



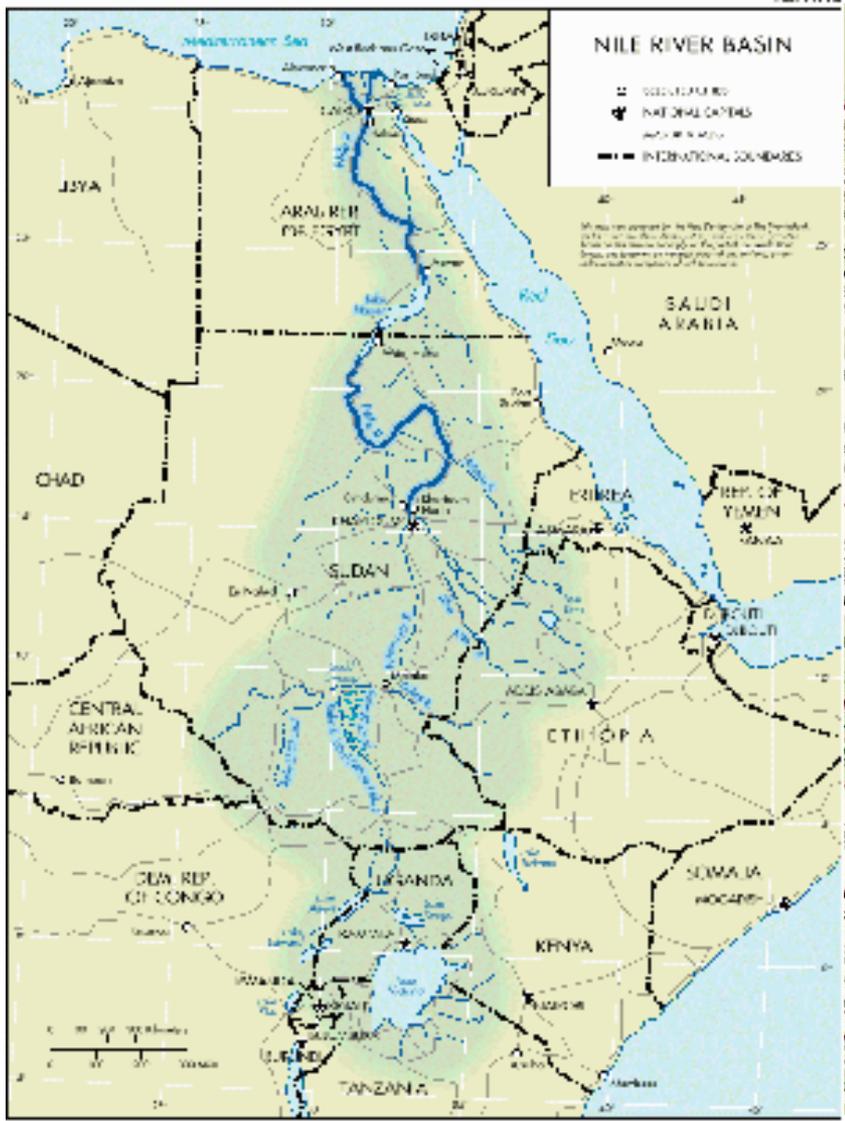
Government of Sudan
Ministry of Electricity and Dams
Dams Implementation Unit



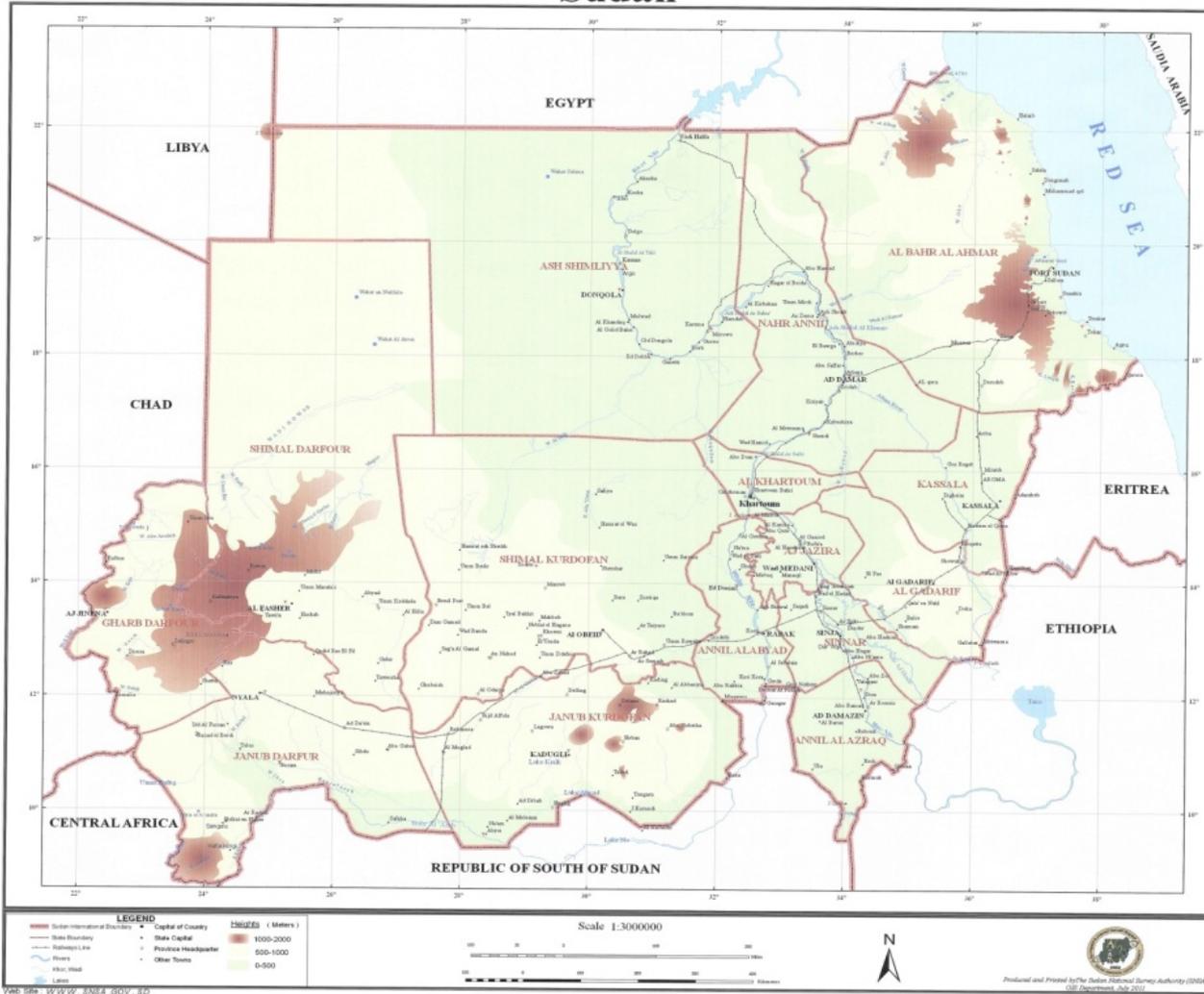
Water Resources Management

A topographic map of a country, showing various geographical features such as mountains, valleys, and rivers. The map is color-coded by elevation, with higher elevations in shades of brown and tan, and lower elevations in shades of green. The text "COUNTRY BACKGROUND" is overlaid in the center of the map in a bold, black, sans-serif font.

COUNTRY BACKGROUND



Sudan



COUNTRY BACKGROUND

- **Location:**

Sudan is located in North Africa bordering Red Sea and seven other African countries (Lat 8° 45' - 23° 8' N, Long. Lat 21° 49 - 23°34' N)

- Total land boundaries: 6,780 km, Coastline: 750 km

- **Area:** 1.88 million km², 2nd in Africa and 3rd in Arab World.

- **Topography:**

Flat in general and characterized by the vast plain extends from south to north with length of 1500 km.

The elevation extremes are: Jebel Mara 3089m and Red Sea 0m

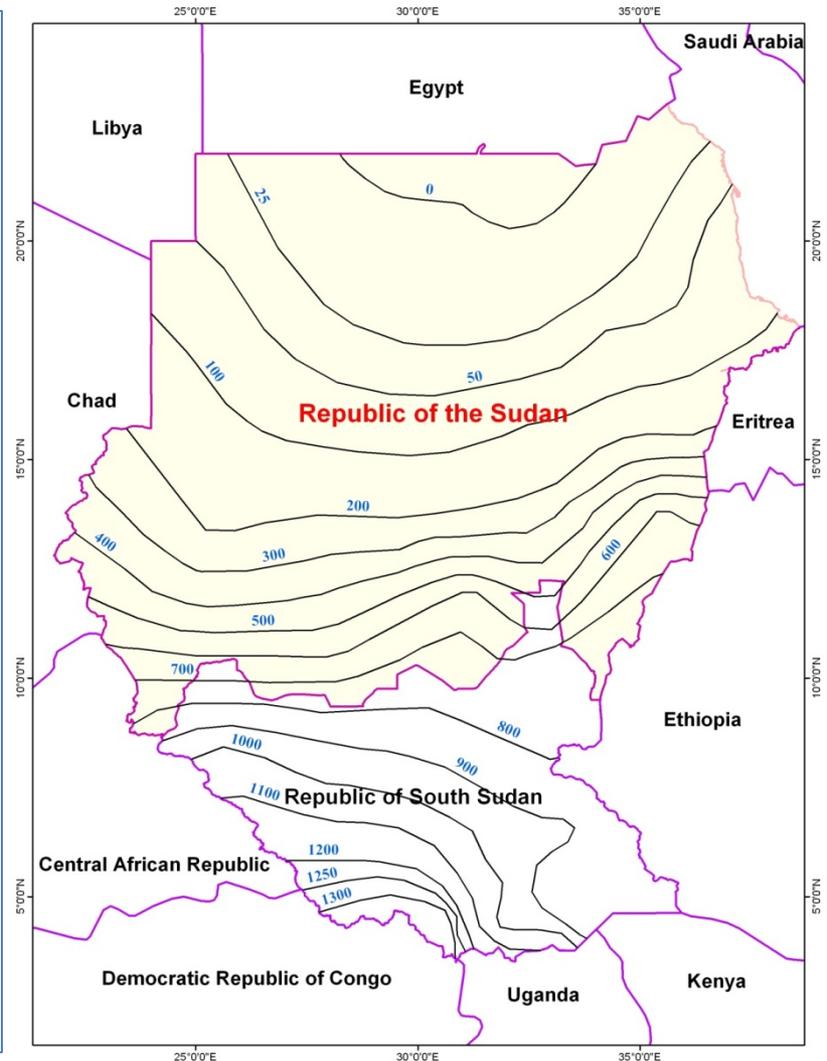
- The Central clay plains are traversed by the Nile system with general slope from southeast to northwest.

COUNTRY BACKGROUND (Contd.)

Sudan

— Climate

- Sudan covers about 13 latitudes north of the Equator towards desert and consequently its climate varies from savannah in south to arid desert in north with a maritime climate along the Red Sea coast.
- The rainfall decreases northwards from 700mm in the southern border to less than 20mm in the North.
- Variability in rainfall may reach about 50% in the northern half of the country and 30% in the central region. Rains are usually intense with short duration. The rainy season is short (July to September).



COUNTRY BACKGROUND (Contd.)

- **Population:**

- The population of Sudan was estimated at **33.4 million in 2009** with an estimated annual **growth rate of 2.8%**. The life expectancy is estimated at 59 years. Most of the population lives in rural areas which accounts for an estimated 49% of the total population.

- **Agriculture:**

- The Area of arable land is estimated at **200 million fed(84 million hec)**
- cultivated area per year is about **40 million fed(17million hec) , 20%**
- (Irrigated land: 11 million fed, rain-fed land: 29 million fed).
- The rural population is mostly engaged in the agricultural related activities. Agriculture remains the backbone of Sudanese economy, with an estimated contribution of 45.6 percent of GDP, 55 percent of employment and 80 % of export earnings. The main export items are livestock, sesame, cotton, groundnuts and gum Arabic

- **Livestock:**

- **134 million:** Camels (3), Cattles(40), Sheep (49), goats(42)

Annual Water Availability

1. Rainfall

• Decreases Northwards	0 -700	mm
• Total annual amount	400	billion m ³
• Potential Evaporation	1500	mm
• <u>Surface Water (Wadi)</u>	6	billion m³

2. Nile Waters

• Annual yield	93	billion m ³
• <u>Sudan Share</u>	20	billion m³

3. Groundwater

• Non-Renewable Groundwater	563	billion m ³
• <u>Renewable Groundwater</u>	4	billion m³

Water Availability	30	billion m ³
<u>Water Availability/capita/year</u>	<1000	m³

Challenges

- **Rainfall and Surfaces Water:**
Seasonality and variability of Rainfall temporally and spatially
- **Nile Waters:**
Shared with 9 countries and bounded with by lateral agreement
- **Groundwater:**
 - High cost of exploitation
 - Shared with 4 countries
 - limited
- **Sedimentation (Reduction in Dams Capacity)**
- **Floods, Drought and Climate Change**
- Lack of competent consultants and construction companies



NILE Major Development

Dams Locations Map



Sr.	Reservoir	River	Dam completion	Design Storage	Live storage	Installed capacity
1	Sennar	Blue Nile	1925	0.930	0.48	15
2	Jebel Aulia	White Nile	1937	3.500	3.5	30.8
3	Khashm El Girba	Atbara	1964	1.300	0.617	13
4	Roseires I	Blue Nile	1966	3.024	2.12	280
5	Meowe	Main Nile	2009	12.4	8.4	1250
6	Roseires II	Blue Nile	2013	4.4	4.4	-
7	Upper Atbra	Atbara	2014	3.6	3.6	320
8	Sabaloqa	Main Nile		0.506		205
9	Sherek	Main Nile		2.202		420
10	Dagash	Main Nile		0.100		312
11	Mograt	Main Nile		0.100		312
12	Kajbar	Main Nile		0.300		360
13	Dal	Main Nile		2.471		684
Ind.	1956-1966			8.75	6.72	338.80
DIU	2003-2014			20.40	16.40	1,570.00
DIU	2014-2024			5.68	5.68	2,293.00
	1956-2024			34.83	28.80	4,201.80

Water Harvesting in Sudan

(An Overview)

OBJECTIVES

- ✓ 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 national security and promotion of peace and stability by developing of the border areas and lessening conflict over water within Sudan and with bordering countries
- ✓ To increase the minimum per capita share of domestic water, to be in line with country strategy and MDG in terms of Water Supply (quantity) and Sanitation (quality)

OBJECTIVES (Contd.)

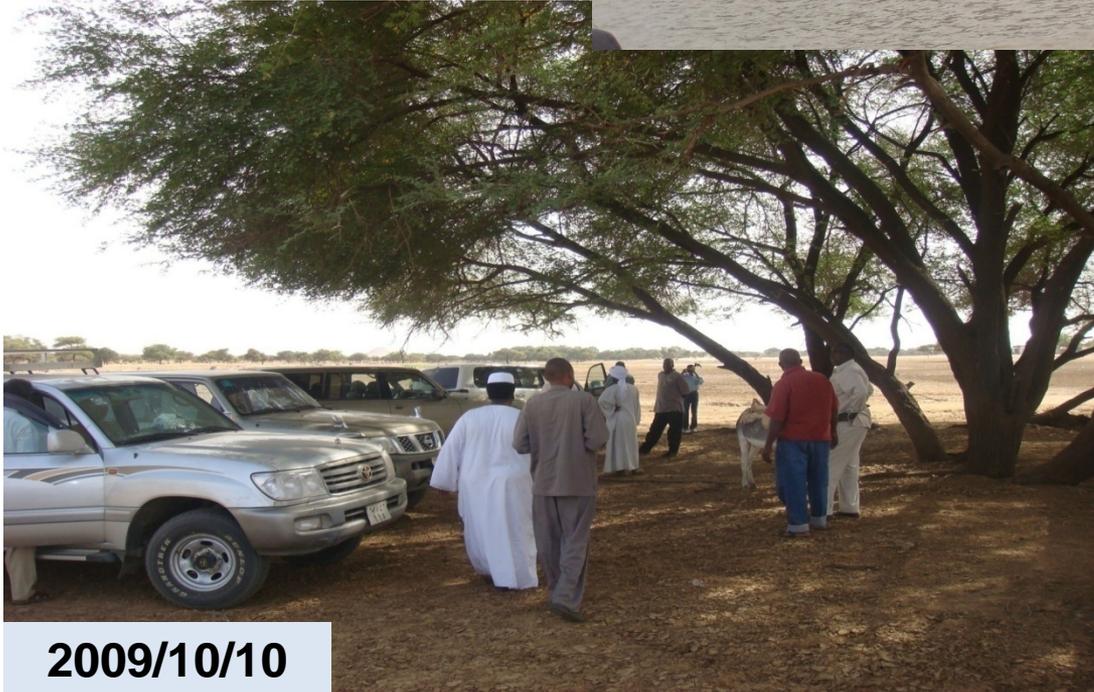
Specific Objective

- Satisfaction of the immediate need for water as a key element of sustainable peace
- Settlement of nomads and pastoralists to avoid conflicts with farmers, within Sudan and with bordering countries (South Sudan and Central Africa) and to encourage IDP (Internally Displaced People) and refugees to return home
- To increase the minimum per capita share of domestic water, to be in line with country strategy and MDG in terms of Water Supply (quantity) and Sanitation (quality)
- To be in line with Country Strategy for Achieving Darfur' Comprehensive Peace, Security and Development

Water Harvesting Concept



2009/07/20



2009/10/10

Water Harvesting Techniques

- The water harvesting techniques in Sudan aimed at collection of rains water or catching the runoff in the rainy season (July-Sep) to store it for the period of shortage (Dec-Jun).
- The main purpose of Water Harvesting Projects is to supply domestic water for human and animal and for irrigation
- The main storage facilities of Water Harvesting are either:
 - Hafir (shallow ground reservoir with water treatment plant)
 - Small dams,
 - Natural depressions (Turda, Rahad, Fola and Dahal) and Adansonia or Baobab tree
 - Contour Bunds
 - House Scale: roof top, House Tank

Baobab tree

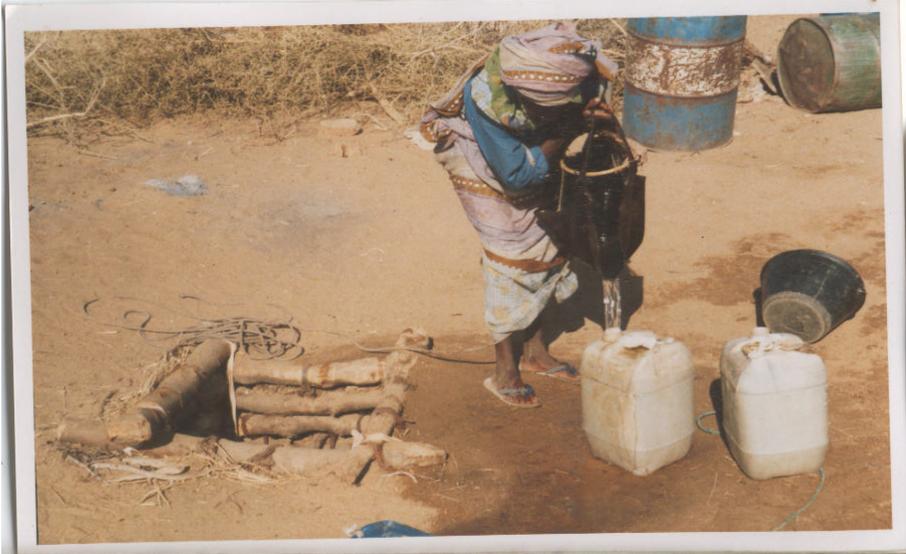




06/06/2012

Dams Implementation Unit_ A. Saghayroon

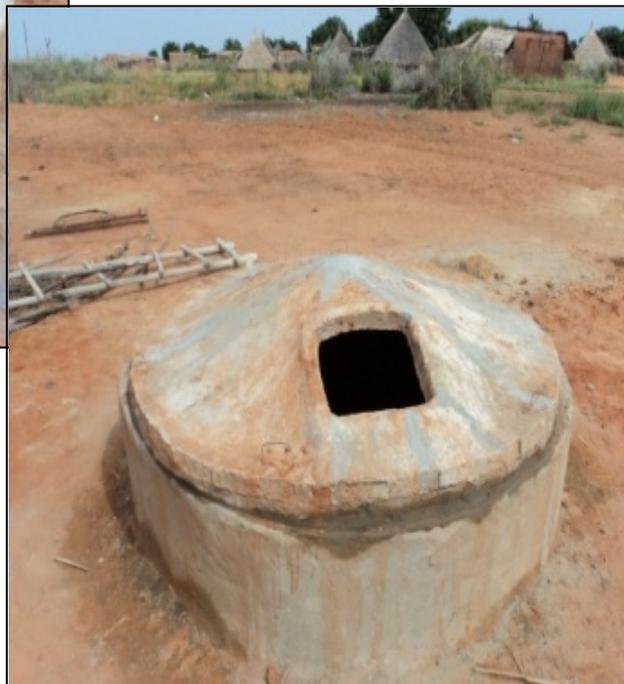
Shallow Wells



06/06/2012

Dams Implementation Unit_A. Sagnayroon

Family Tank



Roof Catchment



Hafir (Water Pond)





Rehabilitation of Water Yards



Golo Dam



Natural Depressions



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Dams Implementation Unit_ A. Saghayroon

Drinking Water and Recession Agriculture



Drinking Water and Recharge of Groundwater



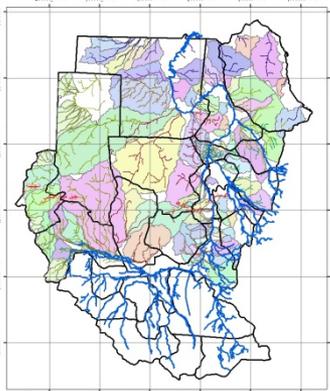


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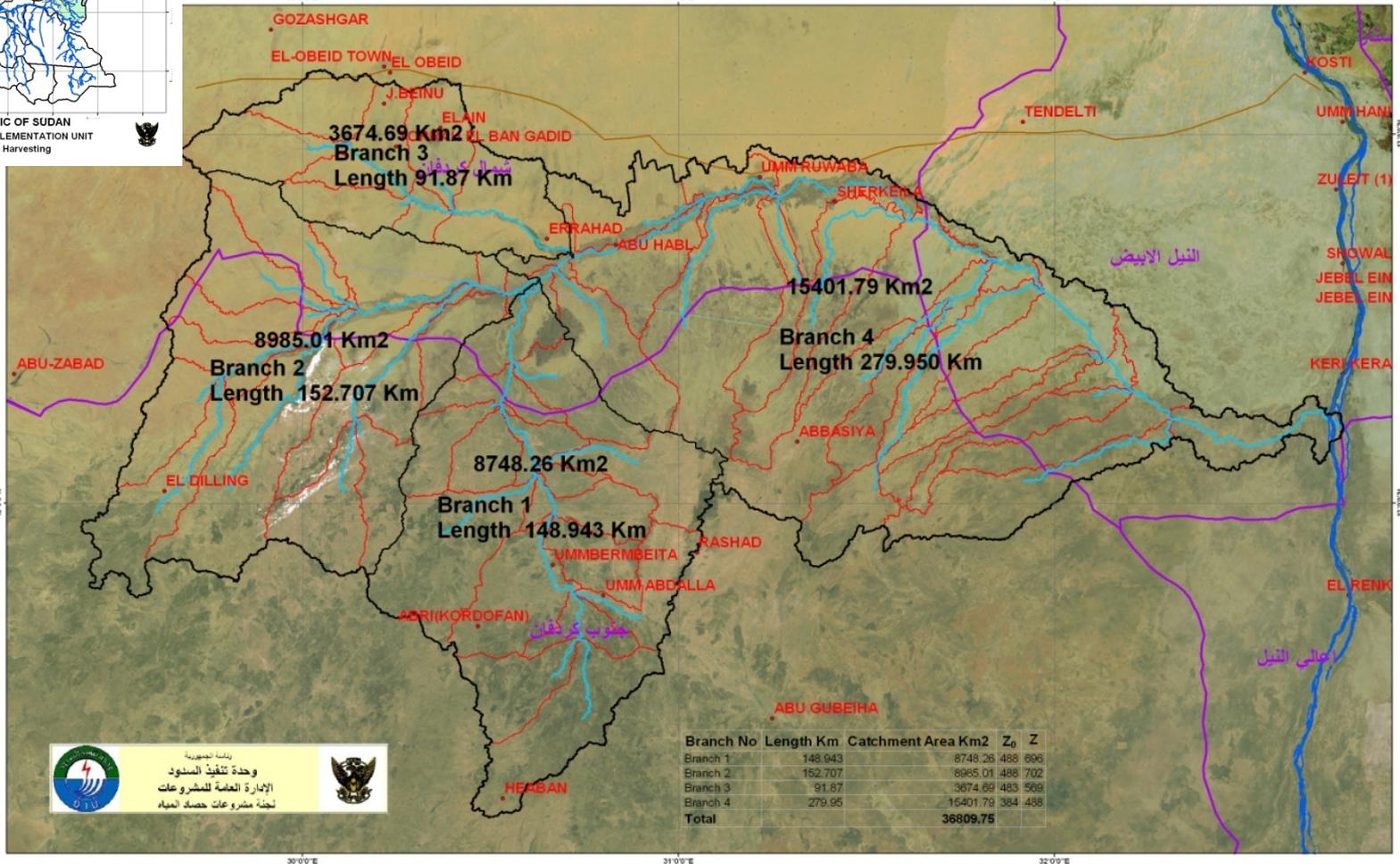
IWRM

تخريط الأودية

وادي ابو حبل



REPUBLIC OF SUDAN
DAMS IMPELEMENTATION UNIT
Water Harvesting



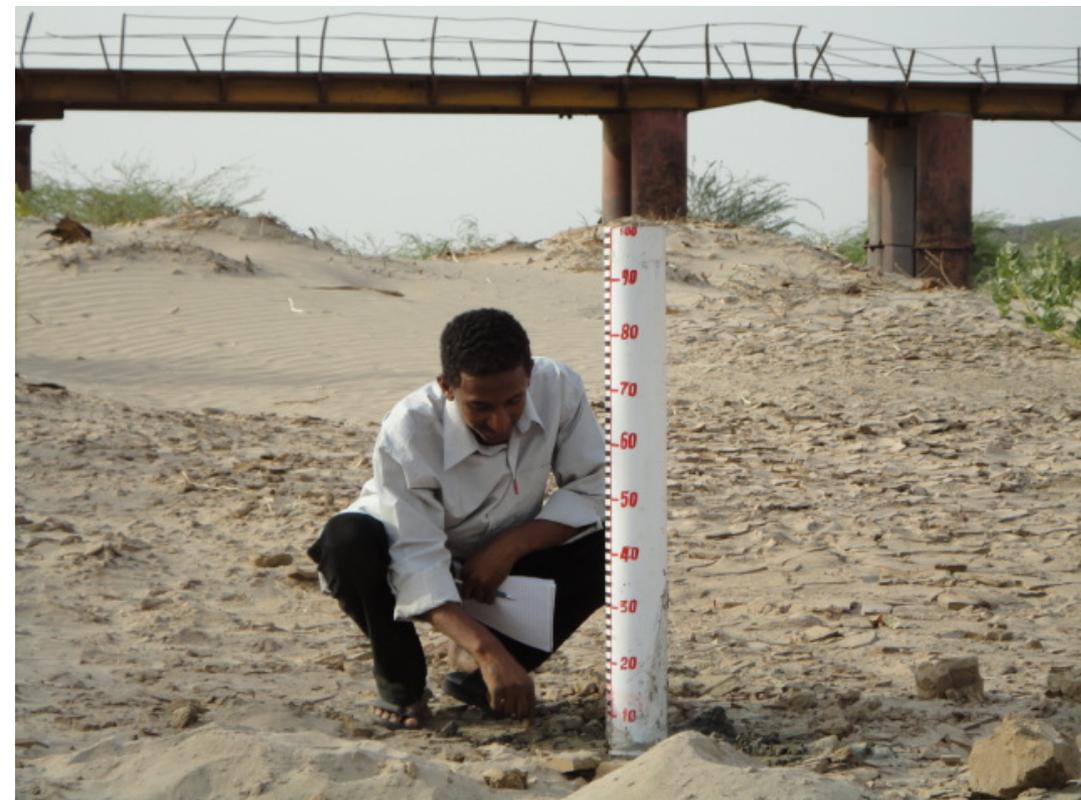
وحدة تنفيذ السدود
 الإدارة العامة للمشروعات
 لجنة مشروعات حصاد المياه

Legend

- State
- Nile
- Road
- Catchment
- SubCatchment
- Abu Habel
- Metstations



المحطات الهيدروميترية - البحر الأحمر



محطات المناخ - الدمازين



مشروع دراسة ترقية و تطوير مرافق المياه



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وحدة تنفيذ السودان
الإدارة العامة للمشروعات
وحدة حصاد المياه

دراسة ترقية وتطوير

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الرمال البطين

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دراسة الإدارة المتكاملة للموارد المائية لحوضي أبو حبل و بركة



Republic of Sudan

Ministry of Water Resources and
Electricity
Dams Implementation Unit

KHOR BARAKA INTEGRATED WATER RESOURCES MANAGEMENT PLANNING PROJECT



BASELINE REPORT

Prepared by



SHOURACONSULT



SWECO



Republic of Sudan

Ministry of Water Resources and
Electricity
Dams Implementation Unit

KHOR ABU HABIL INTEGRATED WATER RESOURCES MANAGEMENT PLANNING PROJECT



BASELINE REPORT

Prepared by

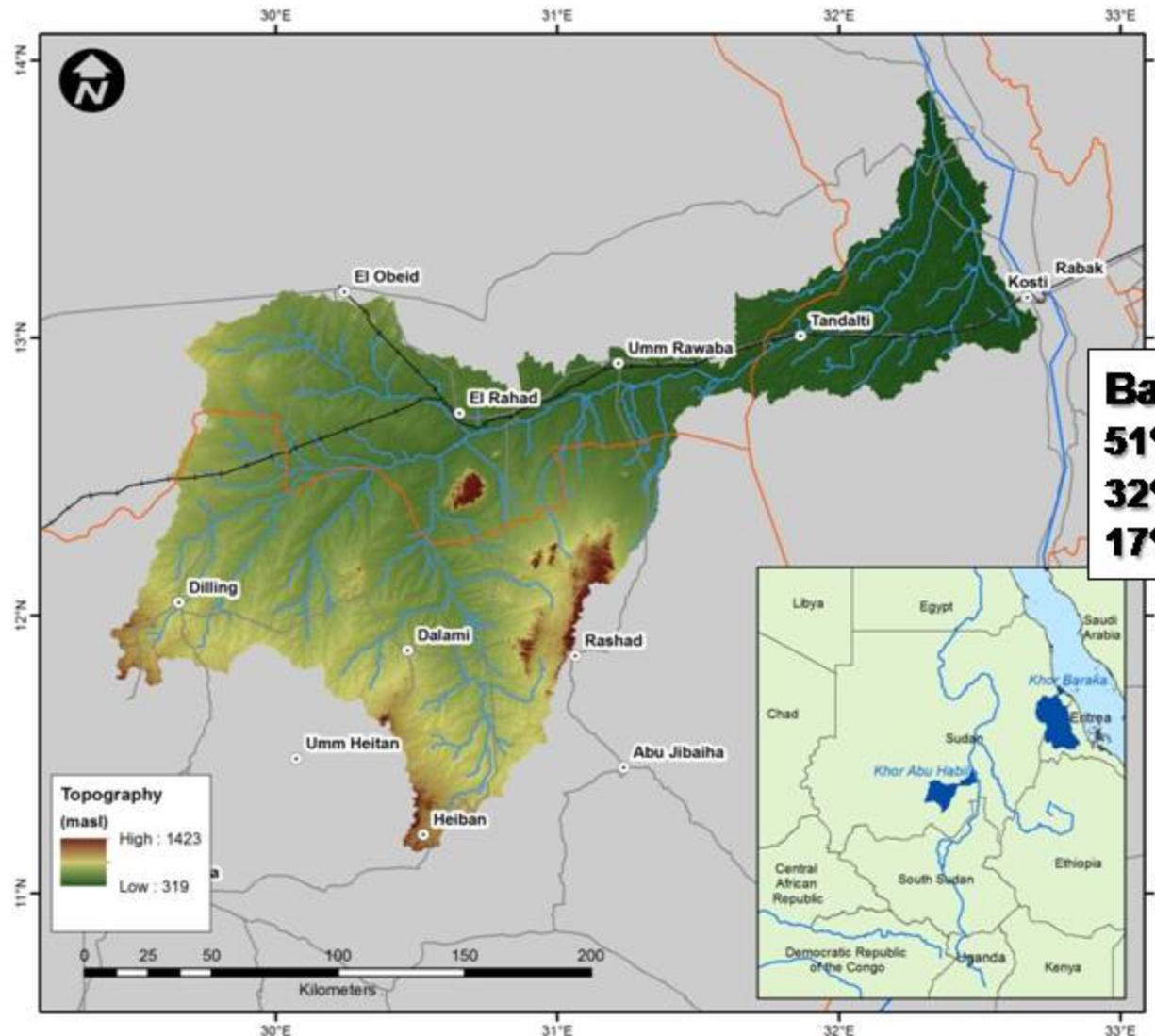


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Dams Implementation Unit – IWRM Studies for 2 Catchments



ABU HABIL

Basin Area ~34,000 km²
51% in South Kordofan
32% in North Kordofan
17% in White Nile

**Generated from a DEM
(USGS 2004)**

Development Goal

*The main development goal is to establish **sustainable management systems** and investment plans of selected watersheds in order to **improve the living conditions of the people**, enhance water supply, agricultural productivity, protect the environment, and reduce sediment transport and siltation of infrastructure.*

CONSULTANCY SCOPE & DELIVERIES

Development Analysis and IWRM Planning Study



BASELINE

Biophysical Description

Socio-Economics

Water Resources

State of Environment

Water Demand

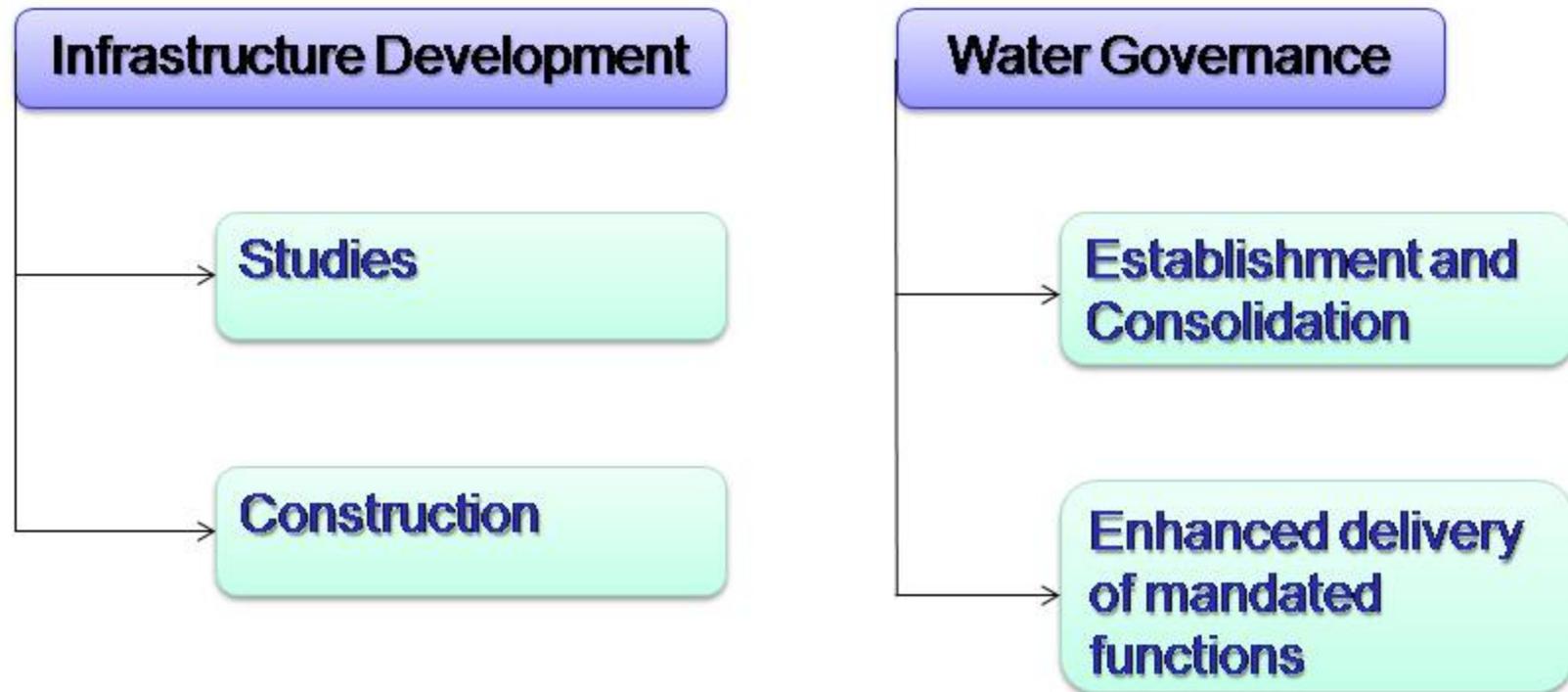
Water Governance

Phase 2 Development Scenarios

Methodology

1. Assessment of existing plans
2. Future water demand & balance analysis
3. Identification of large and small-scale projects
4. Construction of development scenarios
5. Multi-criteria screening-water balance, technical, env. Soc. Economic aspects
6. Ranking and scenario selection

STRATEGY FRAMEWORK



PHASE 3 – BASIN IWRM STRATEGY

Objective:

Translate Selected Options into a Strategic Framework and Implementation Plan

Expected output:

Khor Abu Habil IWRM Strategy 2013-2030

Option for Development

- Other Resources (Oil, Minerals: Gold)
- Regional Cooperation
 - Win-Win Projects (Sudan-Ethiopia)
 - Watershed Management
 - Nile DSS
- International Cooperation
 - Capacity building
 - Technology and Knowledge Transfer