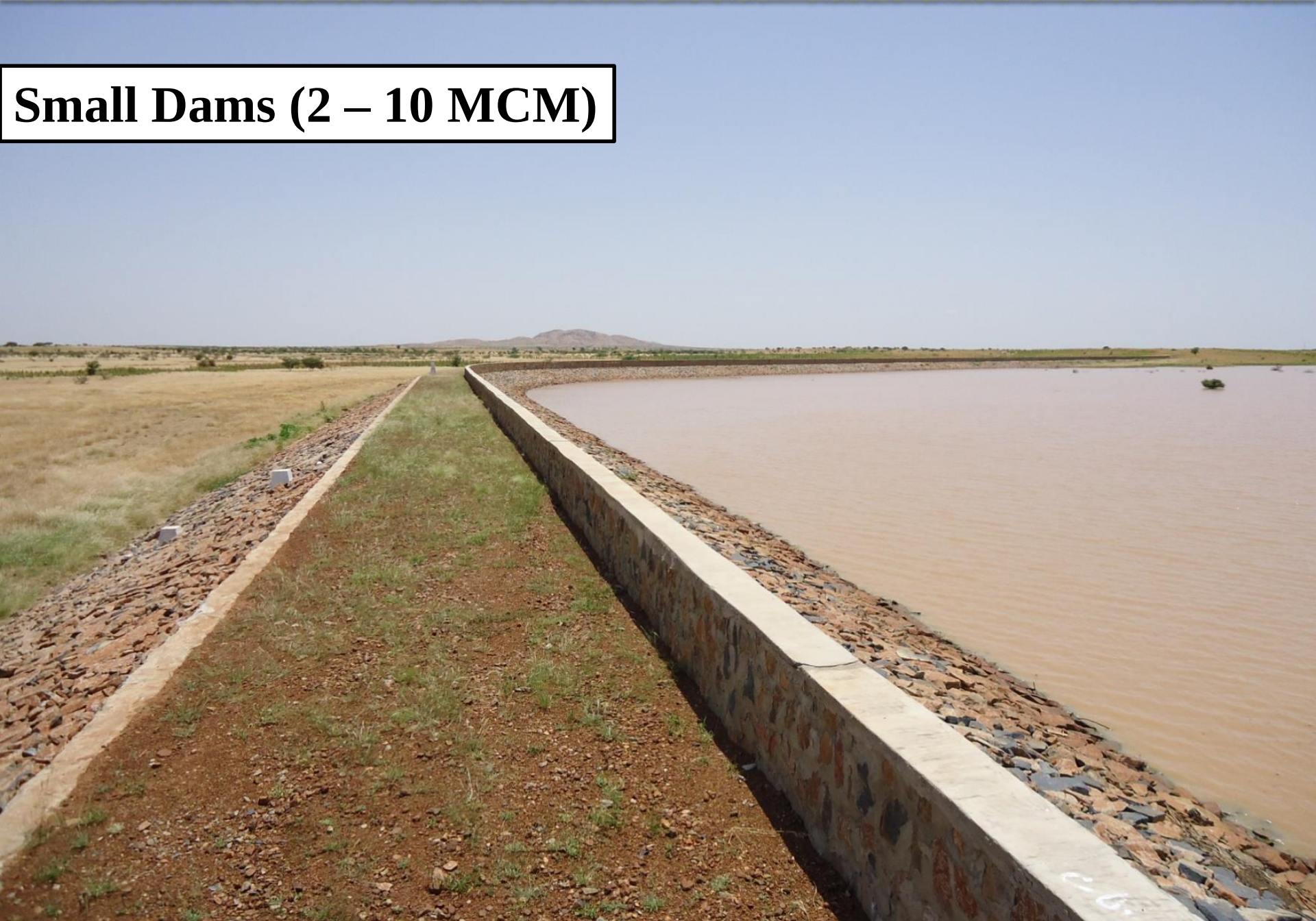
Implementation Procedures

- States shall define and prioritize the water harvesting projects that they would like to develop.
- The States will hand over the locations and projects sites to DIU free of obstacles and well secured during the construction time.
- DIU matches the defined projects with the **Drinking Water Atlas** and then be included in the implementation plan.
- The DIU executes the project through contracted consultants and contractors. (To ensure project feasibility technically and financially)
- Finally the executed projects, on completion, will be handed over to the States in accordance to an agreement that includes all of the project documents i.e. as built drawings, operation and maintenance manuals and any other relevant documents.
- The State will hand over the project to its technical staff for proper operation and maintenance.
- The technical staff will be trained during the first year of operation under the supervision of the Consultant. (especially in complicated projects).

TYPES OF IMPLEMENTED WATER HARVESTING PROJECTS

TYPS OF RAIN WATER HARVESTING IMPLEMENTED BY DIU

Small Dams (2 – 10 MCM)



TYPS OF RAIN WATER HARVESTING IMPLEMENTED BY DIU

Hafirs (30 – 500 Thousand m3)

TYPES OF IMPLEMENTED RAIN WATER HARVESTING

FAMILY TANKS

Jointly with Sugya Organization

CONT…

Sub Surface Dams

GROUND WATER WELLS &WATER YARDS USING SOLAR ENERGY

EXECUTED PROJECTS (2010 – 2020):

1- Hafirs (Water ponds) (530)

530 Hafirs with total **capacity 30 MCM.**

2- Small Dams (39)

39 small dams with total **capacity 120 MCM**

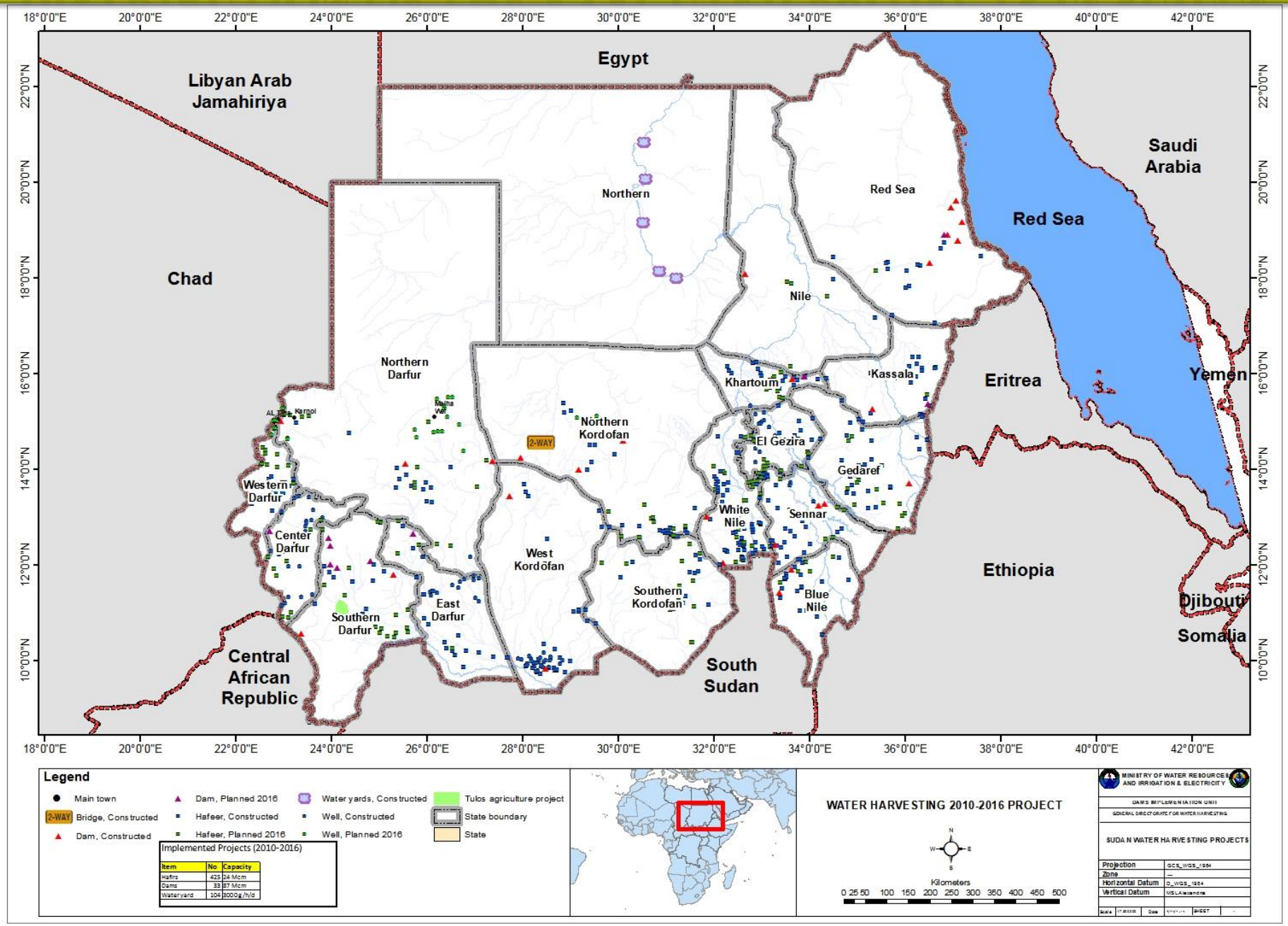
3- Water Yards

590 Ground Water Wells with average **pumping rate 4000 gallons/day**

TOTAL COST:

AROUND 530 M $

DISTRIBUTION OF THE EXECUTED PROJECTS IN SUDAN



Zero Thirst Plan

The Ministry of Irrigation and Water Resources, declared a five-years plan (2016 – 2020) to provide drinking water using different water harvesting techniques.

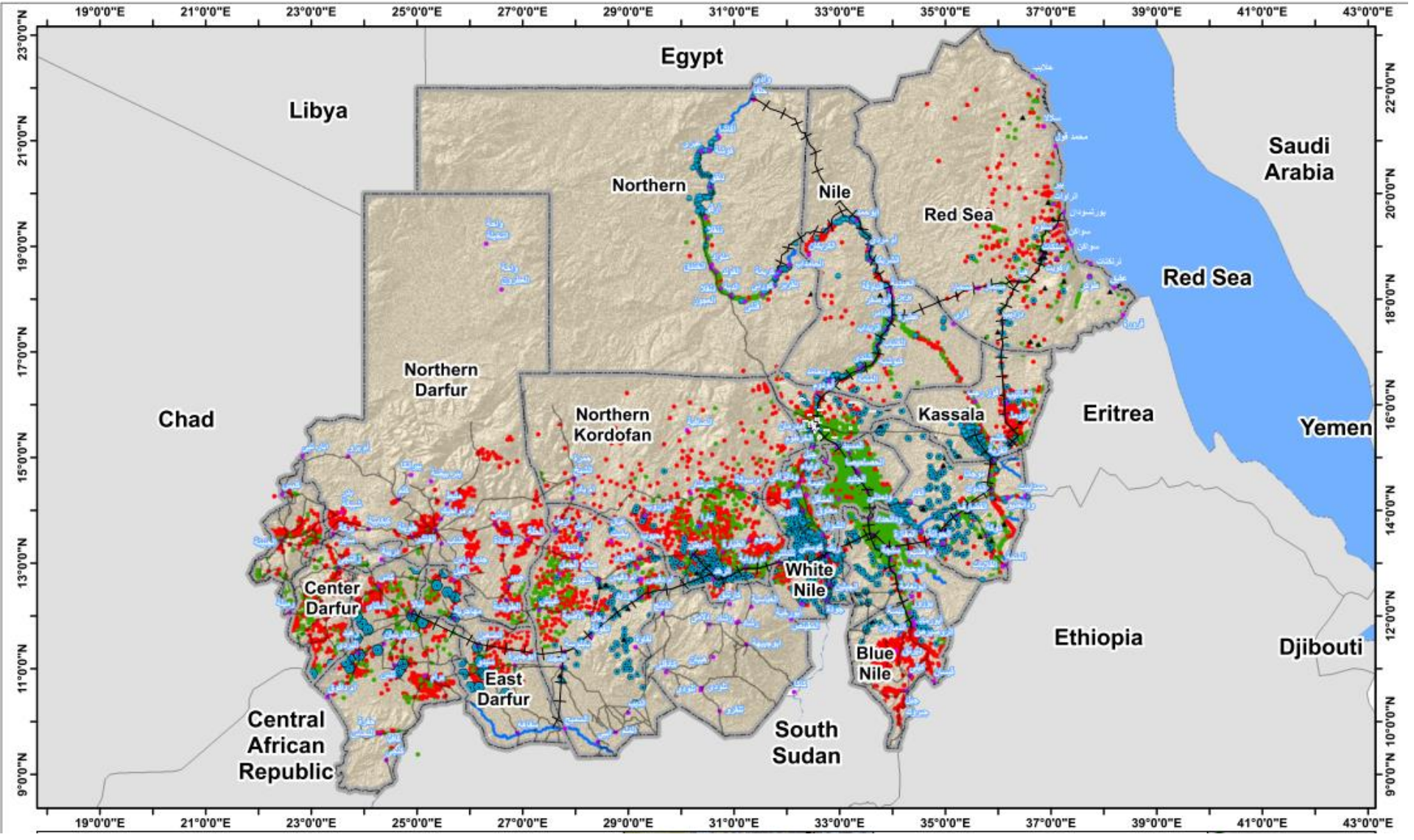
The total number of planed projects is 6,300 projects with total budget 1 Billion $.

THE PLAN OBJECTIVES

- Provide rural population with safe water supply of 35 liters per capita per day by the year 2020 with proximity of the water source not exceeding 2 km at this stage.
- Provide water for livestock to enhance its productivity.
- Enhance sustainability through capacity building, monitoring and evaluation, and research and development
- Promote and adopt environment through institutional, policy and legal arrangements.

FUTURE IMPLEMENTATION PLAN:

(1) COMPLETION OF THE DRINKING WATER ATLAS, THROUGH WHICH WATER NEEDS WERE DETERMINED IN ALL STATES OF SUDAN.



(2) SUPPORT THE IMPLEMENTATION CAPACITY BY SUPPLYING 18 GROUND WATER DRILLING RIGS

(3) SECURING PART OF THE CONSTRUCTION MATERIALS OF GROUND WATER WELLS AND WATER YARDS

(4) IN THE FIELD OF DEVELOPMENT

- **Establishment of research centers to develop different processes of water harvesting**

- **Establishment of monitoring and evaluation body**

- **Adoption of some measures to promote local communities awareness.**

- **Holding seminars and workshops at the federal, state and local levels to discuss various topics in water harvesting (optimal design, conservation of water facilities, optimal use of water, water purification, etc.)**

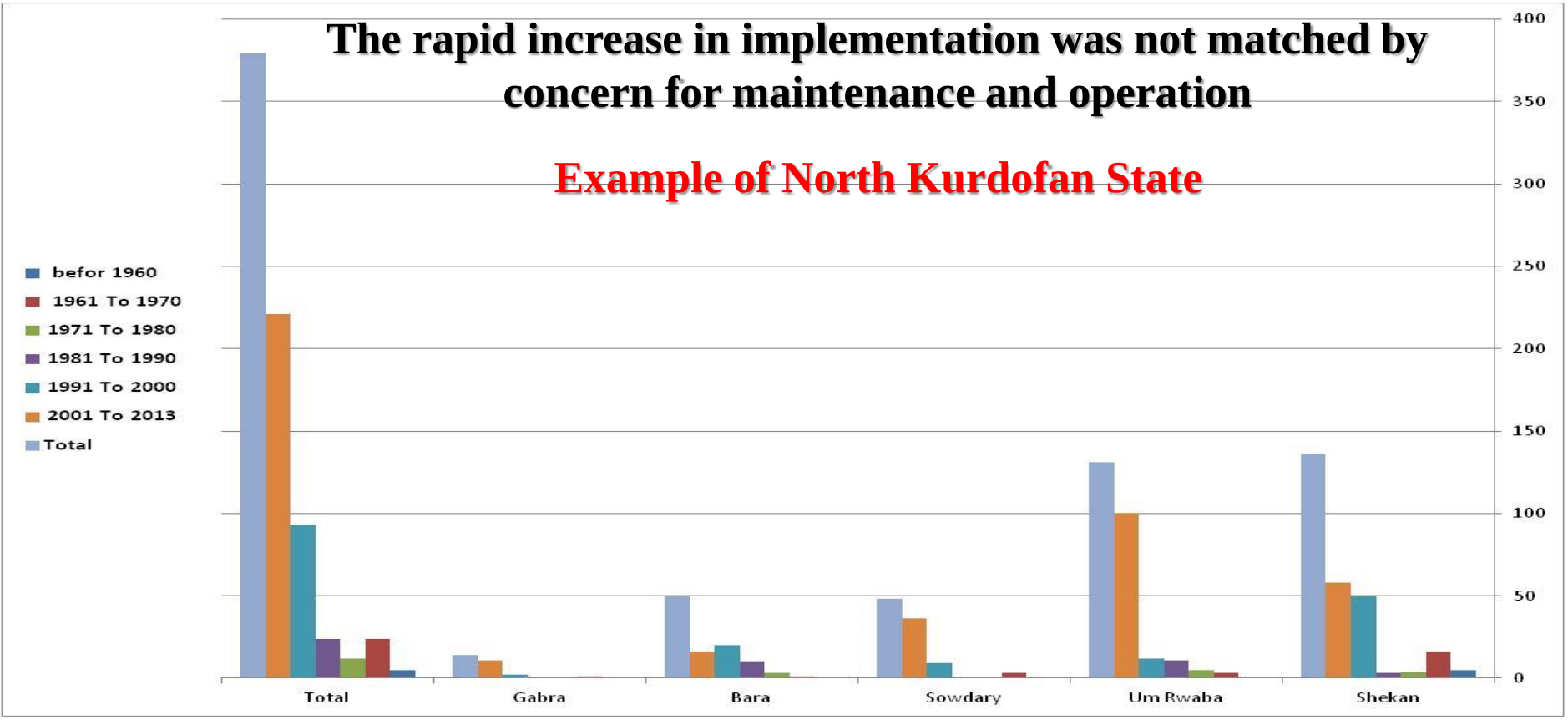
(5) IMPLEMENTING MORE THAN 2000 PROJECTS (SMALL DAMS , HAFIRS , GROUND WATER WELLS).

Challenges

- Inadequate funding
- Lack of basic information
- Weak basic infrastructure
- Few competent consulting and contracting firms
- Lack of well trained local staff at States level
- Operation and Maintenance for the executed projects.
- The rapid increase in implementation was not matched by concern for operation and maintenance

The rapid increase in implementation was not matched by concern for maintenance and operation

Example of North Kurdofan State

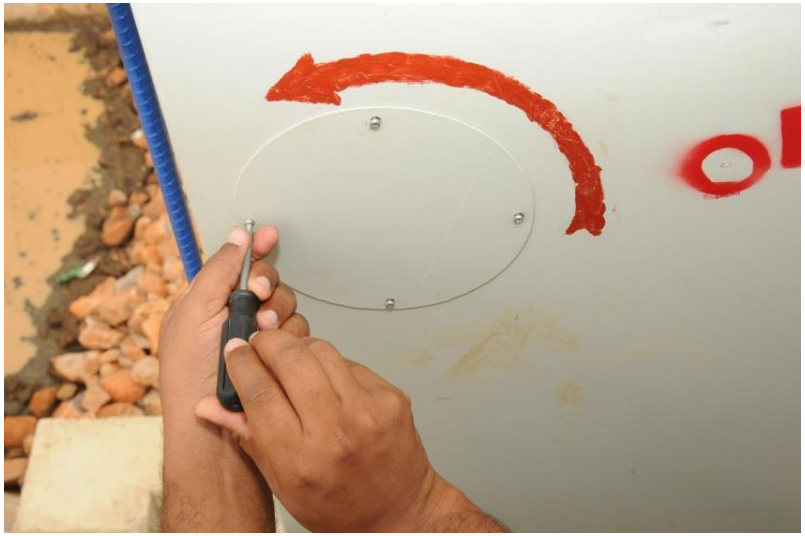


Locality	befor 1960	1961 To 1970	1971 To 1980	1981 To 1990	1991 To 2000	2001 To 2013	Total
Shekan	5	16	4	3	50	58	136
Um Rwaba	-	3	5	11	12	100	131
Sowdary	-	3	-	-	9	36	48
Bara	-	1	3	10	20	16	50
Gabra	-	1	-	-	2	11	14
Total	**5**	**24**	**12**	**24**	**93**	**221**	**379**

SAMPLE OF DAMS UMM BADIR DAM – NORTH KORDOFAN STATE

SAMPLE OF HAFIRS

TRAINING OF LOCAL STAFF - (FLUSHING GATES OF SMALL DAMS)



BENEFITS :
Assisting the stability of the villagers

Sali hafir – N.Darfur State

BEFORE THE HAFIR

- The walking distance was about 15 Km for the nearest drinking water source
- No water in the summer season so most of the population leave to the nearest city (Elfashir)

AFTER THE HAFIR

- The stability of the population
- Improvement in the field of health and hygiene
- Rising of ground water table
- Providing jobs opportunities in agriculture and brick industry
- Availability of vegetables
- Education stability
- Animal Husbandry

Providing jobs opportunities

bricks industry

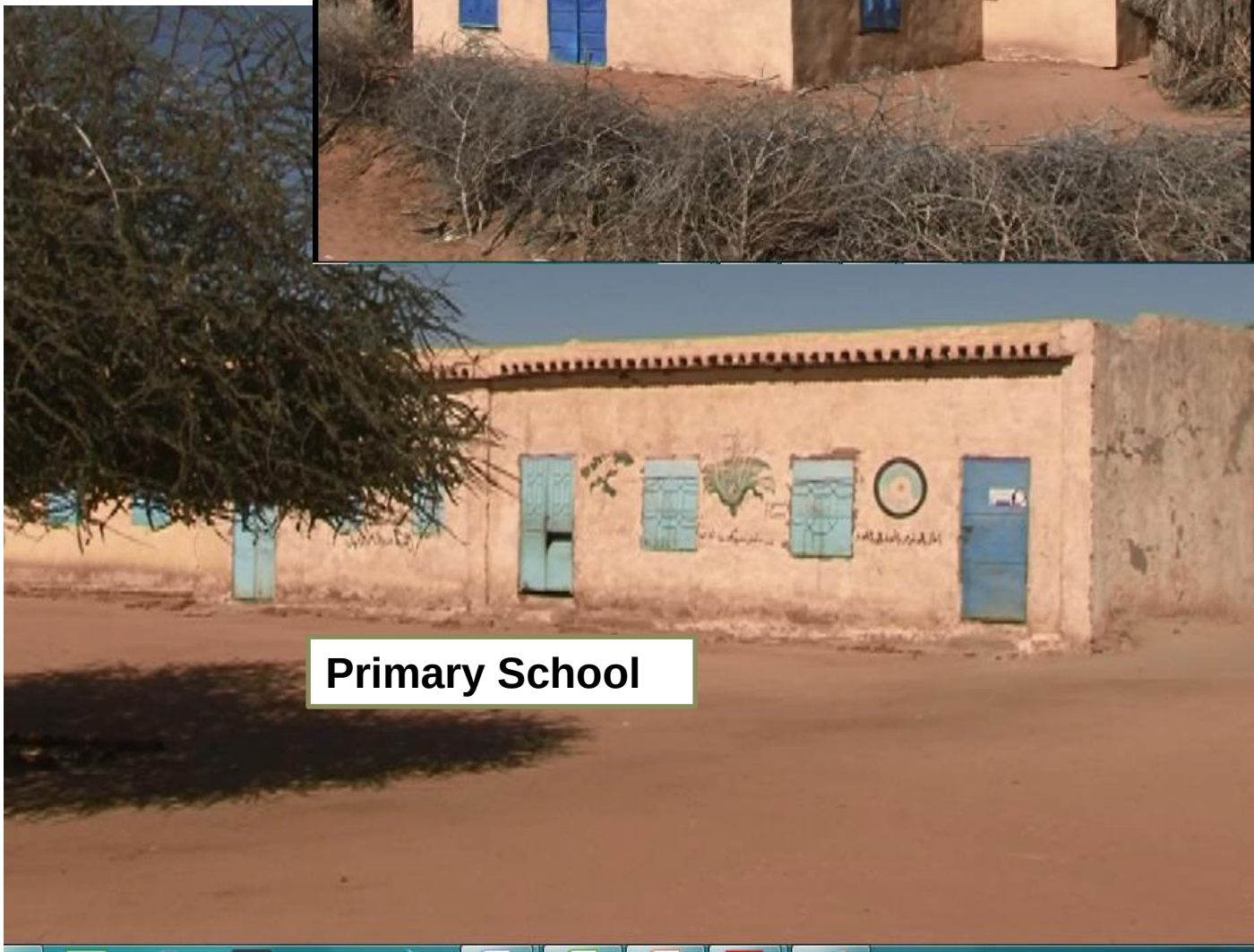
Improvement in the field of health and hygiene

Implementing small hospital

Increase of income

Education stability

Student s & Teachers back to school



AVAILABILITY OF VEGETABLES

BENEFITS :

- REDUCES DAMAGING EFFECTS OF FLOODS.
- IMPROVES WATER AVAILABILITY.

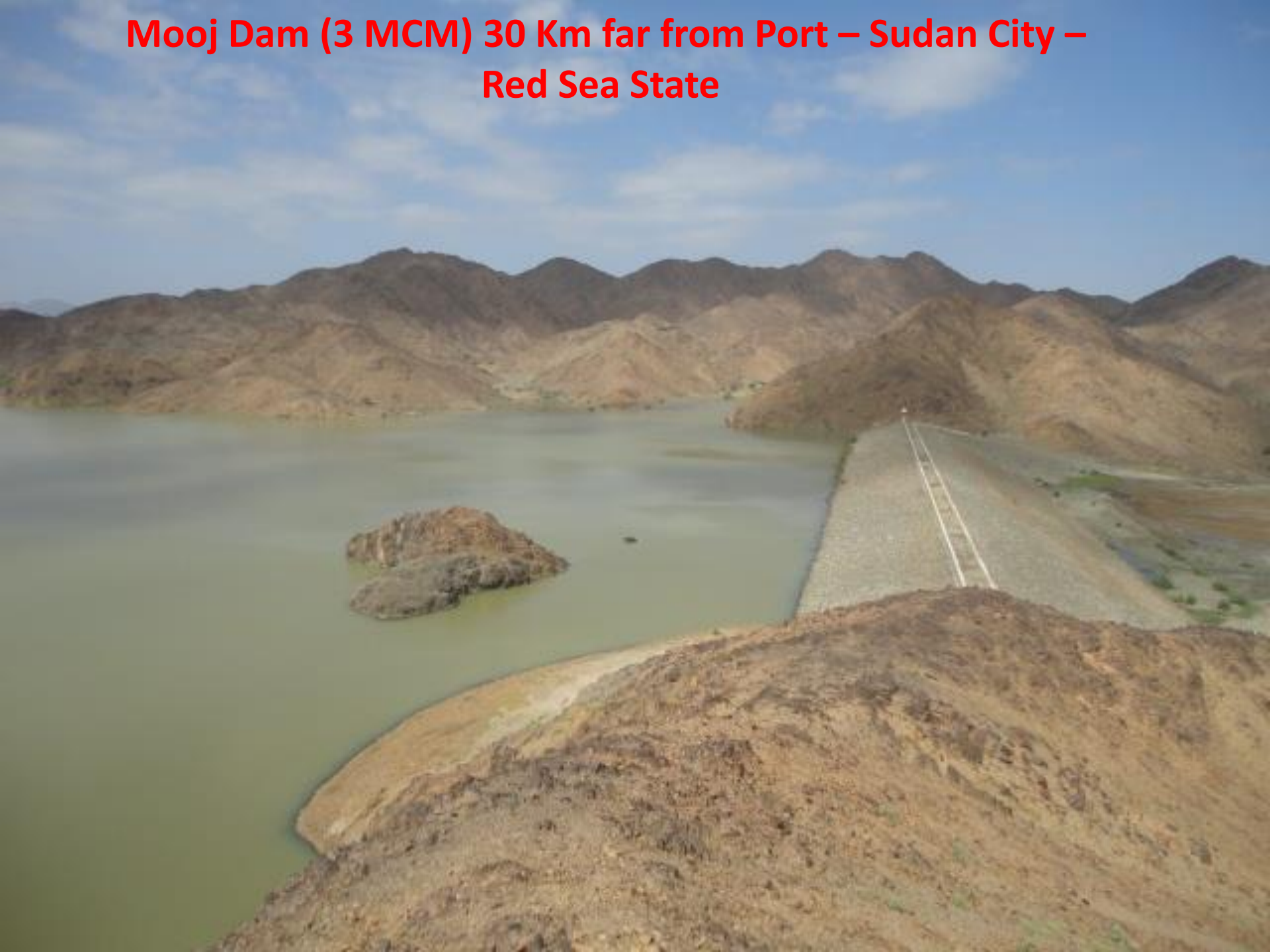
ALAWAG DAM – WHITE NILE STATE

BENEFITS :

- GROUND WATER RECHARGE
- IMPROVING WATER AVAILABILITY.
- ASSISTING THE STABILITY OF THE VILLAGERS

ABU-HADEED DAM – N.KORDOFAN STATE

Mooj Dam (3 MCM) 30 Km far from Port – Sudan City – Red Sea State



Gabet Dam (2 MCM) 13 Km far from Sinkat City – Red Sea State

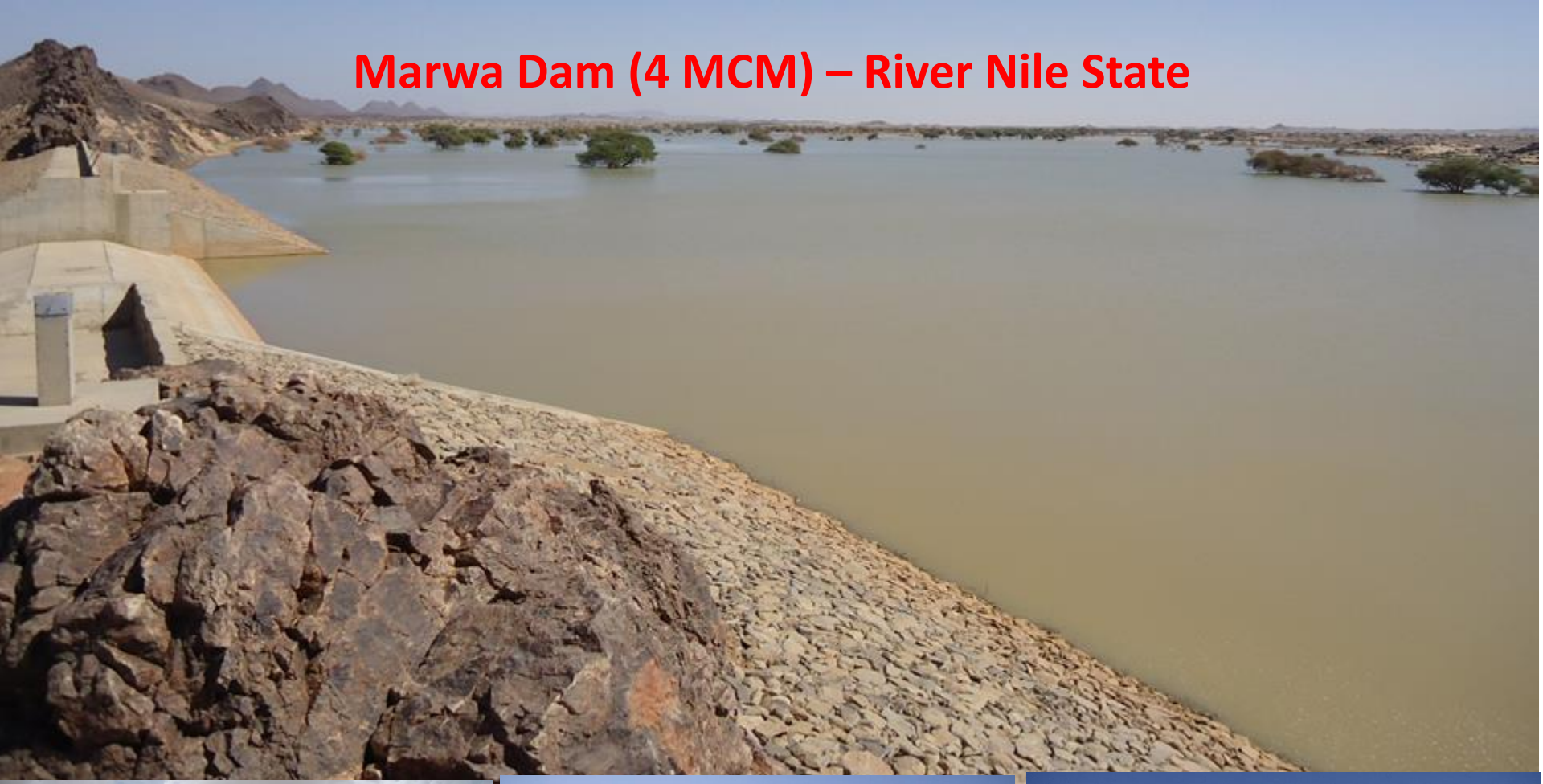
Handop Dam (2 MCM) 12 Km far from Swakin City – Red Sea State

Arkweet Dam (0.9 MCM) near Arkweet City – Red Sea State

Tai Dam (10 MCM) 13.5 Km far from Ageeg City –

Guresha Dam (2 MCM) – Gadarif State

Marwa Dam (4 MCM) – River Nile State




THANK YOU