



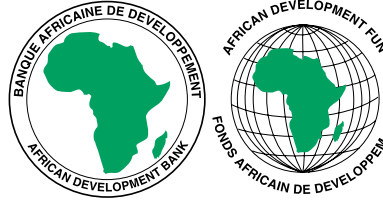
SUDAN COUNTRY OFFICE

# SUDAN: DARFUR INFRASTRUCTURE DEVELOPMENT REPORT



**African Development Bank Group**  
*East Africa Regional Development & Business Delivery Office*

**2016**



AFRICAN DEVELOPMENT BANK GROUP

SUDAN COUNTRY OFFICE

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2016

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## Preface

This analytical piece was prepared in the context of the Darfur Joint Assessment Mission (DJAM) in 2013 in which the African Development Bank (AfDB) was a leading participant. The DJAM entailed a 'needs assessment' in key sectors deemed critical for Darfur's early recovery and development. In this multi-donor exercise, the Bank led the assessment of the *Infrastructure Sector*, in a team comprising the World Bank and the United Nations Office for Project Services (UNOPS). The assessments informed the preparation of the Darfur Development Strategy (DDS) which is the principal document supporting the implementation of the Doha Document for Peace in Darfur (DDPD). As a major input into the preparation of the DDS in 2013, this infrastructure assessment report was one of the background materials for the Darfur Donor Pledging Conference in Doha in 2013, where USD 1.04 billion was pledged for Darfur's early recovery and development.

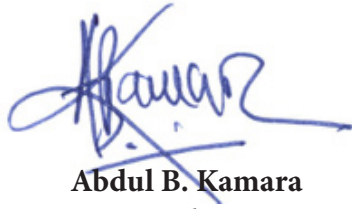
The *Darfur Infrastructure Development Study* sought to systematically identify, analyze and prioritize infrastructure interventions that are critical to Darfur's early recovery and development. It would positively impact other productive sectors such as agriculture and agro-industry, and subsequently the social sectors, and thus serve as an important framework for addressing the root causes of the conflict. In particular, the efficiency gains associated with all season feeder roads, reliable power and water supply systems would play incremental role in boosting agricultural production and productivity, and in generating forward and backward linkages that are crucial for the development of other productive sectors. It is in this context that the analysis of the three principal sub-sectors of transport, power, and water and sanitation was undertaken, with a proposed action plan that prioritizes infrastructure interventions in the short- to medium-terms. It also recommends infrastructure investment options, categorized into medium and long-term priorities.

Darfur's huge infrastructure deficit was indeed aggravated by the protracted civil conflict that is waning. The consequent weakening human and institutional capacity, low levels of economic activity and limited employment opportunities have grossly aggravated poverty, which is prevalent in the region. The report thus reveals a strong need for policy, institutional and regulatory reforms to build adequate capacity to manage and maintain infrastructure. It also proposes viable models of financing through Public-Private Partnerships (PPPs) for infrastructure development and management, particularly in the transport, water and power sectors. While prospects for successful PPPs may vary from one sector to another, it cautions that success will depend on the consolidation of peace and security in the region.

The report has been prepared at an opportune moment when the Government and development partners are embarking on final push for a complete end of the conflict. Beyond its primary purpose of enhancing policy dialogue, it will facilitate resource mobilization while serving as a framework for harmonizing and coordinating development

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activities. I hope that the Government will use this document in rallying support for Darfur's development as it seeks to consolidate peace in the region.



**Abdul B. Kamara**  
Resident Representative, Sudan Country Office (COSD)

## Acknowledgements

The preparation of this report would not have been possible without the coordinated and concerted efforts of the development partners in Sudan, including in particular the Bank as part of the process of operationalizing the Doha Document for Peace in Darfur (DDPD) signed in 2011. The operationalization of the DDPD entailed preparatory analytical work within the framework of the Darfur Joint Assessment Mission (DJAM) undertaken in 2012. During the DJAM process, the Bank took the lead in needs assessment in the infrastructure sector, while other donors took the lead in other sectors. These assessments were used to prepare the Darfur Development Strategy (DDS), which served as a background document for the Darfur Donor Pledging Conference in Doha in 2013.

The report prepared under the overall guidance of the Resident Representative of the Sudan Country Office, Dr. Abdul B. Kamara with the assistance of the task manager, Mr. Suwareh Darbo, Principal Country Economist and Messrs Kenneth Onyango, Principal Program Officer and Yousif Eltahir, Senior Country Economist. Their efforts are duly recognized and appreciated.

The Bank expresses its gratitude to all those who have contributed towards the production of this report. The partnership between the Bank and the United Nations Office for Project Services (UNOPS), and the World Bank in preparing the Situational Analysis and Results Framework Report on Transport, Water and Power Sectors was invaluable and is appreciated. The Bank's appreciation also goes to the various consultants who participated in the different stages of the DJAM process and the preparation of this report. Particular mention is made of Dr. Omer Gurham (DJAM Civil Aviation Consultant), Eng. Mohamed Algizoli (DJAM Transport Consultant), and Eng. Mahmoud Alsadiq Abass (DJAM Power Consultant), who carried out the initial analysis of the air; rail; road transport and power infrastructure, respectively.

Special thanks are due to officials of the Government for the encouragement and support, especially Mr. Hassan Jaffar, the Deputy Director General of International Cooperation at the Ministry of Finance and Economic Planning, as well as those of the Darfur Regional Authority (DRA) and the Darfur State Governments, especially H.E. Dr. Tadjadine Bechir Niam, former DRA Minister for Reconstruction and Development, who provided useful information that enabled the Bank to prioritize the programs and projects. The United Nations/African Union Hybrid Mission in Darfur (UNAMID) for all its logistical support, without which the Bank would not have been able to visit the Darfur region to consult with state governments and undertake the field missions.

Finally, special thanks should also go to Mr. Godfrey M. Onyango, Senior Infrastructure Consultant, who consolidated various DJAM reports and undertook additional research to supplement the information available from the DJAM process. Several experts from different departments of the Bank reviewed the Draft Final Report and provided very

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valuable comments and suggestions. They included Mr. Richard Malinga, Senior Transport Engineer, RDGS; Mr. Peter Lamisi, AHWS; Mr. Chanda Oswald Mulenga, OIC Director (AHWS); and Mr. Girma B. BEZABEH, Principal Transport Engineer, PICU1. Their contribution is appreciated.

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## Acronyms and Abbreviations

AfDB	African Development Bank
ADRA	Adventist Development and Relief Agency
ARC	American Refugee Committee International
AU	African Union
CAP	Community Action Plans
CATS	Community Approach to Total Sanitation
CBO	Community Based Organization/s
CFCI	Child Friendly Community Initiative
CIDA	Canadian International Development Agency
DLC	Darfur Land Commission
CPA	Comprehensive Peace Agreement
DPA	Darfur Peace Agreement
DDPD	Doha Document for Peace in Darfur
DFID	Department for International Development (UK Government)
DIU	Dam Implementation Unit
DIWC	Darfur International Water Conference
DJAM	Darfur Joint Assessment Mission
DRA	Darfur Regional Authority
DRDF	Darfur Reconstruction and Development Fund
DSG	Darfur Regional Governments
FAO	Food and Agricultural Organization of the United Nations
FSSS	Friends Society in Social Service
GDP	Gross Domestic Product
GOS	Government of Sudan
ICAO	International Civil Aviation Organization
IDPs	Internally Displaced Persons
IAS	International Aid Services
IFAD	International Fund for Agricultural Development
IRW	Islamic Relief Worldwide
IWRM	Integrated Water Resources Management
KV	Kilovolts
LCD	Litres Consumed per Day
TWG	Technical Working Group
Km	Kilometers

MDG	Millennium Development Goal/s
MOFNE	Ministry of Finance and National Economy
MIWR	Ministry of Irrigation and Water Resources
MW	Mega Watts
NAVAIDS	Navigational Aids
NCWR	National Council for Water Resources
NGOs	Non Governmental Organizations
NHA	National Highways Authority
NEC	National Electricity Corporation
NERC	National Energy Research Centre
NTMP	National Transport Master Plan
OCHA	Office for Coordination of Humanitarian Affairs (UN)
UN	United Nations
UNAMID	United Nations –African Union Mission in Darfur
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNESCO	United Nations Educational, Social and Cultural Organization
UNICEF	United Nations Children’s Fund
UNOPS	United Nations Office for Project Services
USAID	United State Agency for International Development
UWC	Urban Water Corporation
RHF	RUFAIDA Health Foundation
SDFO	Sudan Field Office of the African Development Bank
SDG	Sudanese Pounds
SEDC	Sudan Electricity Distribution Company
SETCO	Sudan Electricity Transmission Company
SRC	Sudan Railways Corporation
SCS	Save the Children Sweden
SWC	State Water Corporation
TWRO	Technical Water Resources Organ
WASH	Water, Sanitation and Hygiene
WB	World Bank
WES	Water and Environmental Sanitation
WHO	World Health Organization
WVI	World Vision International

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## Executive Summary

In 2003, civil conflict broke out in Darfur which left hundreds of thousands dead. In spite of concerted efforts by bilateral, multilateral development partners and political efforts to bring peace, the Darfur conflict is yet to come to a permanent end. This report builds on these efforts, especially the preliminary work undertaken by the Bank and other development partners as part of the process of operationalizing the Doha Document for Peace in Darfur (DDPD) signed in 2011. The operationalization of the DDPD entailed preparatory analytical work within the framework of the Darfur Joint Assessment Mission (DJAM) undertaken in 2012. During the DJAM process, the Bank took the lead in needs assessment in the infrastructure sector, while other donors took the lead in other sectors. These assessments were used to prepare the Darfur Development Strategy (DDS), which served as a background document for the Darfur Donor Pledging Conference in Doha in 2013. At the Doha Conference, donors pledged about USD1.047 billion to finance early recovery and development activities in Darfur. The biggest challenge for the government is to operationalize the outcomes of the Doha conference by developing implementable projects and programs.

This operationalization requires detailed analysis that will lead to the development of priority projects. It is in this context that a detailed study on Darfur's Infrastructure Development needs becomes important so as to systematically identify and prioritize bankable projects for financing by the Government of Sudan and development partners. In doing so, the study documents the state of the Darfur's infrastructure sector in the three categories of transport, power and water and proposes an action plan and priority interventions in the short to medium term. The study also recommends infrastructure investment options, categorized into medium and long-term priorities. The report focuses on the key infrastructure sectors in Darfur notably the transport, water and sanitation and power.

The assessment revealed that the main issues of the Sudanese airport systems, including those in Darfur relate to inability to comply with international civil aviation standards as propagated by the International Civil Aviation Organization (ICAO); lack of adequate airport infrastructure, inefficient maintenance and management systems; lack of functional capacity to manage systems; limited facilities at airport terminals resulting in congestion at terminal buildings; lack of flight information systems with own dedicated frequencies; lack of up-to-date functional information systems; inadequate support service systems and back-ups such as navigational aids (NAVAIDS). Above all, security concerns in terms of personal safety and aircraft fleet safety remain paramount.

Secondly, the water sector in Darfur access averaged 85% in 2000, but by 2006 it had declined dramatically to around 45%, due to a decade of devastating conflict. There is an even steeper decline in the number of households with piped borne water, which fell from 14% to 3%. This declined can be taken as an indication of the rapidly increasing demand being placed on urban supplies – as a result of very high levels of rural-urban

migration and displacement and of the under-capacity and under-performance of urban supply systems themselves.

Thirdly, access to sanitation in households using improved sanitation facilities averaged less than 30% in Darfur<sup>1</sup> compared to the North Sudan average of 39.9%. It is estimated that less than 5% of the population has access to flush latrines with septic tanks, most of whom are urban residents.

Fourthly, power sector installed capacity is about 73MW, the actual output is only 42.5 MW, implying that the installed capacity is underutilized or largely dysfunctional. As a consequence of the shortfalls, available output is barely enough to supply power for 6 to 8 hours per day, for lighting purposes only. This inevitably leads to load shedding in order to balance distribution. Current estimates show that about 87% of the country's population do not have access to electrical power or energy and hence dependence on biomass energy sources is as high as 92.6%. This is certainly not sustainable amidst the negative impact of climate change.

The study corroborates the findings of earlier assessments that Darfur's reconstruction and recovery needs stands at USD7.25 billion for the period 2013 to 2019. These needs are broken down into foundational short-term and medium and long-term priorities. Within the framework of foundational short-term activities (6-12months), the three infrastructure sectors under review (namely transport, water and power) will require USD 41.5 million. Regarding the medium to long-term needs, approximately USD2.025 billion will be required for transport sector. Similarly, increased access to water resources and sanitation is estimated at about USD1 billion over the six-year period of the Darfur Development Strategy (DDS). Finally, approximately USD1 billion will be required to expand power generation capacity and construction of distribution lines, institutional, legal and regulatory reforms, as well as human capacity development. Of this USD7.25 billion that is required, only USD1.047billion has been pledged so far, mostly by Qatar during 2013 Donor Conference in Doha.

The report has revealed that the state of infrastructure in Darfur is generally very poor and grossly inadequate, due to underdevelopment and the legacy of a protracted civil conflict. The consequence of this dilapidated state of infrastructure development is of low level of economic activity and limited employment opportunities and increasing poverty. The Government's creation of the Darfur Regional Authority (DRA) to consolidate peace and oversee early recovery and development process is an opportunity that needs to be exploited, in addition to the Doha framework. In particular, the pledges made at the Doha Conference in 2013 serve as a solid foundation on which development partners can now build to ensure implementation, and complement the efforts with capacity building and modest targeted operations given Sudan's external debt situation and lack of access to concessional financing.

<sup>1</sup> The 2008 Census showed a Darfur average of 45.83% (ND 51.2%; SD 42.2%; WD 44.1%) compared to North Sudan average of 56.9%.

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The report also reveals that to address Darfur's infrastructure gap, there is need to undertake policy, institutional and regulatory reforms in all sectors under consideration. Institutional capacities can be enhanced through technical assistance support, provision of equipment and training of trainers, so as to ensure that there is adequate capacity to manage and maintain the infrastructure that would be developed. Capacity building activities should include undertaking a manpower survey in order to determine priorities for manpower development; prepare and execute training program; development of institutional capacities at regional/state/local/community level for integrated water resource management; establish vocational training institutes in Darfur for technicians in water and power sectors.

Finally, regarding financing, various models of PPPs can be explored for the development and management of infrastructure in Darfur, particularly in the transport, water and power sectors, using the scenarios and options presented in the report. However, the prospects for successful PPPs may vary from one sector to another, and would depend on the consolidation of peace and the granting of unhindered access to regions of Darfur.

# 1. INTRODUCTION

## 1.1 Background and Objectives

In 2003, civil conflict broke out in Darfur which left hundreds of thousands dead. In spite of concerted efforts by bilateral, multilateral development partners and political efforts to bring peace, the Darfur conflict is yet to come to a permanent end. The report builds on these efforts, especially the preliminary work undertaken by the Bank and other development partners as part of the process of operationalizing the Doha Document for Peace in Darfur (DDPD) signed in 2011. The operationalization of the DDPD entailed preparatory analytical work within the framework of the Darfur Joint Assessment Mission (DJAM) undertaken in 2012. During the DJAM process, the Bank took the lead in needs assessment in the infrastructure sector, while other donors took the lead in other sectors. These assessments were used to prepare the Darfur Development Strategy (DDS), which served as a background document for the Darfur Donor Pledging Conference in Doha in 2013. At the Doha Conference, donors pledged about of USD1.047 billion to finance early recovery and development activities in Darfur. The biggest challenge for the government is to operationalize the outcomes of the Doha conference by developing implementable projects and programs.

This operationalization requires detailed analysis that will lead to the development of priority projects. It is in this context that a detailed study on Darfur's Infrastructure development needs becomes important as to systematically identify and prioritize bankable projects for financing by the Government of Sudan and donors. In doing so, the study documents the state of the Darfur's infrastructure sector in the three categories of transport, power and water and proposes an action plan and priority interventions in the short to medium term. The study also recommends infrastructure investment options, categorized into medium and long-term priorities.

The preparation of the report entailed reviewing and consolidating all DJAM reports and updates completed in 2012, as well as information on Darfur infrastructure produced in variable formats and disparate sources. It also entailed a review of previous works and assessments, existing strategic plans, and master plans relating to transport, water and power sectors. Information obtained from various reports of the DJAM process were supplemented by data and information obtained from key informants in Government Ministries, Departments and Agencies of the Government of Sudan. In addition further consultations were carried out with the Darfur Regional Authority (DRA), as well as with Darfur State Governments (DSG). This also entailed field missions to some of the Darfur States and detailed interviews and rapid assessments carried out in rural towns and communities. The final was subjected to thorough peer review that generated useful comments and suggestions that were taken into account during the preparation of the final report.

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The report is arranged in four chapters. **Chapter 1** summarizes the background and objectives of the study, as well as an overview of the Darfur conflict and the Darfur peace process. **Chapter 2** presents a situational analysis of the state of infrastructure in both Sudan and Darfur. The on-going and proposed interventions are presented in **Chapter 3**. **Chapter 4** presents an analysis of Darfur infrastructure needs, including strategies for the realization of medium to long-term priority projects, and proposes measures for sustainability and possible areas for Bank Group intervention. **Chapter 5** presents the conclusions and recommendations.

## 1.2 Overview of the Darfur Conflict

The secession of South Sudan and the residual post-secession issues continue to weigh heavily on the political, economic, social and security situation in Sudan. Progress on the political landscape has remained mixed, dominated by recurrent deadlocks and breakthroughs in some of the post-secession issues. This situation, in turn, has exacerbated external and internal threats to sustainable peace, security and stability since the approval of the Sudan CB 2012-1014 in October 2012. The external threats emanate largely from the failure to full implementation agreements reached with South Sudan, notably on oil, debt and arrears, security, border demarcation, and the final status of Abyei. The internal threats relate primarily to Darfur and the Two Protocol Areas (Blue Nile and South Kordofan States), and to a lesser extent the protests against Government austerity measures. In the case of Darfur, the infrastructure has been completely destroyed during the war making the sector one of the top priorities areas to address.

Darfur is a region in the west of Sudan sharing borders with Libya, Chad, Central African Republic and South Sudan. It covers an area of some 503,180 square kilometers (194,278 square miles). Darfur has a total population of about 8.2 million (2010 estimate). A majority of the population are agro-pastoralists with a mix of urban (19 per cent), rural (59 per cent) and nomads (22 per cent). It has a livestock population that is 3.78 times the overall human population. In West Darfur, livestock outnumbers humans by 9.7 times, while North Darfur has fewer livestock than people. Human and livestock population distribution of Darfur is shown in **Table 1**. Therefore, access to Darfur's land and water resources is a subject of conflict between sedentary crop producers, agro pastoralists and nomadic livestock farmers.

**Table 1: Darfur's Human and Livestock Population (2010)<sup>2</sup>**

State	Area (sq.km)	Human Population				Livestock Population
		State Population	Population Density (/sq.km)	IDP Population	Number of Major IDP Districts	
North Darfur	296,420	2,517,133	8.5	297,000 (12%)	16	2,209,726
West Darfur	79,460	1,377,140	17.3	899,611 (65%)	38	13,416,226
South Darfur <sup>2</sup>	127,300	4,309,227	33.8	1,016,692 (24%)	21	14,988,010
Total	503,180	8,203,500	16.3	2,213,372 (27%)	75	30,613,962

Source: Extracted from Darfur Water Conference Document, Khartoum Sudan, June, 2011

The Darfur region has had a long outstanding conflict whose roots pre-date the nineteenth century. Darfur was an independent territory (Darfur Sultanate) for several hundred years, until it was incorporated into Sudan by Anglo-Egyptian forces in 1916. The underlying factors of the conflict are complex, multi-level and exist in local, regional, national and international theatres simultaneously. For many years, the tension was mainly over land and grazing rights between nomadic people, and farmers from the Fur, Masalit and Zagawa communities. In early 2003, however, the Darfur conflict escalated into a civil war when two liberation movements, namely, the Sudan Liberation Movement and the Justice and Equality Movement began a rebellion in Darfur, calling for the redress of social and economic grievances and demanding greater political power. The rebel movements in Darfur, while having different ideologies, had the same objective, that is: “to bring to an end the region’s chronic economic and political marginalization”

As a result of the war in Darfur, the region has been in a state of humanitarian emergency since 2003. The ensuing insecurity coupled with very limited access to infrastructure has severely affected all aspects of life and raised the level of poverty. Limited public and private investment in social and physical infrastructure in Sudan as a whole and the Darfur region in particular, has led to huge infrastructure gaps, resulting in low or no connectivity of infrastructure services to critical core institutions, markets and centres. Due to the past neglect of the Darfur region, the state of infrastructure in that part of the country is worse than the national average resulting in a pattern of skewed development of the Darfur region and other states in comparison with some states in the northern part of Sudan.

### 1.3 Darfur Peace Process

The Darfur peace process was first initiated in 2003 by the President of Chad, with the support of the African Union (AU) and the United Nations (UN), the process led to the signing of the Darfur Peace Agreement (DPA) between the Government of Sudan and the Sudan Liberation Movement of Minni Minnawi in 2006. The DPA was, however, signed by only one rebel group, the Sudan Liberation Movement, and rejected by the Justice

<sup>2</sup> The figures correspond to the original three Darfur States before the creation of East and Central Darfur States

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and Equality Movement resulting in a continuation of the conflict. Subsequently, United Nations and the State of Qatar initiated the Doha talks in October 2009, culminating in the finalization of the Doha Document for Peace in Darfur (DDPD) at the All Darfur Stakeholders Conference in May 2011, which was subsequently signed in July 2011.

The DDPD provides for a Darfur Vice-President and an administrative structure that includes both the state structure and a strategic regional authority, namely, the Darfur Regional Authority (DRA). The DRA serves as the principal instrument for the implementation of this Agreement in collaboration with the Government of Sudan (GOS) and the international partners. It will also play a central role in enhancing implementation, coordination and promotion of all post-conflict reconstruction and development projects and activities in Darfur, and be responsible for cooperation and coordination among the States of Darfur.

The determination of the Sudanese Government, the Darfur Regional Authority and other actors to implement the DDPD is very encouraging. In this regard, it is worth noting that the Sudanese Government has already made available to the Darfur Regional Authority the first tranche of US\$ 200 million, out of the total obligation of US\$2.65 billion under the DDPD. Also, worth noting is that at the International Donors Conference for Darfur held in Doha, Qatar in April 2013, the international community pledged approximately US\$1.047 billion towards the reconstruction of Darfur and created the Darfur Coordination Board for Recovery, Reconstruction and Development. The Board comprises the State of Qatar, Government of Sudan, Darfur Regional Authority (DRA), the United Nations, and other development partners. Furthermore, the establishment of the United Nations Fund for Recovery, Reconstruction and Development in Darfur (UNDF) was also agreed upon.

## 2. SITUATIONAL ANALYSIS OF THE STATE OF INFRASTRUCTURE

### 2.1 The State of Sudan's Infrastructure

According to the Africa Infrastructure Country Diagnostic (AICD) Report for Sudan (2011), addressing Sudan's infrastructure challenges will require sustained expenditure of almost \$4.2 billion per year over the next decade, mainly for capital investments. In terms of the size of the economy that level of infrastructure needs would be equivalent to just over 20 percent of gross domestic product (GDP). While this is not unthinkable of, as it is comparable to the 15 percent of GDP China has been investing in recent years on infrastructure; the report however indicates that this would be an ambitious target for Sudan as it would represent almost tripling the recently observed annual average of infrastructure spending (of about 7 percent of GDP); with water and transport accounting for 80 percent of the spending needs.

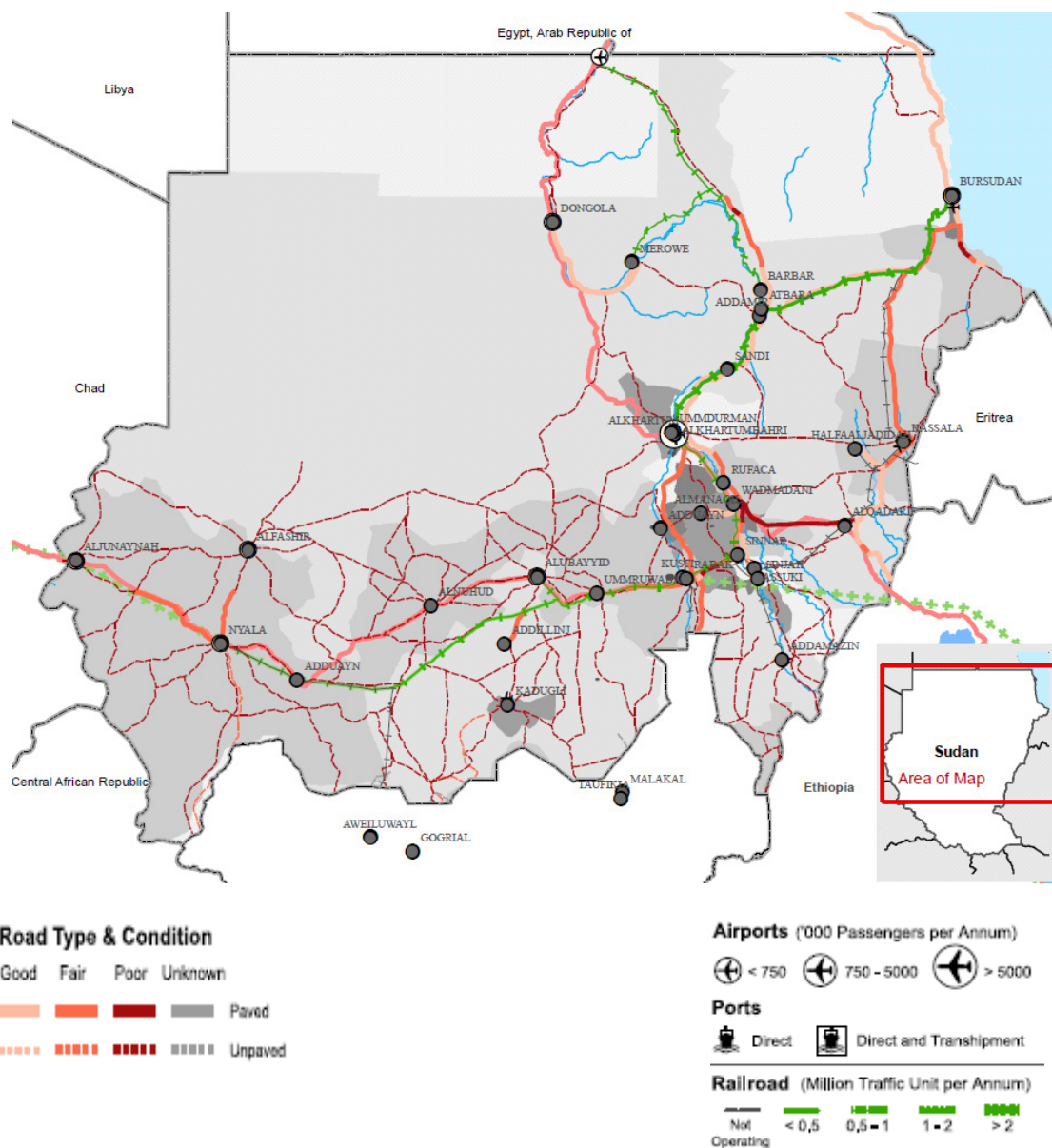
The AICD report further indicates that Sudan already spends approximately \$1.5 billion per year on infrastructure, equivalent to about 6 percent of its GDP, and that two-thirds of Sudan's spending consists of investment, with Chinese funds accounting 40 percent of investment finance. However, private investment in Sudanese infrastructure is also significant, at 23 percent of the total, while official development assistance (ODA) is negligible. It is further stated that Sudan's annual infrastructure funding gap is \$2.9 billion per year, equivalent to almost 14 percent of its GDP. Most of the funding gap is associated with the water and transport sectors, each of which is more than \$1 billion short of resources. But these gaps could each be reduced by half by judicious choice of lower-cost technologies for water and sanitation services and road surfacing. Whereas the AICD report indicates there is no funding gap in the power sector, due to the relatively high level of spending in recent years and the magnitude of inefficiencies that could be captured to bolster sector finances, this cannot be said to be true in the case of Darfur as it will be elaborated in this report..

To bridge the funding gap, the report suggests, Sudan could build on its existing success in capturing infrastructure finance both from China and the private sector. According to the report, Sudan has done quite well in attracting about 1 percent of GDP in private investment for infrastructure; although a number of other African peers have done even better, capturing two to three times as much in proportional terms. *However, the AICD report suggests that the largest funding gaps in transport and water may be less amenable to private finance. That one option would be for Sudan to draw increasingly on its Chinese and Arab partners to support transport and water investments, and allow the private sector to play a larger role in the power sector, where it has not been active to date.* The AICD report concludes that the funding gap remains substantial relative to the Sudanese economy.

Furthermore, the AICD report points out the fact that Sudan's transport infrastructure is unevenly developed (*see Figure 2.1*). That despite a few road corridors, a large share of Sudan is unconnected or lacks paved roads and road density in Sudan is among the lowest in Africa and the world. The existing road arteries are centered on Khartoum as the hub. One artery connects Khartoum with the coastal gateway of Port Sudan, a second connects Sudan with Egypt and North Africa, a third connects Khartoum with the Eritrean border, and a fourth connects Kordofan with Khartoum and a fifth leads to Ethiopia. Connections to other parts of Sudan, including Darfur are fragmented resulting in little traffic overall.

**Figure 2.1: National and regional transport network in all parts of Sudan**

Source AICD Sudan Report (2011)



The rail network consists of nearly 2,500 miles of single-track railroad that radiates from Khartoum. One line runs from Khartoum to Atbara where it splits into two lines, one running from Atbara to the Port Sudan on the Red Sea and the other running from Atbara to the border with Egypt. From Khartoum, a rail line runs from North and South Kordofan to Nyala in South Darfur. With regard to air transport, Sudan as a whole has five airports which are designated as international airports and are in Khartoum, Port Sudan, El Obied, Nyala, and El Fasher, with the last two being situated in the Darfur region. Most of the airports are considered to be financially unviable, probably due to limited flight operations<sup>3</sup>. This manifests itself in a wide array of issues adversely affecting their operation, such as poor equipment facilities due to inadequate maintenance, and lack of management systems. Khartoum has developed as an international gateway, but as will be discussed later, there are limited air services linking Darfur and challenges include the need to raise air safety standards. Power infrastructure is developed only around select urban centers. The national power grid covers limited areas and there are no cross-border interconnectors. In addition, power infrastructure is primarily focused on hydropower, with some thermal generation capacity. In recent years, Sudan has benefitted from an increase in capacity, but there is an even greater hydropower potential that could be exploited.

## 2.2 The State of Infrastructure in Darfur

In the case of the Darfur region in particular, DJAM reports indicate that the state of infrastructure in Darfur is generally very poor and grossly inadequate and that lack of good infrastructure in Darfur presents enormous challenges that include: geographic isolation, long distances to markets, inaccessibility to education, health and water facilities, and in some cases weak governance. As a consequence of poor or lack of adequate infrastructure facilities and services, economic activity has barely kept pace with growth in population, leading to limited employment opportunities. This section of the report examines the state of infrastructure in Darfur relating to three sectors namely: transport, water and power sectors. The transport sector is categorised as road, rail and air transport

### Transport

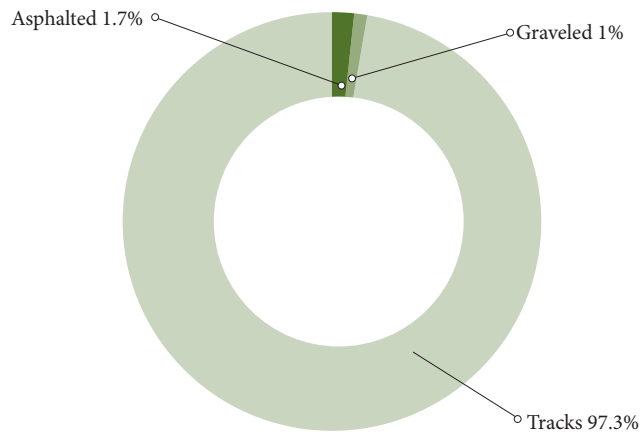
#### *Road Infrastructure*

In order to address the problems of geographic isolation, access to markets for agricultural produce, access to health facilities and poverty reduction, the road subsector has been accorded top priority. Roads are also considered vital for effective administration and control. Whereas Darfur appears to have an extensive road network (*see Figure 2.2*), most of it is in a dilapidated state and virtually impassable. The Situational Analysis and Results Framework undertaken in November, 2012 indicated that the road network in the Darfur region covers over 12,000km. However, only 200km are asphalted and only 100km of the network are gravelled, while over 10,000km remain in a state of disrepair, some only

<sup>3</sup> Sudan National Transport Master Plan 2010



Figure 2.3: Proportions of Different Road Surfaces in Darfur



Sudan National Highway Authority/Darfur States Ministry infrastructure

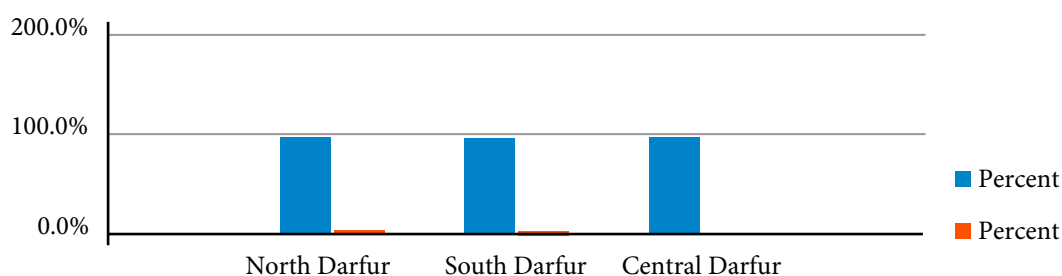
existing as tracks, which become virtually unusable during the rainy seasons. This sad state of affairs is diagrammatically depicted in **Figure 2.3**, which shows that only 1.7% of the road network in Darfur is paved; about 1% is graveled, while tracks comprise 97.3 % of the network.

This is further illustrated in **Figure 2.4** which shows the proportion of paved and unpaved roads in the former three Darfur States, namely; North, South and West Darfur, prior to the creation of two new states. As can be seen from this figure, 96%, 97.6% and 100% of the roads in North, South and Central Darfur respectively, are not paved. The portions paved are 4%, 2.4% and 0%, respectively.

With regard to the actual condition of the road network, in a list documented by the National Highway Authority (NHA), the Darfur region registers some of the most extensive network of bad roads. For instance, the El Nuhud to Nyala via Babanousa and Ed Da'ain road sections, a major inter-state link representing some 436 kilometres, are un-paved and hardly passable. The road section from El Fasher to El Geneina, some 328 km is virtually impossible to navigate or drive. Likewise, the road from Zalingei to El Geneina, some 175 km is in a severe state of disrepair, restricting movement, the conduct of basic economic activity and inter-state trade between the two states of West Darfur and Central Darfur.

The road systems in Darfur are, therefore, in a dilapidated state of repair and require major rehabilitation or reconstruction. The situation is not helped by the fact that the National Highway Authority (NHA), responsible for development and management of the national highway network, and the Darfur State Governments, responsible for intra-state roads, are faced with severe financial, human and technical capacity constraints. Furthermore, private sector is not yet fully developed to take on road construction and maintenance tasks. The prevailing insecurity has further complicated matters.

Figure 2.4: Paved Versus Unpaved Roads in Darfur<sup>4</sup>



Source: Data from Darfur State Governments

### *Civil Aviation Infrastructure*

The main airports in Darfur are located in Nyala (South Darfur), El Fasher (North Darfur) and El Geneina (West Darfur), with the first two being designated as international airports. In addition, there are seven mini-airports located in Kutum, Kabkabia, Al Lait, Hashkna, Buram, Garsila and Njama. These mini-airports are rarely used at the moment and as such their upgrading should only be considered in the long term, when the level of economic activities in Darfur will have escalated. However, of immediate concern is the lack of functional airstrips/airports in the capitals of the two newly created states, namely: Ed Daein (East Darfur) and Zalingei (Central Darfur). These towns are now only accessible from other regional towns by helicopter flights, as most of the roads are virtually impassable. Besides improving the road links, the development of airports for these two cities should also be a priority.

The main issues of the Sudanese airport systems, including those in Darfur, relate to inability to comply with international civil aviation standards as propagated by the International Civil Aviation Organization (ICAO). General problems experienced at these airports and airstrips include lack of adequate airport infrastructure, inefficient maintenance and management systems, lack of functional capacity to manage systems, limited facilities at airport terminals resulting in congestion at terminal buildings, lack of flight information systems with own dedicated frequencies, lack of up-to-date functional information systems, inadequate support service systems and back-ups such as navigational aids (NAVAIDS). Above all, security concerns in terms of personal safety and aircraft fleet safety remain paramount.

To facilitate humanitarian relief operations, the African Union-United Nations Hybrid Mission in Darfur (UNAMID) mobilized resources for some critical upgrades in the system, including air traffic controls and some rehabilitation of the three major airports. Besides UNAMID air traffic operations, the private sector is the leading provider of air transport services but with limited coverage. However, air transport services provided by private companies are said to be expensive and not easily afforded by a large segment of the population in Darfur. The capacity to transport larger numbers of passengers is said to

<sup>4</sup> Refers to state of networks before the 5-State formation

be far below demand within the region<sup>5</sup>. Moreover, by the year 2007, passenger terminal capacities at some of the airports in Sudan as a whole and in Darfur region in particular, were either nearing or had passed saturation point, as shown in Table 2.1 below. Passenger terminal capacity at Khartoum and Nyala airports, for example, are nearing saturation points while at El Fasher, demand is five times the available terminal capacity.

**Table 2.1: Passenger Terminal Capacity Analysis**

Airport	Terminal Building Area (m2)	Capacity (annual Passengers)	Annual Air Passengers 2007	Demand vs. Capacity
Port Sudan	3,822	546,000	156,120	0.29
Dongola	2,266	323,714	9,62/5	0.03
Kassala	561	80,143	656	0.01
Khartoum	13,910	1,987,143	1,825,549	0.91
El Fasher (North Darfur)	127.5	18,214	95,158	5.22
El Obeid	600	85,714	29,675	0.35
Damazine	230	32,857	8,168	0.25
Nyala (South Darfur)	860.25	122,893	110,968	0.90

Source: Sudan National Transport Master Plan

The demand for air transport services at major airports in Sudan including those in Darfur in the post-conflict period has been projected to grow tremendously over the next five years and beyond. It is anticipated that demand will not only be determined by commercial orientations and or trade, but also by the needs of peace-keeping operations, support to relief and recovery operations, the return of IDPs, and urgent rehabilitation works involved in economic development activities. As depicted in **Table 2.2**, passenger traffic at all the three main airports in Darfur, namely: Nyala, El Fasher and El Geneina are expected to almost double between 2011 and 2021. In the case of El Obeid, however, it is forecast in the National Transport Master Plan (NTMP) that there will be an extensive loss of traffic once peace returns and the UN departs; as UN operations related to humanitarian aid activities presently depending upon aviation, will slowly drop over a period of time.

**Table 2.2: Forecast of Passenger Traffic at Major Airport in Sudan**

Airport	2007	2011	2016	2021	2016	2031
Khartoum	1,843,917	2,350,505	3,663,734	6,069,064	9,177,800	12,959,030
Port Sudan	156,120	217,148	368,488	587,248	842,252	1,130,851
Nyala	110,968	145,621	233,805	403,516	685,149	1,103,439
El Fasher	95,158	119,209	173,342	266,755	407,847	573,108
El Geneina	46,977	53,971	61,302	77,797	116,184	163,262
El Obeid	29,675	34,171	34,626	29,288	21,254	16,740

Source: Sudan National Transport Master Plan (2010)

<sup>5</sup> DJAM Situational Analysis Report

Similarly, two major airports in Darfur, namely; Nyala and El Fasher, have been forecast to experience decline in cargo volumes handled as shown in **Table 2.3**. This decline is mainly due to the fact that UN cargo volumes are expected to reduce and eventually disappear when the conflict in Darfur dissipates. While El Geneina's is forecast to grow cargo traffic, the quantities are rather small.

**Table 2.3: Cargo Forecast at Major Airports (Tons)**

Airport	2007	2011	2016	2021	2026	2031
Khartoum	79,400	79,047	100,291	143,322	190,281	256,023
Port Sudan	380	573	1,040	1,851	3,131	5,020
Nyala	5,770	5,287	4,546	3,969	4,359	5,151
El Fasher	6,079	5,401	4,256	3,198	3,365	3,761
El Geneina	1,528	1,687	1,704	1,854	2,171	2,601
El Obeid	7,090	5,550	3,302	1,286	1,024	1,024

Source: Sudan Nation Transport Master Plan (2010)

### ***Rail Transport***

Rail transport is considered to be the third most important mode of transport in Darfur after road transport and air transportation, although it is rather limited in geographic coverage. The only existing rail link with Darfur runs from Babanousa in West Kurdufan State to Nyala in South Darfur. This rail line is said to be the only land access route available all year round to provide transport for goods, people and livestock to and from Darfur's vast region under reasonably safe and secure conditions. However, this single (1067mm gauge) line of approximately 375 km has been in a dilapidated condition due to lack of maintenance, but is currently undergoing rehabilitation. Generally speaking, the entire Sudan rail system has experienced a decline in traffic, partly due lack of resources for track maintenance and repair and partly due to competition from road transport. The rail traffic market share declined from 33% in 1997 to 25% in 2000 and to only 6% in 2005. As a consequence, about one third of the main lines of the Sudan rail network under the Sudan Railways Corporation (SRC), totaling 4,578km, are reported to have been closed. Capital investment and repair budgets are highly constrained to the point that in recent years SRC is reported to have received only one to two per cent of its requirements from the Ministry of Finance and National Economy (MOFNE). Moreover, SRC presently lacks a clear and cohesive strategy to upgrade, repair or abandon existing tracks. The process of line closure appears to have been done retroactively rather than based upon a business plan and analysis to match revenue, expenditure and investment with potential profitability.

Furthermore, the situational analysis and results framework undertaken in 2012 has indicated low availability of locomotive power and rolling stock in the entire national rail system. Maintenance of the rail systems is rarely done due to lack of spare parts, poorly equipped workshops, as well as the lack of a skilled technical workforce. Rail system infrastructure, including management and control systems are weak. Workshops such as the one located in Babanousa are ill equipped and ineffective, having been left to deteriorate.

Recently, however, Sudan Railways Corporation (SRC) has proposed upgrades to the lines between Babanousa and Nyala in order to increase speed and load efficiency along the total length of this rail line of 375 km. Rehabilitation or reconstruction of approximately 113 km of this section, at a cost of US\$0.4 million per km, has been completed using new rails and semi-ballast track, as a first phase. The second phase is to be completed within the next three years. It is expected that trainload capacity and speed will increase, resulting in higher performance of the lines after completion of the upgrades. In conjunction with the upgrade of Babanousa-Nyala section, there is need to upgrade the link between Babanousa and El Rahad in order to increase speed and loading capacity.

### *Water Infrastructure*

Water infrastructure includes (i) Bore holes, pumping facilities, water storages and distribution networks serving urban centres; (ii) Sanitation infrastructure serving urban centres; (iii) Dams, Hafirs<sup>6</sup> and other structures that serve dual water supply and water resource management purposes; and (iv) Water supplies to rural communities (in the form of shallow dug wells and hand pumps, mini-water yards and main water yards) or to IDP camps.

### *The Water Resource*

Darfur is largely semi-arid, or arid, with annual rainfall varying from under 200mm in the populated areas of North Darfur, to 800mm in some parts of Jebel Mara in the South and South West of the region. Surface water is relatively abundant in absolute terms but also highly seasonal in its availability and temporal distribution. Groundwater on the other hand is widely present in Darfur, year round, even if variable in quantity and accessibility. Overall therefore, it can be said that sufficient water exists in Darfur to meet the needs of Darfur's 8.2 million people (2010 estimate), but the process and transfer of water to the people remains a challenge.

Population growth, climate change, prolonged conflict, and rapid urbanization have combined to create conditions in Darfur that place the region's water resources under considerable strain. While raw data is scarce, the following general statements hold:

- Decline and variability of rainfall over the past 50 years has resulted in less dependable seasonal surface water availability, increased desertification, increased rates of surface water run-off, increased siltation rates and reduced rates of aquifer recharge.
- Over the past 30 years, climatic factors and conflict have driven rapid urbanization<sup>7</sup>, and more recently the concentration into urban or peri-urban camps of upwards of 1.7m conflict-affected people. This has resulted in unsustainable rates of local groundwater extraction in some areas. Climatic factors have also intensified migration of the camel nomads to South Darfur and Jebel Marra area putting more pressure on existing surface water infrastructure.

<sup>6</sup> Hafir: Shallow ground water reservoir with water treatment plant.

<sup>7</sup> The 2007 DJAM reported a doubling of Darfur's urban population since 2000. This analysis assumes a current urban population of 3.3 million, or 40% of the region's total population.

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### *Access to Adequate Water Supply*

The 2007 Darfur Joint Assessment Mission (DJAM) reported that access to adequate water supply<sup>8</sup> in Darfur had fallen sharply during the period 2000 to 2006. In 2000, access averaged 85%, but by 2006 it had fallen to around 45%. Within the overall trend, there was an even steeper decline in the number of households with piped borne water, which fell from 14% to 3%. This fall can be taken as an indication of the rapidly increasing demand being placed on urban supplies – as a result of very high levels of rural-urban migration and displacement – and of the under-capacity and under-performance of urban supply systems themselves.

**Table 2.4** below shows that in 2010, huge gaps remained in water coverage which reached as low as 25%, while average per capita water consumption estimates show that **IDPs** and people living in towns and cities in Darfur are better served<sup>9</sup>, the Darfur average is as low as 5 litres of water per person per day. **Table 2.5** meanwhile, shows that on average just 15% of water resource demand is met for humans and livestock in Darfur. It is important to note that the growing challenge of meeting urban water demand in Darfur is made more complicated by the presence of large IDP populations, whether located within the towns (e.g. Kass), or at a distance in geographically separate camps (e.g. Zam Zam, Kalma). Here it must be assumed that, while IDP return is and will continue to happen, at least a part of the population will become either a permanent addition to its host urban community, or a new urban centre in its own right. In this connection, the 2007 DJAM noted that IDP populations often have higher levels of access to water than either the rural communities from which displacement occurred, or neighboring urban centers.

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8 Note that the access to adequate water supply is different to access to improved water supply. Access to the former has fallen, while, as reported by the Darfur International Water Conference, access to the latter actually increased during the period of conflict – possibly reflecting the investment in WASH basic services for IDPs and other conflict affected groups outside of the main urban centres. In this regard, in 2011 WHO estimated that 85% of IDPs living in camps had access to “good quality water”.

9 This is most notable in North Darfur where average urban level of consumption is 40 litres of water, per person, per day

**Table 2.4: Total Water Supply by Different Sources, Population and Per Capita Consumption in Darfur**

State	Boreholes		Hafirs+Dams		Hand Pumps + hand dug wells		Total Supply (Mm3/yr) in summer time	Population		Per capita (LCD)	Coverage (%)
	No	Mm3/yr	No	Mm3/yr	No	M3/yr		Human	Livestock		
South Darfur	254	4.2	67	5.5	2514	2.71	12.41	3,342,235		6	30 %
North Darfur	153	2.35	76	7.83	1197	1.4	11.58	1,661,859		8	40 %
West Darfur	20	0.33	31	5.4	576	0.62	6.36	1,537,967		4	15 %
Darfur	426	6.88	174	16.73	4287	4.73	30.35	6,542,061		5	25 %

Source: Darfur Preliminary Water Assessment, World Bank, 2010

**Table 2.5: Water Availability and Demand**

State	Water Resource (WR) Available. (Mm3)			WR (Current supply) (Mm3)	WR Demand (Mm3)			% of demand met	% water demanded vs. availability
	Surface Water	Groundwater (sustainable)	Total		Human Drinking Water	Live Stock	Total		
South Darfur	823	1250	2073	12	14	76	90	13	4
North Darfur	103	106	209	12	7	42	49	24	23
West Darfur	4016	1010	5026	6	8	52	60	10	1
Darfur (Total)	4942	2266	7208	30	29	170	199	15	3

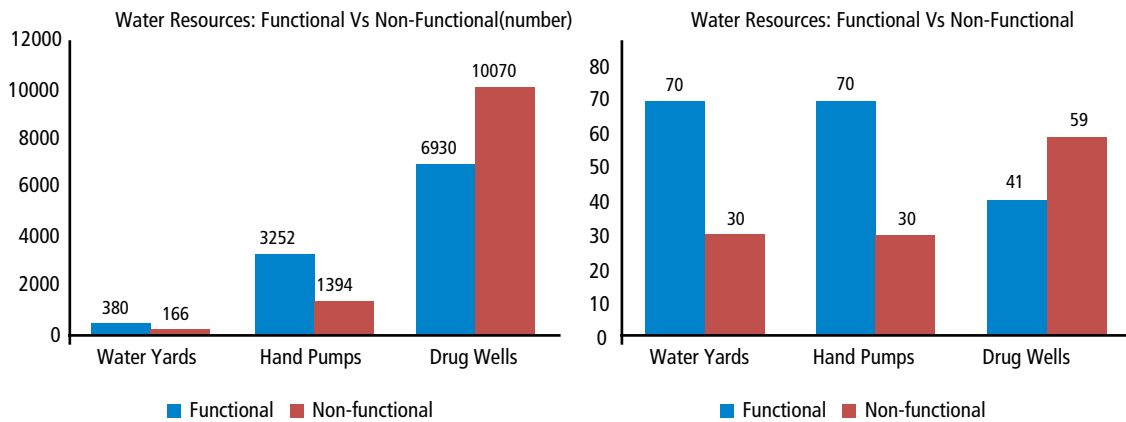
Source: Darfur Preliminary Water Assessment, World Bank, 2010

For the purposes of this report, it has been assumed that the picture painted by the 2007 DJAM more or less still holds true<sup>10</sup> that is, a declining portion of urban households (probably around 3%) has access to pipe in water supply of 80 LCD<sup>11</sup>. The rest rely on public tap stands, water vendors and private wells. This low level of access yields revenues that do not meet the cost of system operation, and which, combined with institutional under-performance, mean that neither water production nor distribution capacities have been maintained or strengthened in line with urban population growth.

<sup>10</sup> An assumption supported by the June 2011 Darfur International Water Conference

<sup>11</sup> The accepted "adequate" urban water supply standard, as opposed to 25 LCD for rural and IDP populations.

Figure 2.5: Existing Water Infrastructure in Darfur



Source: Darfur Preliminary Water Assessment, World Bank, 2010

### Access to Adequate Sanitation

According to the 2006 Sudan Household Health Survey, the proportion of households using improved sanitation facilities averaged less than 30% in Darfur<sup>12</sup> compared to a North Sudan average of 39.9%. In reference to the 2007 DJAM, it is estimated that less than 5% of the population has access to pour-flush latrines with septic tanks, most of whom are urban residents. It can be inferred that no more than 12% of the urban population have access to what could be described as adequate sanitation<sup>13</sup>. The remainder of the population rely on pit latrines of varying sophistication and levels of hygiene.

### Surface/Sub-Surface Water Infrastructure

It is estimated that across Darfur there exists more than 50 surface water dams and 100 *Hafirs*, and a scattering of other water harvesting schemes. As for many rural water supply schemes, these structures have suffered both destruction and lack of maintenance over the past 10 years and most of them are in need of water treatment facilities. Their restoration and an increase in the coverage of surface and sub-surface water infrastructure will be central to successful integrated water resource management in Darfur, ideally at the catchment areas. These will greatly contribute to the sustenance of peaceful co-existence among its people.

The water sector has suffered from lack of investments as well as maintenance of existing infrastructure. The graphs in **Figure 2.5** below illustrate this situation. Hafirs, not captured in the chart, are in equally bad shape with most of the 45 hafirs and 25 earth dams in North Darfur in need of rehabilitation; 75% of the 56 traditional chute hafirs without capacity and most of the 25 hafirs and 8 earth dams in West Darfur in need of rehabilitation. Water infrastructure is also highly susceptible to pollution and hygiene issues.

12 The 2008 Census showed a Darfur average of 45.83% (ND 51.2%; SD 42.2%; WD 44.1%) compared to North Sudan average of 56.9%.

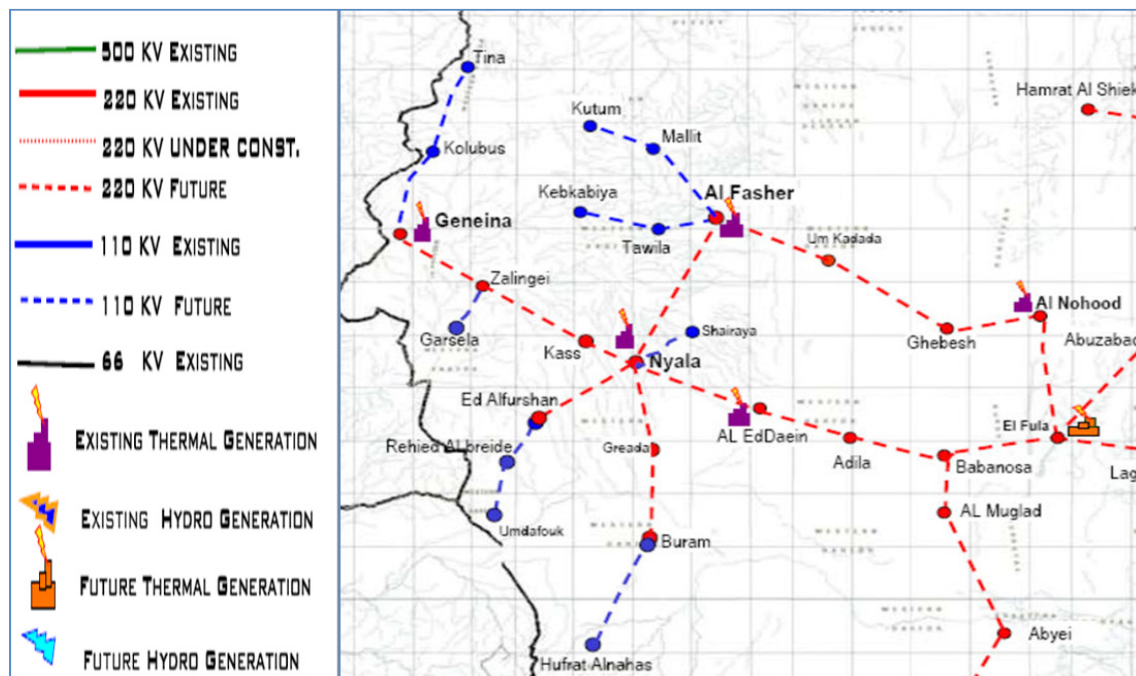
13 This figure does not tally with the 3% of the urban population having access to piped-in water supply: pour and flush latrines and septic tanks imply piped-in water.

The Dams Implementation Unit (DIU) of the Ministry of Water Resources and Electricity (GoS), which is responsible for construction and maintenance of dams and *hafirs* for water harvesting in the whole country, including Darfur, has enumerated major challenges that include: (i) inadequate funding; (ii) insecurity in Darfur region; (iii) lack of basic information; and (iv) weak basic infrastructure. As a consequence, the DIU has indicated that the major towns in Darfur lack Integrated Water Resources Management (IWRM) systems. The challenges highlighted by DIU and the resulting shortfalls were indeed confirmed during the field visits to Darfur. In almost all cases, the existing water facilities are inadequate and require expansion in order to meet water and sanitation requirements in towns and districts. A tour of the facilities also revealed a considerable level of dilapidation as a result of lack of resources for maintenance, coupled with inadequate technical and human capacity.

**Power Infrastructure**

The Darfur region is neither linked to nor powered by the existing power grid system in Sudan. Instead, some five isolated diesel powered generator plants located in El Fasher, Nyala, Ed Daein, El Geneina, and in Zalingei provide severely interrupted electricity service to the five state capitals, as shown in Figure 2.6 below. Electricity provided in a large number of the towns and rural areas is generated from smaller private generators at very expensive rates to the communities.

**Figure 2.6: Current and Future Distribution of Power Plants in Darfur**



Source: Ministry of Electricity and Dams

Figure 2.5 also shows the planned power distribution network in Darfur, which according to the Sudan Electricity Transmission Company Ltd, will be undertaken in the next 3 to 5 years. It is planned to link all the major towns in Darfur through a 220KV lines. In addition, it is planned to link the main towns in the neighbourhoods using 110 KV lines.

Existing electric power in Darfur is grossly inadequate and represents only a small fraction of the actual needs and demand. This is illustrated in Figures 2.7 and 2.8, depicting supply and demand on the one hand; generated capacity and required capacity on the other.

Moreover, the site ratings and actual ratings of the off-grid power systems in Darfur are quite different. This is illustrated in the Table 2.6 below, which depicts a wide variation between site rating in Mega Watts (MW) and the actual generation capacity. The variation is mainly attributed to fuel shortage, generator overheating, and mechanical failures (due to difficulty to obtain spare parts for old generators and maintenance challenges). During field visits to some of the power stations, a number of engines were found to be unserviceable and requiring spare parts or complete overhaul.

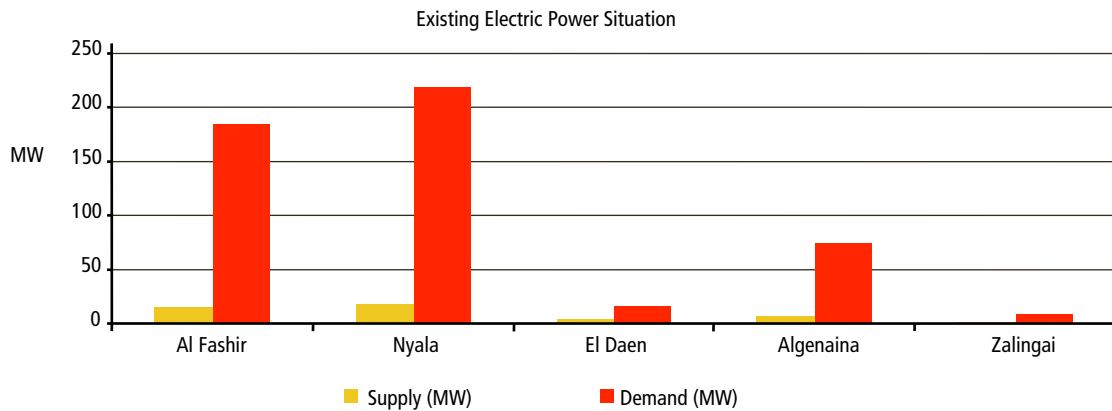
In El Fasher for example, 5 CAT type engines, each with generating capacity of 1.3 MW were out of service and therefore need to be overhauled, but lack of funds couldn't permit. In addition, two out of four Chinese Engines, were not operating due to lack of spare parts. At Zalingei, the situation was found to be even more acute as only one of the four generators (with total rating of 3.2MW) was operational; producing a mere 0.8MW to serve the entire town and yet Zalingei requires at least 4.5MW. In general, most of the infrastructure and equipment at the Zalingei power station were visibly in dilapidated state. As most of the equipment is quite old, such as the generators, it may be more prudent to replace them with new ones. There is also a need to rehabilitate the network, which will among others things entail installation of new transformers and insulators.

**Table 2.6: Rating of Darfur Off-Grid Power Stations (2012)**

Power Plant	Installed Capacity (MW)	Available Capacity (MW)	Customers
El Fashir (a, b)	22.48	15.4	18,500
Nyala	29.19	17.6	21,915
El Daein	7.90	1.5	1,600
El Geneina	10.365	7.0	7,500
Zalingei	3.2	1.0	890
Total	73.135	42.5	50,405

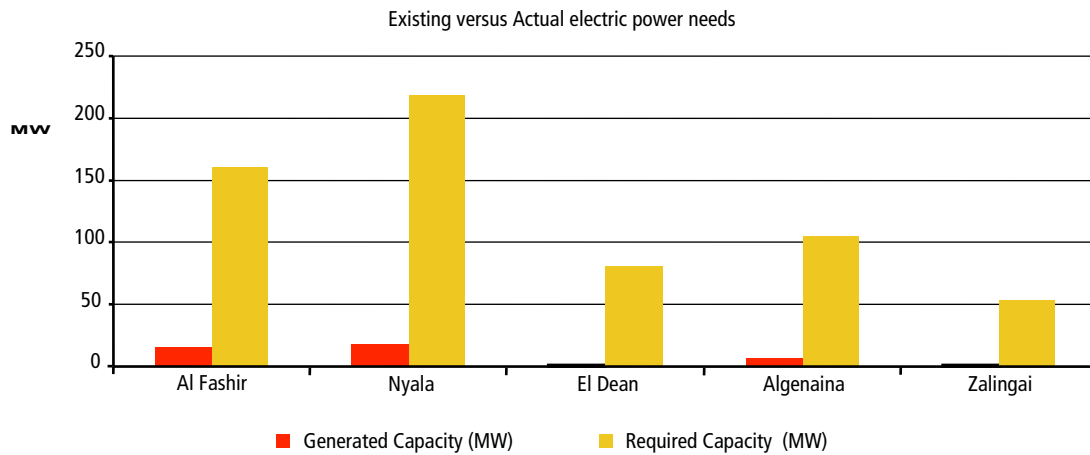
Source: DJAM 2012 Power Report

**Figure 2.7: Existing Supply Vs Electricity Demand in Darfur**



Source: General Directorate of Policies, Planning & Projects, Ministry of Electricity and Dams (MED) - Medium Term Power System Plan (2012 – 2016).

**Figure 2.8: Existing Generation Capacity Versus Required Capacity in Darfur**

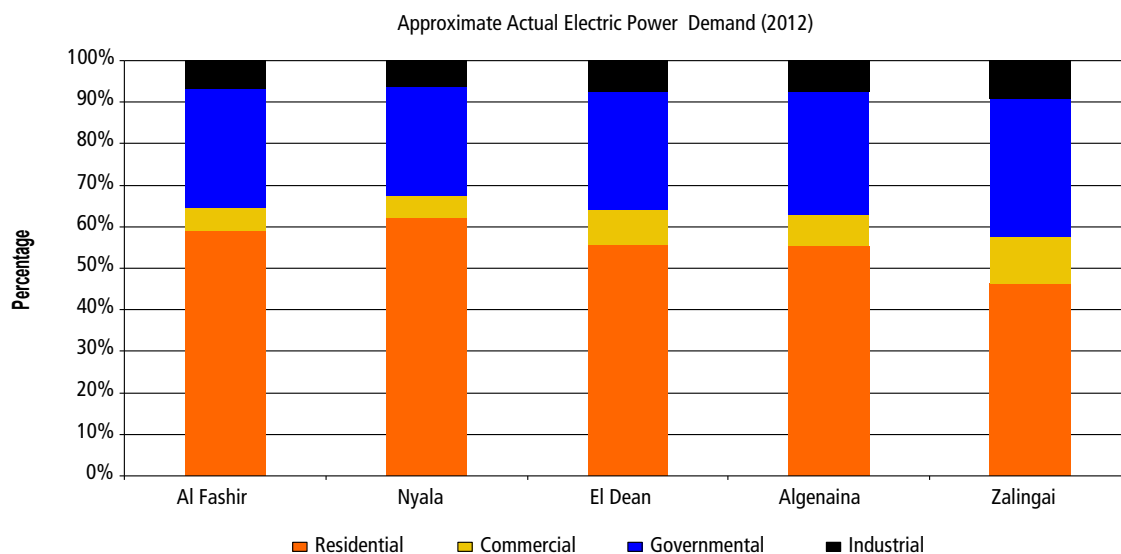


Source: Extracted from Study conducted in Darfur by Electrical Engineers (NEC)

**Power Usage in Darfur**

The National Electricity Corporation (NEC) estimated the total number of electricity-connected points in the Darfur region to be 9,680 (about 1.1% of NEC consumers in 2005). In 2012, the total number of connected points increased to nearly 50,405. While this is impressive and demonstrates clearly the demand for such services, the cost to users and for generation by suppliers is not sustainable by any measure. Already shown in Table 2.6 above is the fact that whereas the installed capacity is about 73MW, the actual output is only 42.5 MW. As a consequence of the shortfalls, available output is barely enough to supply power for 6 to 8 hours per day, for lighting purposes only. This inevitably leads to load shedding in order to balance distribution.

**Figure 2.9: Approximate Power Demand by Usage (2012) in Darfur**



Source: Extracted from Study conducted in Darfur by Electrical Engineers (NEC)

Depicted in **Figure 2.9** is the approximate power demand by category of usage. For now demand is dominated by residential and governmental uses. Limited industrial and commercial demand may be a reflection of the current level of economic activities. Due to limited availability, actual demand in the case of industrial and commercial usages may be suppressed. Lack or shortage of power for industry limits opportunities for increased economic activities, job creation and increased incomes.

### *Sustainability of Darfur Power Systems*

Lack of access to modern energy is considered to be one of the root causes of poverty in Darfur. Darfur population is predominantly rural and hence without energy in rural areas, clinics cannot operate and core municipal facilities such as schools cannot be lit. As a result, the region is plagued by deficiencies that severely limit opportunities to generate economic activities, jobs and additional incomes. Current estimates show that about 87% of the country's population do not have access to electricity or energy and hence dependence on biomass energy sources is as high as 92.6%. This is certainly not sustainable amidst the negative impact of climate change. The environmental effects of gas/fuel-powered generators, such as noise pollution and health related concerns to people who work in the plants, are an economic cost worth considering. A study conducted in Darfur by the Food and Agricultural Organisation (FAO) and the United Nations Environmental Programme (UNEP) in 2010 revealed that current wood harvesting consumption of wood fuels is causing widespread degradation and depletion of existing resources, particularly around IDP camps, and that sustainable forest management is highly essential. In Nyala for example, the annual accessible supply of potential wood fuel for 2011 was 52,000 tonnes but the demand was 366,000 tonnes. This situation clearly demonstrates the urgent need for alternative energy systems such as solar and efficient cooking systems at the bare minimum.

In conclusion, therefore, there will be need to explore alternative sources of energy, such as solar and geothermal, which are said to abound. In addition, the national energy policy has to be reviewed to make it responsive to the needs of the poor. Similarly, energy technology research, development and transfer should be responsive to the needs and capacities of the poor, in order to reduce the high women drudgery, worsening poverty in Darfur.

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## 3. ON-GOING AND PROPOSED INTERVENTIONS

### 3.1 Transport

#### *Roads*

The NHA's list of unpaved priority National Highways in the Darfur region includes the following roads: (i) En Nuhud to Nyala via Babanusa and Ed Daein 436 km; (ii) El Fasher to El Geneina 328 km; (iii) Zalingei to El Geneina 175 km; (iv) Nyala to El Fasher 213 km; (v) Nyala to Buram 153 km; and Kutum to El Fasher 110 km.

The construction and upgrading of El Fasher to Kutum (110km) road to asphalt standard was reported to have started two years ago with central government funding, on the basis of measured contract performance. This implies that after the down payment, the contractor only receives payment on the basis of measurement of the work done. During the field visit to Darfur in September 2013, the El Fasher-Kutum road project was inspected. It was noted that progress was very minimal, as the contractor had only been able to undertake the base construction of 13km of the road from El Fasher. The target completion date of 2014 was not met. Government officials attributed the delay mainly to the prevailing insecurity; however escalation of costs of building materials, cash flow problems, fluctuating exchange rates and limited budget were also cited among major problems. The Government has only budgeted SDG 5.4 million for the rehabilitation of the road from El Fasher through Kutum to El Tina, a distance of 360km. This amount of funding would not even be adequate to fully gravel the section between El Fasher and Kutum, which would require at least US\$25.2 million at an estimated cost of US\$240,000 per km<sup>14</sup>.

Upgrading to bitumen standard the road from Zalingei in Central Darfur to El Geneina in West Darfur, a distance of 175km is also underway. This road was fully completed in 2014. The road link from En Nuhud in Northern Kurdufan to El Fasher, through Um Kadada in North Darfur, a distance of 389km, was under construction for upgrading to asphalt standard and was completed in 2014. Although Nyala-Kass-Zalingei road was asphalted in 1983, it has since deteriorated. Rehabilitation of the section between Nyala and Kass (86km) has recently been completed, leaving the section Kass-Nertiti-Zalingei (112km) in need of urgent rehabilitation.

#### *Civil Aviation*

There are no major on-going civil aviation infrastructure projects in Darfur. In the recent past, UNAMID carried some emergency repairs to runway facilities and air navigation equipment in order to keep key airports and airfields in the Darfur region operational.

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<sup>14</sup> Government officials at the Ministry of Transport, Roads and Bridges estimate the unit cost of gravelling a kilometer of road in Darfur to be between US\$240,000 to US\$350,000 per km, and that of asphalted road at between US\$600,000 and US\$700,000 per km, depending on the terrain.

UNAMID has also erected terminal facilities at some airports and airfields and is currently engaged in the extension of the runway of the airstrip in Zalingei from 1,500m to 1700m. However, the plans for the new airports at Ed Daein and Zalingei have been completed.

### *Rail Transport*

The Sudan Railways Corporation (SRC) has embarked on the rehabilitation and upgrading of the rail line from Babanousa, through El Daein to Nyala (375km) in order to increase speed and load efficiency along the sections. Rehabilitation or reconstruction of approximately 113 km of the first phase from Babanousa to Abu Jabra has been completed using new rails and semi-ballast track. The second phase from Abu Jabra to Nyala requires US\$200 million, which is not yet available. It is expected that trainload capacity and speed will increase, resulting in higher performance of the lines after completion of the upgrades.

The following new projects are planned:

- i. Rail extension from Nyala through Kass to El Geneina (550km), requires funding. It understood that negotiations are ongoing with the Islamic Development Bank to reallocate US\$150 million that had been earmarked for the new Khartoum airport towards this project, whose total cost is estimated at US\$1.1 billion;
- ii. Feasibility and design studies for a rail extension from Ed Daein through Sheriya to El Fasher in North Darfur.

## **3.2 Water Sector**

In addition to the significant emergency assistance provided over the years by OFDA/ USAID, ECHO, CIDA, Italy, Ireland, etc., some of the new and on-going projects continually addressing humanitarian, recovery and development needs (such as capacity building and institutional strengthening) related to Darfur's water sector are:

- The African Development Bank (African Water Facility)'s \$4.5 million Darfur Water project for conflict resolution and peace-building was launched at the end of 2012. The project entails undertaking a number of priority water works, capacity building and the preparation of investment plans for 20 municipalities in the whole of Darfur;
- World Bank's \$1.8 million peace-building for development project;
- Japan International Cooperation Agency's \$1.7 million human resource development project; and,
- Government of China's bulk water supply project in Nyala.
- The UKs DFID, in partnership with UNOPS (the United Nations Office for Project Services) is implementing the urban water supply improvement interventions in the state capitals, El Fasher, in North Darfur, Nyala, in South Darfur, and El Geneina in West Darfur, as well as the town of Zalingei in Central Darfur at a cost of about GBP 10.5 million. It complements the on-going network expansion by the Darfur Regional Authority (DRA) and enhances the long term economic sustainability of

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the Urban Water Corporations (UWCs). In addition, other towns that are in need of reticulated water supply networks and bulk water provision would include: Mellit, Kabkabiya, Kass, Ed Dein and Buram. These projects are seen as urgent priorities to respond to the growth and development that has taken place in towns in recent years.

There are a number of useful examples of IWRM initiatives that are now set to coalesce into widespread implementation of IWRM in Darfur. The economic aspect of IWRM has been promoted by the camp-based surveys which demonstrate that up to 50 per cent of water supplied under the humanitarian program is either sold or used for commercial activities such as brick making in few locations. There are now nascent efforts towards cost recovery and an increased engagement in community water resources planning.

- UNICEF has supported detailed studies for the establishment of eight artificial recharge systems for the groundwater vulnerable IDPs locations in the three Darfur States. In cooperation with North Darfur Government, UNICEF has implemented a successful artificial recharge system to increase the groundwater storage at Zam Zam IDP camp near El Fasher (Figure 3.1).
- UNOPS already undertaking water projects in main cities and IDPs. In addition UNOPS has commenced training program for water management authorities including engineers; training program during the period September 2013 to June 2014.
- UNICEF also has a project handling sanitation in a number of IDP Camps in Darfur and is in talks with UNEP and UNOPS for a possible project in the rural areas.
- UNOPS and DFID have undertaken important analysis of the formal and informal water market in Nyala as part of the implementation of their Darfur Urban Water Supply Project. This project, which supports the larger DRA project that renews networks in the three largest cities in Darfur, sets the course to institutional development for applying IWRM in urban contexts in Darfur.
- UNEP is working with UNOPS and state governments to implement a planned program of dam building that meets strategic needs for water resources management.

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**Figure 3.1 Zam Zam Artificial Groundwater Recharge System**



The work has established good contextualized practice on assessing and managing social and environmental impacts of dam building.

- The Ministry of Finance and National Economy has indicated that the Islamic Development Bank (IDB) has earmarked US\$26 million for water harvesting projects in Darfur.
- Practical Action, an INGO, has a strong track record of building small dams in Darfur relying heavily on community mobilization for construction and management. One of the most critical aspects of this work is to set up equitable arrangements for upstream and downstream users in addition to migrating groups who pass through the area. As a result of this intervention, the dam at Shangil Tobay now distributes water over a large area for spate irrigation, improving food security in the village. In order to accommodate the concerns from the village downstream, an arrangement has been made for those farmers to cultivate in the irrigated area of the upstream village. This community-based and participatory approach to sharing the benefits of water is core to the IWRM ethos.

### 3.3 Power Sector

A number of projects are presently underway to add fossil, hydropower, and renewable generating capacities. The power system development plan shall tie together generation, transmission, and distribution expansions to ensure that all proposed capital investments are part of a medium to long-term, structured plan. In this regard, measures are underway to extend the national power grid to link all the five capitals of Darfur States using 220KV transmission lines as shown in *Figure 2.6*, within the next 3 to 5 years. It also planned to extend the grid to locality capitals using 110KV transmission lines. Two main projects are currently planned:

- i. Extending the national grid from Babanousa to Adila-Ed Daein-Nyala-El Fasher (570Km), with five (5) sub-stations. The total cost of this project is US\$240 million, but only US\$ 50.2 million has been obtained from the Islamic Development Bank to cover the first 95km from Babanousa to Adila in East Darfur. The remaining sections have no funding, but it was reported that the Kuwait Fund has been approached and negotiations were ongoing. Execution of this project is expected to take three years.
- ii. Extending the grid from Nyala to Kass – Zalingei – El Geneina (350km) with four (4) sub-stations. The total cost of this project is US\$ 205 million. The Ministry of Finance and National Economy has indicated that a financing agreement for US\$ 200 million has been signed with the Arab Fund for Economic and Social Development. The project is expected to be completed within two years, after completion of the first project.

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In addition to the transmission lines, funding is required to expand the distribution network within the cities. The distribution network in Adila, for example, will require US\$18 million. The above power grid extensions will be boosted by the power generation project at El Fula in Western Kurdufan, which is nearing completion and will add 405MW to the national grid when it comes into operation at the end of this year. The project is funded by the EXIM Bank of China.

Prior to the extension of the national power grid to reach Nyala, it is intended to increase thermal generation capacity in Nyala by 25MW within the next two years. It is planned to add 5MW within the next 8 months, by installing two thermal generators of 2.5MW each. This has been estimated to cost €5.3 million plus Sudanese Pounds (SDG) 6.8 million, but this funding is not yet available. It is then planned to add the remaining 20MW within two years, by installing four thermal generators, each with a capacity of 5MW, for a total cost of €27 million and this amount is not available either. In addition, the Government of Sudan plans to increase the contribution of renewable energy generation to 15% of all generation sources. In this regard, the following are planned:

- (a) **4 Solar Projects (Generation)** whose feasibility studies have been completed and preparation of tender documents were completed by end of October, 2013, as follows:
  - 5Mw for Nyala to cost of US\$13.35 million
  - 3Mw for El Fasher to cost US\$8.46 million
  - 2MW for El Geneina to cost US\$6.03 million
  - 1.75MW for Zelingei to cost;
- (b) **Wind Power Generation (20MW)** for Nyala at an estimated cost of US\$46.2 million and the feasibility study and technical specifications have been completed;
- (c) **Geo-thermal Generation** is planned for Tegabo and Medop in North Darfur and the contract for a detailed study has been awarded; and
- (d) **Rural Solar Home Systems**
  - Pilot projects being undertaken in four States involving 100 Solar Home Systems (SHS), 25 units per State;
  - Overall, 1.1 million home systems are planned by 2031 of which, 330,000 units will be installed in Darfur;
  - Tendering of the project is to commence soon; and
  - Each unit of 100 watts costs US\$750, hence the cost of the units in Darfur alone will cost US\$247.5 million.

## 4. DARFUR INFRASTRUCTURE DEVELOPMENT PLAN

### 4.1 Assessment of Needs

Needless to say, infrastructure development plan for Darfur has to respond to the assessed needs. In this regard, it is worth noting that the Darfur Joint Assessment Mission process identified all needs in order to transition Darfur from emergency humanitarian support to reconstruction and recovery, including infrastructure needs. In total, Darfur reconstruction and recovery needs have been estimated at US\$7.25 billion for the period 2013 to 2019. This has further been broken down under each of the three pillars as follows:

- Pillar I: Governance, Justice and Reconciliation estimated at US\$845 million;
- Pillar II: Reconstruction, estimated to cost US\$5 billion, of which US\$4.105 billion is for the three infrastructure sectors covered in this report; and
- Pillar III: Economic Recovery has been estimated to require US\$1.4 billion.

Out of the total needs of US\$7.25 billion, US\$ 177.4 million will be required for foundational and short-term activities, further broken down as follows: (i) Pillar I (US\$ 25,450,000); Pillar II (US\$132,900,000); and Pillar III (US\$ 19,050,000).

#### *Foundational Short Term Infrastructure Needs*

Within the framework of foundational short term activities (6-12months), the three infrastructure sectors under review (namely transport, water and power) have been allocated US\$ 41.5 million, whose broad outline appears in **Table 4.1**.

Since the foundational short-term activities are being handled by the DRA using the first tranche of US\$200 million received from the Sudan Government; they will not be the main focus of this report. At the time of preparing this report, the DRA had constituted a Technical Committee that was still in the process of identifying and costing projects relating to foundational activities. The report has instead focused on the medium to long-term needs, as identified in the DDS and whose broad outline is shown in **Table 4.2** and which form the backbone of Darfur reconstruction programme.

**Table 4.1: Short Term Foundational Activities, Pillar Reconstruction (Transport, Water and Power Sectors)**

Objective	Activities	Cost Estimate US\$
1. Improved physical access to goods, markets, and administrative and social services	1.1 Detailed assessment of transport needs and priorities	
	i) Assessment of trade infrastructure flows	
	ii) Feasibility studies and design of priority projects (market access and return sites in rural villages)	
	iii) Feeder roads development	750,000
	Rehabilitate and upgrade existing road network through spot improvements	10,000,000
	Reconstruction of administrative buildings in selected clusters using stabilised soil blocks	1,000,000
2. Increase access to improved water sources and sanitation	Increased coverage and access to safe water and sanitation services	20,000,000
	i) Rehabilitation of appropriate water supply systems, such as hand pumps and water yards in return, rural and nomadic areas	
	ii) Systematically support running costs for 80 water supply units across 5 States including fuel, labor , servicing	
	iii) Construction of new hand pumps in return, rural and nomadic areas	
	iv) Construction of new household and public improved latrines in return, rural and nomadic areas	
	v) Establish new water facilities at health centers	
	vi) Construct water and sanitation facilities at schools	
	Improved monitoring and evaluation of safe water use at State and community level	500,000
	i) Train Water, Sanitation and Hygiene (WASH) staff at state level and community members on Community Action for Total Sanitation (CATS) – training of 1000 persons per year for all 5 states	
	ii) Environmental sanitation department supported at community level	
	Water management is integrated into each State's poverty reduction strategies, with water policies revised to permit more decentralisation and the roles and responsibilities of government water officials clarified	250,000
	i) Carrying out training workshops, for 3-5 targeted Water and Environmental Sanitation (WES) units (Sector of State Water Corporation) per state per year are supported, including establishment of water testing facilities	
	ii) A workshop per state to revise and clarify roles and responsibilities of government water officials (50 participants per state)	
	iii) Dissemination of workshop results (1000 brochures per state)	
	Improved water supply infrastructure and distribution systems	250,000
	i) Development of urban water master plans	
	a) Detailed assessments and feasibility studies	
	b) Identification and costing of priorities	
	ii) Design and construction of specific facilities	4,500,000
	Departmental capacity-building plan developed; identification and costing of priorities	250,000
	Studies on water resource management	500,000
	i) Review existing water resources information systems and water monitoring structures in place	
	ii) Prepare comprehensive water resources information system strategy	
	Initiation of integrated catchment programmes in key sites	1,000,000
	i) Selection of sites	
	ii) Detailed assessments to determine priority works	
	iii) Design and implement plans	
	Waste management (solid , liquid) strategy designed	250,000
	i) Identification and costing of priorities	
	ii) Design and implement plans	
Increased access to electricity services	Survey of solar systems for pilots areas	250,000
	Initial small scale electrification as peace dividend: immediate procurement and installation of photovoltaic solar systems for selected public buildings and selected street lights	2,000,000
<b>TOTAL</b>		<b>41,500,000</b>

Source: Extracted from DDS Document

### Medium to Long Term Needs

**Table 4.2**, shows medium to long term infrastructure needs. Approximately *US\$2.025 billion* will be required for the transport sector, entailing rehabilitation and upgrading of roads linking state capitals to each other and within the districts; rehabilitation of feeder roads linking markets, schools and agricultural centres; rehabilitation and upgrading of sections of the rail network serving Darfur; and the rehabilitation, upgrading or construction of strategic airports and airfields. Improvement of air transport infrastructure in particular, is essential for constructive integration of the five Darfur states, as well as linking Darfur region with the other national strategic centres in the rest of Sudan.

Similarly, increased access to water resources and sanitation has been estimated to require in the region of *US\$1 billion* over the six-year period of the DDS. This estimate is consistent with documentation prepared for the Darfur Water Conference for Sustainable Peace that prioritized 65 projects requiring total funding of about *US\$1.0 billion*. The projects were proposed by the Government of Sudan, various United Nations agencies (UNICEF, UNOPS, UNEP, FAO, UNESCO, WHO, UNDP), UNAMID and NGOs. Two-thirds of the projects relate to water supply infrastructure.

**Table 4.2: Medium to Long-term Activities (Transport, Water, Power) Infrastructure**

Objectives	Key Outputs	Indicative Costing(US\$ million)
Improved physical access to goods, markets, administrative and social services	<ul style="list-style-type: none"> <li>• Several km of roads rehabilitated and upgraded in order to connect State capitals with each other on the one hand and State Capitals with Locality capitals on the other hand</li> <li>• Feeder roads linking markets, schools and agricultural centers rehabilitated</li> <li>• Babanousa-Nyala and Babanousa–El Rahad rail lines rehabilitated/upgraded</li> <li>• Locomotives and rolling stock provided</li> <li>• Airstrips rehabilitated/upgraded/ or constructed</li> </ul>	2,025
Increased access to water sources and sanitation	<ul style="list-style-type: none"> <li>• Build, rehabilitate and upgrade existing water and sanitation infrastructures and storage facilities, especially in IDP/refugee return locations</li> <li>• Development of urban master plans for water infrastructure, sanitation, drainage and waste management</li> <li>• Development of a programme for rural water supply (multi uses), basic sanitation and hygiene</li> <li>• Review of policies on water resources and access, delineating for federal and state level institutions</li> <li>• Construction of improved community water points</li> <li>• Rehabilitation and increment of water points along nomadic stock routes and in pastoral zones</li> </ul>	1,080
Increased access to electricity services	<ul style="list-style-type: none"> <li>• Generation capacity expanded</li> <li>• Kilometres of transmission and distribution lines constructed or rehabilitated</li> <li>• Independent regulator established</li> <li>• Comprehensive energy law adopted</li> </ul>	1,000
<b>Total</b>		<b>US\$ 4,105</b>

Source: Extracted from DDS Document

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Finally, approximately *US\$1 billion* will be required to expand power generation capacity and construction of distribution lines, institutional, legal and regulatory reforms, as well as human capacity development.

Details of the projects in transport, water and power sectors, as well as their costing are contained in *annexes 1-8*.

## **4.2 Strategies for the Realization of Medium to Long Term Need**

Sector strategies and priority projects are outlined below. In line with the Darfur Development Strategy, the medium-term covers the period 2013-2016, while the long-term covers the period 2017-2019.

### **Sector Strategies**

#### *Transport*

Whereas in the short term a number of measures can be put in place for rehabilitation of basic infrastructure in the transport sector, for the medium to long-term a strategic approach is essential. In this regard, there will be need to elaborate a ***Transport Sector Development Strategy*** for the Darfur Region. The strategy will enhance policy formulation in ranking of priority projects and adoption of funding strategies. Needless to say, the Transport Sector Development Strategy for the Darfur region would have to be in synch with the National Transport Master Plan (2010-2030). The NTMP, which was prepared before the secession of South Sudan will itself require updating. As part and parcel of the Transport Sector Development Strategy, appropriate policy and regulatory frameworks will have to be put in place. Such a strategy will also identify and assign roles and responsibilities to the various levels of government, in each of the sub-sectors.

With regards to the road subsector, the strategy would entail: (i) construction to paved standard, roads linking the five capitals of the Darfur States, and roads linking district capitals with the state capitals; (ii) construction of feeder roads that link remote areas with municipal townships, as well as repair and rehabilitate bridges specifically, those that pass through difficult and impassable valleys; and (iii) rehabilitation and dredging drainage systems along the road networks that tend to escalate flooding. Priority should be given to the road networks linking the five Darfur State capitals and those that link the state capitals with main municipalities of the districts; as well as feeder roads to provide links with major market centres and agricultural areas.

Rail transport remains a viable option for hauling heavy loads from Darfur to the northern part of Sudan and vice versa. In this regard, the following actions and interventions are necessary in the medium to long term:

- Support institutional development and maintenance of stations;
- Provision of new locomotive power and rolling stock in the system, as well as spare parts;
- Rehabilitation of the existing workshop facilities at Babanousa, in order to improve availability of locomotive power;
- Promoting private sector interests to invest in the railway transport industry through public private partnership mechanisms;
- Upgrading of existing railway lines to meet the tonnage capacity from what is currently available (3tons/m<sup>2</sup>, 30km/hr) to the standard (6tons/m<sup>2</sup>, 60km/hr), particularly between Al Rahud and Nyala. Given the potential hauling opportunities in trade from the Darfur region, rail network system could benefit tremendously from these interventions.

Air transport is a very important mode of transport for Darfur landlocked region. However, demand for air transport is not matched by availability and accessibility of services. In this regard, infrastructure investments should focus on air-safety and on essential capacity improvements for the air side (runways, taxiways, aprons, navigation and approach aids, etc), with a view to fulfilling ICAO requirements at all major airports. The development or expansion of terminal facilities at some airports will also be necessary. In summary, the following intervention measures will be necessary during the six-year reconstruction period:

- Capacity enhancements at major airports, namely; El Fasher, Nyala and El Geneina
- Human Capacity building through training;
- Plan development of intra-regional airports in Greater Darfur to include Kutum, Kabkabiya, Garsilia Zalingei and Ed Daëin; with the latter two being top priorities;
- The establishment and development of additional local airstrips in the Greater Darfur region, at places such as Muhajerria and Abu Jabra in East Darfur; Golo (Central Darfur); El Taweisha, El Atroon, (North Darfur), El Radoom (South Darfur) and Muzbat (North West Darfur); to serve as key connecting points to core regional centers;
- Establishment of effective flight information and safety management systems; and
- Construction of helipads, where necessary, for use in seasonal situations (rainy-season) to connect isolated towns and to link them with state capitals.

### *Water Sector*

There is extremely low water coverage and supply in Darfur. Increased availability and access to water could contribute significantly to conflict resolution. There is need to protect existing water resources and to develop potential ones. This will require strengthening institutions which are currently fragmented and too ill equipped to tackle water related

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challenges. Consequently, a strategic approach will be required in the development and management of water resources. This will entail:

- Prioritisation of critical watersheds and thematic areas relating to water;
- Formulation of a coherent water resources development and management strategy and action plans (short, medium, long term);
- Identification of areas for improved irrigation/agriculture through restoration/addition of water harvesting structures;
- Institutional development and capacity building programs at regional/state/local/community level for an integrated water resource management; and
- Support to regional/state/local authorities for the development and management of natural resources, especially in hotspots (traditional migration routes, areas where grazing and agriculture coincide, areas where traditional boundaries are contested because of desertification, displacement and areas with high population density).

Some of the specific activities have to be geared towards the following objectives:

- Building and rehabilitating water infrastructure and storage facilities, as well as better management through user associations for improved and sustainable rural water services;
- Expansion of water supply in urban areas by rehabilitating transmission and distribution networks, management of demand through water charges in order to improve access to drinking water in urban centres;
- Improved hygiene through enhanced access to safe sanitation, by expanding and rehabilitating infrastructure;
- Power Sector.

In the energy sector, medium to long-term strategic options would include the following elements:

- Rehabilitation and maintenance of the existing networks and plants to ensure consistent access to power in the short term, while long-term investments are being planned or implemented.
- Exploiting the potential of Solar Energy to provide access to cleaner energy and power in very remote locations, in the short to medium term;
- Exploring in the medium to long term, wind and geothermal energy options in the Jebel Mara area as an alternative to isolated diesel generator powered electricity to reduce production costs and pollution;
- Adopting strategies promoting Public Private Partnerships in power generation and distribution; in order to enhance efficiencies in the sector as a result of competition and pursuit of profit and to promote investment;
- Putting in place policies to encourage research and to promote investments in alternative sources of energy and technologies in the medium to long-term; and
- Linking of Darfur to the National Grid or regional grids through power trade, in the medium to long term.

Bearing in mind the above strategies, a pipeline of priority projects and their detailed costing and phasing of the selected projects appear in the annexes.

## Pipeline of Priority Projects

### *Road Projects*

Priority road links in the five Darfur States have been identified with detailed costing appearing in *annex 1*. In the first category are national roads linking the capitals and major towns of the Darfur States; falling under the responsibility of the National Highways Authority and for which all feasibility and design studies have been undertaken. In the second category are Darfur State roads, linking the capitals of the states with districts capitals and production areas.

#### Category I: National Roads in Darfur

- i. Upgrading and Reconstruction of sections of EL Fasher – Nyala Road (195km);
- ii. Upgrading to bitumen standard: En Nuhud – Ed Daein – Nyala (436km) in two phases:
  - Phase I, El Rahud- Ed Daein (272km)
  - Phase II, Ed Daein – Nyala (154km)
- iii. Upgrading to bitumen standard: Nyala - Ed El Fursan - Rahad El Berdi - Um Dafok (268km). Funding is available for 158km, leaving a funding gap of US\$71.5 million for the remaining portion, which will also entail design;
- iv. Rehabilitation of the tarmac road Nyala - Kass – Nertiti – Zalingei road (198km): Nyala – Kass (86km), remaining Kass-Nertiti- Zalingei (112km); and
- v. Construction of Nertiti – Geldo – Golo – Rokero (99km)
- vi. Rehabilitation of gravel roads:
  - Zalingei – Garsila – Foro Baranga (150km)
  - El Fasher – Kutum – El Tina (360km)
  - El Fasher – Kabkabiya – El Geneina (328km)
  - Nyala – Graidia - Buram – Radoom (303km)
  - Buram – Tulus – Ed El Fursan (127km)

#### Category II: Darfur State Roads and Bridges

- a. **North Darfur Road Projects**
  - i. Re-gravelling of Roads
    - 25 km of roads inside El Fasher
    - El Fasher – Mellit Road- Malha Road (189km)
    - El Fasher – Sag El Naam – Wada'ah –El Taweisha – Ailliet (268km)
    - El Fasher – Korma (95km)
    - 80km of roads in State Districts
  - ii. Construction of 4 Bridges (Hallof, El Nasser, Abu Shook); and
  - iii. Construction of 15 water-ways (Wadi) crossings.

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**b. South Darfur Road Projects**

Re-gravelling of the following roads:

- Nyala-Graida-Buram-Radoom (Approx.280km) – agricultural road
- Nyala – Ed El Fursan – Rahad El Berdi - Um Dafug (268km)
- Nyala- Abu Ajara-Tulus (129 km)
- Nyala – Kubum – Rahad El Berdi (180km);

**c. West Darfur Road Projects**

Re-gravelling of the following roads:

- El Geneina –Sirba – Se Leah- Kulbus (107km)
- El Geneina – Habila- Foro Baranga (166km)
- El Geneina –Masteri- Kango Haraza-Beida- Arara (152km)
- El Geneina -- Saraf Omra (90km);

**d. Central Darfur Road Projects**

i. Re-gravelling of the following roads

- Um Dhukun – Rahad El Berdi (110km)
- Zalingei - Garsila- Bindisi – Kabar – Silili - Um Dhukun (240 km)
- Zalingei – Saraf Omra (70km)
- Bindisi-Mukjar-Saraf Magin-Kubum (80km)

ii. Asphaltting 30km of Zalingei Street Network;

**c. East Darfur Road Projects**

Re-gravelling of the following roads:

- Road Networks in Ed Daein (30km)
- Ed Daein – Abu Jabra (126km)
- Ed Daein – Mahajería – Sheariya (137km)
- Mahajería – Labado – Um Kurdoos (147km)
- Ed Daein – Abu Matariq- Saimaha- Bahar El Arab (300km)
- Ed Daein – El Ferdous – Abu Ud- Kubbi (132km);

### *Railways*

As indicated earlier, rehabilitation and reconstruction of approximately 113 km of rail line from Babanousa to Nyala has been completed using new rails and semi-ballast track. The second phase from Abu Jabra to Nyala requires US\$200 million, which is not yet available. In addition, the following new projects are planned:

- i. Rail extension from Nyala through Kass to El Geneina (550km) estimated at US\$1.1 billion. As the completion of this project is likely to take more than six years, only the first section from Nyala to Kass is to be considered; and
- ii. Feasibility and design studies for a rail extension from Ed Daein through Sheriya to El Fasher in North Darfur, estimated to cost US\$2 million.

In addition to the above projects, there will be need to upgrade railway workshops, repair of rolling stock and procure at least 7 new locomotives. The total cost outlay for rail infrastructure related expenditure over the six-year span of the DDS is summarized in **annex 4**.

### *Civil Aviation*

Under this sub-sector, investments are required to improve and expand airport facilities. This will entail improvements to the region's main airports at Nyala, El Fasher and El Geneina as detailed in Tables 4.3, 4.4 and 4.5, respectively. The short, medium and long term requirements for these airports were analyzed and adequately elaborated in the Sudan National Transport Master Plan (2010). Not much progress has been made since the NTMP was produced in 2010, the short-term estimates for the period 2010-2016 are assumed to be investments that are now required during the period 2013-2016, in the Darfur Development Strategy. Similarly, the medium-term estimates are assumed to correspond with the long-term investments during the period 2017-2019 in the DDS.

**Table 4.3: Nyala Airport Investments (US\$)**

Item	Short-Term (2010-2016)	Medium-Term (2017-2021)	Long-Term (2022-2031)
Runway Strip & RESA <sup>1</sup>			
Clearing and grading	1,425,275	-	-
Re-pavement	4,778,000	-	-
Passenger Terminal Expansion	960,000	1,875,000	7,350,000
Aircraft Rescue & Fire Fighting	630,860	-	1,200,000
Sub-Total	7,794,135	1,875,000	8,550,000
Professional Fees (12%)	935,296	225,000	1,019,703
Contingency (20%)	1,558,827	375,000	1,716,172
<b>TOTAL</b>	<b>10,288,258</b>	<b>2,475,000</b>	<b>11,285,875</b>

Source: Derived from Table 10-2.4, Sudan National Transport Master Plan

**Table 4.4: El Fasher Airport Investments (US\$)**

Item	Short-Term(2010-2016)	Medium-Term(2017—2021)	Long-Term (2022-2031)
Passenger Terminal Building			
New Pax. Terminal Building	1,800,000	-	-
Expansion	-	1,350,000	3,150,000
Aircraft Rescue and Fire Fighting	-	-	1,200,000
Perimeter Fencing	694,590	-	-
Sub-Total	2,494,590	1,350,000	4,350,000
Professional Fees (12%)	299,351	162,000	522,000
Contingency (20%)	498,918	270,000	870,000
<b>TOTAL</b>	<b>3,292,859</b>	<b>1,782,000</b>	<b>5,742,000</b>

Source: Derived from Table 10-2.5, National Transport Master Plan

**Table 4.5: El Geneina Airport Investments (US\$)**

Item	Short-Term (2010-2016)	Medium-Term (2017-2021)	Long-Term (2022-2031)
Passenger Terminal Building			
New/ Expansion	585,000	487,500	750,000
Aircraft Rescue and Fire Fighting	630,680	-	1,230,680
Navigational Aides			
Airfield lighting system	2,860,000	-	-
PAPIs	80,000	-	-
Sub-Total	4,155,680	487,500	1,980,680
Professional Fees	498,682	58,500	237,682
Contingency	831,136	97,500	396,136
<b>TOTAL</b>	<b>5,485,498</b>	<b>643,500</b>	<b>2,614,498</b>

Source: Derived from Table 10-2.8, National Transport Master Plan

Besides the three major airports, plans have been completed for the development of regional airports at Ed Daein and Zalingei, the two capitals of the new states of East Darfur and Central Darfur, respectively. Investment of US\$43.4 million for each of these two airports is required during the implementation of the DDS. In addition, the development of mini-airports located in Kutum, Kabkabia, Al Lait, Hashkna, Buram, Garsila and Njama, will be required in the medium to long term. This will mainly entail the expansion and paving of aircraft manoeuvring areas, as well as erecting perimeter fence. Details of necessary investments are shown in *annex 2 and 3*.

### *Water Sector*

The Darfur International Conference on Water for Sustainable Peace was held in June 2011. It provided the opportunity to establish a more effective way to manage the region's natural resources in the longer term, while assisting the growing population to adapt to the challenges of climate change. The "Donor Appeal Document" which was the flagship document of the Conference, was jointly prepared by UNICEF, UNEP, UNDP, UNAMID, FAO, the Ministry of Irrigation and Water Resources (MIWR), the Public Water Corporation (PWC), and the Ground Water Wadi Directorate (GWWD), in cooperation with the three Darfur states at the time, and other UN Agencies and NGO partners. The conference called for support for the following objectives towards "water for sustainable peace."

- To increase access to improved water and sanitation and implement a sustainable approach to water resources management through Integrated Water Resources Management (IWRM) (Millennium Development Goal 7);
- To promote sustainable livelihoods through good health, reduced time lost in water collection, and water use for agriculture, pastoral and other economic activities. This will increase community resilience and adaptive capacity to impacts of climate change, population growth and urbanization;

- To rebuild and strengthen systems of good water governance to mitigate conflict over natural resources and improve cooperation between livelihood groups; and
- To support the processes of recovery from the impacts of conflict and promote economic development in Darfur.

Sixty five (65) projects requiring a total of about \$1.0 billion in funding were proposed, most of them were proposed by the Government of Sudan. Others were developed by United Nations agencies (UNICEF, UNOPS, UNEP, FAO, UNESCO, WHO, UNDP) UNAMID and NGOs. While two-thirds of the projects relate to water supply infrastructure, the remainder is meant to promote other vital aspects such as conflict mitigation, sustainable livelihoods, peace-building and capacity-building. The 65 projects are detailed in **annex 6**. While two-thirds of the 65 projects are hardware (infrastructure) oriented, one-third of projects worth about \$ 86m (about eight per cent of the total appeal) are dedicated to software aspects, like climate change adaptation, IWRM, capacity building, institutional strengthening, food security, natural resources management, database management, conflict mitigation and peace-building, as shown in **annex 7**.

There was an indicative pledge at the water conference amounting to about US\$ 500 million which led to the formation of a Technical Committee to prioritize the submitted projects while scaling down some of them. This process led to the selection of thirty eight (38) priority projects estimated to cost US\$387.7 million, to be implemented in the short-term (2 to 3 years). The projects were selected using the following criteria:

- Geographical and stakeholder balance:** So as to ensure that the objectives of promoting peace are achieved;
- Visible impacts over a short implementation period:** The projects need to show tangible results in a short time period. The committee agreed that a 2-year horizon was a reasonable project period. Some major infrastructure may take longer;
- Sustainability – capacity, environmental:** In order to ensure the benefits from the work are sustainable – and consequently have a lasting impact on peace, the work needs to ensure that water resources are available to all and that institutions are supported that can manage the resources and formulate projects sustainably; and
- Implementation capacity:** Given the complexity of the operating environment in Darfur, project allocation acknowledges proven capacity to deliver in the region.

The breakdown of the selected priority projects appear in **annex 5**. There are three types of water supply projects, namely: (i) Eighteen Projects to supply water from pipelines and wells estimated to cost US\$285.5Million, WASH projects are numbers 1-10 and Infrastructure are numbers 11-18; (ii) Sixteen Projects to supply water from dams and surface sources estimated to cost US\$94.1Million; and (iii) Four climate change projects estimated at US\$8.125Million. This categorization enabled the Technical Committee to identify priorities according to donor priorities and preferred funding modalities. The

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first category, “*water supply from pipelines and wells*”, includes both WASH and water infrastructure projects. WASH projects integrate water supply, sanitation and hygiene promotion. This is best practice in low cost humanitarian, recovery and development programming so as to be able to improve health needs of a population. Typical interventions are water yards (a borehole, overhead tank and tap stands), hand pumps, latrines, soap distribution and hygiene promotion activities. The WASH programs are coordinated by UNICEF and WES, federal and State Water Corporations and NGOs are particularly focused in this work.

Water Supply Infrastructure includes engineering works such as water supply networks for towns, well fields, storage reservoirs, water treatment and pipe work. This work responds to the rapid urban growth and overcrowding in Darfur’s towns and cities. Numerous government agencies are involved in this work: Public Water Corporation, Transitional Darfur Regional Authorities, and State Water Corporations. UNOPS are the major UN implementers.

Water supply from dams and surface water (Integrated Water Resource Management projects) addresses management of the resource so that water is available for all categories of users: agriculture, industry, domestic use, and the needs of the environment. It focuses on balanced availability for all through user participation. Activities include water harvesting, dams, groundwater and surface water monitoring and management, water user consultations and planning. It aims to ensure sustainability across the water sector, with all groups included, however organizations leading in this area include: Groundwater and Wadis Department, State Water Corporations. UNEP have been identified to provide leadership in this sector from the UN side in the Donor Appeal Document. FAO have particular relevance relating to water for agricultural production. Climate Change projects, include those that particularly focus on adaption to the impacts of increasing variability in the climate such as floods and droughts. This is a small category in the appeal and includes work on community environmental management, water harvesting and on flood protection.

### *Power Sector*

The summary of power projects and associated costs phased in the medium-term and long-term appears in **annex 8**.

## **4.3 Measures for Sustainability and better Management of the Sectors**

### **i) Policy, Institutional and Regulatory Reforms**

There will be need to undertake policy, institutional and regulatory reforms in all the sectors under consideration. Herein below is an outline of necessary policy, institutional and regulatory reforms in the three sectors.

## *Transport*

The National Transport Master Plan (NTMP) of Sudan (2010) identified three critical issues that need to be addressed in order to further develop the sector, namely: Organization Structure and Sector Management; Corporate Governance of State owned enterprises/institutions; and Public Investment Financing. In each of these areas, a number of options were proposed to address the issue as summarized below.

With regard to ***organization structure and sector management***, the Master plan proposed four options as follows:

- Continue with the present method of managing the sector through semi-autonomous agencies having regulatory roles attached to the Ministry of Transport, Roads and Bridges, but with the assistance of independent advisors and/or consultants;
- Continue as in 1 above, but strengthen the semi-autonomous agencies;
- Organize the Ministry of Transport, Roads and Bridges along modal lines such as roads, maritime transport, railways, civil aviation, and inland waterways with decision support systems relying on a transport database.
- Organize the Ministry of Transport, Roads and Bridges, around functional activities such as planning, regulation (technical and economic), implementation, and international agreements, each covering several modes of transport with decision support systems relying on a transport database.

With regard to ***corporate governance of state owned enterprises and institutions***, the following options were proposed in the NTMP:

- i. Maintaining the present arrangements and management practices;
- ii. Strengthening corporate governance through introduction and implementation of performance contracts between state owned enterprises and the oversight ministry(s); and
- iii. Combination of 1 and 2 above.

Regarding ***public investment and financing***, options proposed in the NTMP for investment and financing of transport infrastructure and systems include: (i) using tariffs to generate investments funding; (ii) obtain grants or loans from international financing institutions; (iii) using country national budget; (iv) Public Private Partnerships (PPPs).

An analysis of how the various options/choices could influence or affect the management of the transport sector, corporate governance and investment financing in the transport sector, *which was beyond the scope of the current exercise*, should be undertaken as part and parcel of the implementation of the Darfur Recovery and Reconstruction Strategy; with a view to adopting the most appropriate options or combination of options.

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## *Water and Sanitation*

In a paper entitled, “Water Policy of Sudan: National and Co-Basin Approach”, Eng. Seifeldin H. Abdalla (PhD) and Eng. Kamal A. Mohamed (FICE), present an overview of water resources in Sudan with emphasis on issues on legal and institutional setup governing water resources management and development. The paper also outlines and highlights the Sudan Water Policy as indicated herein below.

The responsibility of water resources monitoring, assessment, development and management in Sudan has not been under one institution. While the major part was under the responsibility of the Ministry of Irrigation and Hydroelectric Power now the Ministry of Irrigation and Water Resources (MIWR), responsibilities were also shared with the Ministry of Agriculture and Forestry, the Meteorology Department of the Ministry of Science and Technology; and the Rural Water Corporation. Realizing the drawbacks of scattered responsibilities, the Government started in the last decade some major steps towards the integration of activities in this important sector. One major step was to place the responsibility of all water resources, surface (Nile and Wadis) and ground water resources, under the umbrella of the Ministry of Irrigation and Water Resources (MIWR). Another major step was the formation of the National Council for Water Resources (NCWR) with the objective of formulating common water resources policies and coordinating the activities of all water sector agencies and stakeholders. The NCWR has the Technical Water Resources Organ (TWRO) as its executing arm.

Whereas at the national level, the structures seem to be in place, information gathered in the field point to serious lack of institutional, technical and human capacities, at state levels, especially in Darfur. There will, therefore, be need to undertake institutional reforms and capacity enhancements at the level of the Darfur States.

As in the case of the institutional framework, there were several pieces of legislation governing the development, management and utilization of water resources in Sudan, prior to the year 2000. In 1999, MIWR decided to review, integrate and update the existing 1992 Water Policy with support from the FAO and the UNDP which resulted in the preparation of the year 2000 Water Policy Document. The main considerations in the Water Policy 2000 were:

- Balance between supply and demand in efficient use for irrigation water in agriculture;
- More utilization of groundwater for irrigation to solve the problem of drawdown and deterioration;
- Striking a balance between agricultural uses and hydropower;
- Increase the water use, particularly rain-fed to match with the available vast land areas;
- High rate of growth dictating excessive investment programs in the water sector;
- The need to enhance regulation and coordination between the different users and to avoid fragmentation of Government responsibilities and institutions in the States as dictated by the Comprehensive Peace Agreement (CPA);

- Mitigating the environmental pollution hazard;
- The formulation of regulation Acts to establish the appropriate enforcement mechanism for the management and development of water resources and the Environment Protection Ordinance of 2000; and
- Enhancing capacity in water resources management and development in the States and GoS.

Subsequently, the Water Policy of 2007 was developed based on the Transitional Constitution of Sudan and taking into account macroeconomic and social policies, and development strategies. The formulation of the policy was also based on sound water assessments, established effective regulatory framework and capacity for enforcement of approved legislations and promoting the role of women and market oriented solutions and creating incentives for the sustainable use of water resources. According to Section 105 of the Constitution of 1998 (repealed by the Transitional Constitution of 2005), the federal government is responsible for planning, regulating and executing interstates waters and national electricity projects. Each State exercises legislative, executive and planning functions in non-transit waters and electric power within its boundaries.

Sudan water policy and regulatory framework should not only able to deal with national water issues, but should also be robust enough to accommodate international water issues, as well as trans-boundary water issues. Cooperation in the harvesting of trans-boundary water resources, for example, is very important for Darfur as far as water harvesting programs involving collaboration with South Sudan is concerned. *It will, therefore, be necessary to review existing water policies and regulatory framework in order to ensure that Darfur's interests are well catered for.*

### ***Power***

Access and coverage to energy resources remain a major challenge in Sudan, especially in the states and rural areas. Almost 87% of the country's population does not have access to electricity and ratio of those who depend on biomass energy sources remains as high as 92.6 %. During the past few years, the National Electricity Corporation (NEC) formulated a number of development plans in generation, transmission and distribution for the National and Isolated Grids in order to overcome supply constraints. The plans, however, fell short of achieving their objectives mainly because of financial constraints, which have narrowed investments in the energy sector. To address these constraints the Government of Sudan (GOS) launched the Investment Encouragement Act 2000 and Electricity Act 2001. The Investment Encouragement Act offers various incentives to investors including tax exemptions and as such the private sector has begun to participate in power generation and distribution. However, much more needs to be done to allow greater and more transparent competition in the supply of electricity, and also in strengthening the role of the private sector in extending the electricity coverage to the 95 percent of Darfur's population presently without access.

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In addition to the above measures, in 2010, the Federal Government decided to abolish the National Electricity Corporation, replacing it with five companies, namely: (1) Merowe Dam Electric Company Ltd; (2) Sudanese Hydro Power Generation Company Ltd; (3) Sudanese Thermal Power Generation Company Ltd; (4) Sudanese Electricity Transmission Company Ltd; and (5) Sudanese Electricity Distribution Company Ltd. Pursuant to this decision, the Ministry of Electricity and Dams (MED) has published the necessary legal instrument to this effect. Furthermore, the Presidential Decree No. 39 of 2012 for the National Energy Research Center (NERC) has an ambitious objective to increase substantially the rate of electrification and scale up utilization of renewable energy resources (solar, biomass, wind, geothermal) to reduce the dependence on unsafe and environmentally threatening energy sources. In this regard, it will be necessary to put in place policies that encourage research and investments in alternative sources of energy and technologies in the medium to long-term.

It would, however, appear that despite the above measures, a comprehensive policy and strategy to guide further development of the energy sector is still lacking. Similarly a comprehensive regulatory framework is not in place and its preparation should be fast-tracked. In order to attract investments in power generation and associated infrastructure, appropriate legal frameworks covering licensing, safety, standards, setting of tariffs and tariff differentiation, private sector relations, privatization of distribution and sales, are necessary. This is particularly important for Darfur which needs significant investment in the power sector.

## **ii) Capacity Building**

Capacity building is a cross cutting issue in all the three sectors and there is need for capacity building/enhancements at both the operational and managerial levels. In addition, appropriate incentive schemes are necessary in order to stem migration of skilled personnel out of the region and beyond. In the meantime, institutional capacities can be enhanced through technical assistance support, provision of equipment, such as computers, and training of trainers. Capacity building activities should include:

- i. Undertaking a manpower survey in order to determine priorities for manpower development in the medium to long term for all the three sectors;
- ii. Prepare and execute training programs in all sectors;
- iii. Development of institutional capacities at regional/state/local/community level for integrated water resource management; and
- iv. Establish vocational training institutions in Darfur for technicians in water and power sectors.

## **iii) Public Private Partnerships**

There are several definitions of public-private partnerships, but perhaps the most befitting one is that of the Canadian Council for Public-Private Partnerships that has defined PPP as follows:

“A cooperative venture between the public and private sectors, built on the expertise of each partner that best meets clearly defined public needs through the appropriate allocation of resources, risks and rewards.”

The options available for delivery of public infrastructure range from design-build to outright *privatization*, where the government transfers all responsibilities, risks and rewards for service delivery to the private sector. Within this spectrum, public-private partnerships can be categorized based on the extent of public and private sector involvement and the degree of risk allocation. There are two main models of Public-Private Partnerships, namely: *management contract* and *concessions*. In a concession contract, a private sector concessionaire undertakes investments and operates the facility for a fixed period of time after which the ownership reverts back to the public sector. Thus the public sector ‘concedes’ market power associated with the financial asset. On the other hand, under management contract, the private provider merely delivers a service (for a fee) with no fiduciary interest in the financial asset.

In between these two models, a number of variants (read other models) of PPP exist, depending on: (i) responsibility for creating the physical asset; (ii) responsibility for preserving the physical asset; (iii) the control of any financial asset pertaining to the physical asset; and (iv) the mechanism of eventual handing over the physical asset. The variables above lead to some common labels such as:

- *Design-Build (DB)/Build-Transfer (BT)*: Under this model, the public sector contracts with a private partner to design, and build, a facility in accordance with the requirements it sets. Upon completion the public sector assumes responsibility for operating and maintaining the facility;
- *Build Operate Transfer (BOT)*: The private sector builds an infrastructure asset in accordance with public sector specifications, operates and transfers the public asset after a specified period of time;
- *Design Build Operate Transfer (DBOT)*: A private sector entity designs, builds, operates a public asset and operates it for an agreed period of time before transferring to the public sector;
- *Build-Transfer-Operate (BTO)*: Under this model, the private sector designs and builds a facility. Upon completion, the title for the new facility is transferred to the public sector, while the private sector operates the facility for a specified period;
- *Build Own Operate Transfer (BOOT)*: The public sector grants a franchise to a private partner to finance, design, build and operate a facility for a specific period of time. Ownership of the facility is transferred back to the public sector at the end of that period;
- *Finance Only*: A private entity, usually a financial services company, funds a project directly or uses various mechanisms such as a long-term lease or bond issue;
- *Operation & Maintenance Contract (O & M)*: A private operator, under contract, operates a publicly-owned asset for a specified term. Ownership of the asset remains with the public entity;

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- *Build-Finance*: The private sector constructs an asset and finances the capital cost only during the construction period;
  - *Design-Build-Finance-Maintain (DBFM)*: The private sector designs, builds and finances an asset and provides hard facility management or maintenance services under a long-term agreement;
  - *Design-Build-Finance-Maintain-Operate (DBFMO)*: The private sector designs, builds and finances an asset, provides hard and/or soft facility management services as well as operations under a long-term agreement; and
  - *Build-Own-Operate (BOO)*: The private sector finances, builds, owns and operates a facility or service in perpetuity. The private entity is not required to transfer the asset. However, public constraints are stated in the original agreement and through on-going regulatory authority.

In addition to delivering new infrastructure, PPPs can also be used for existing services and facilities. Models include:

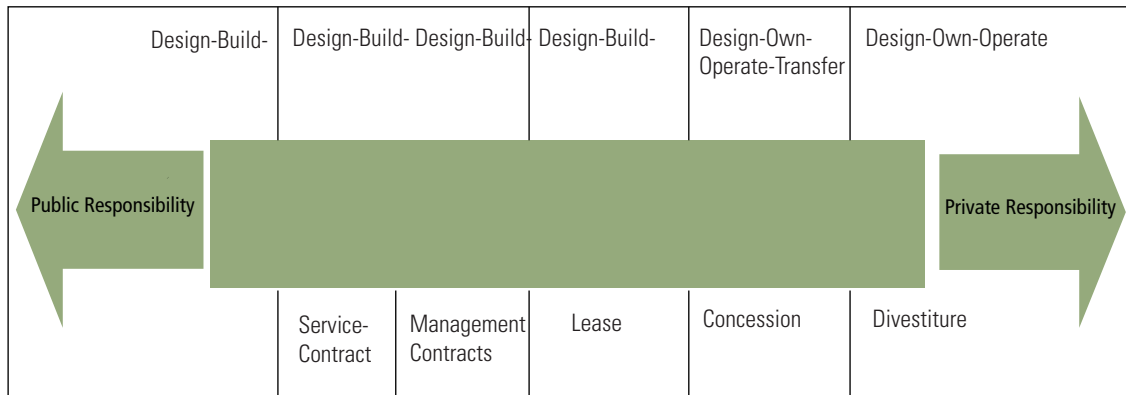
- **Service contract**: The public sector contracts with a private entity to provide services the public sector previously performed;
- **Management contract**: A management contract differs from a service contract in that the private entity is responsible for all aspects of operations and maintenance of the facility under contract;
- **Lease**: The public sector grants a private entity a leasehold interest in an asset. The private partner operates and maintains the asset in accordance with the terms of the lease;
- **Concession**: The public sector grants a private entity exclusive right to operate and maintain an asset over a long period of time in accordance with set performance requirements. The public sector retains ownership of the original asset, while the private operator retains ownership over any improvements made during the concession period; and
- **Divestiture/Privatization**: The public sector transfers an asset, either in part or in full, to the private sector. Generally, it will include certain conditions with the sale of the asset to ensure that improvements are made and the community continues to be served.

Figure 4.1 below, illustrates possible PPP models that can be adopted for delivery of new infrastructure or existing services and facilities. The top part of the diagram indicates options for new projects, while the bottom part shows options in case of existing facilities and services. The following elements are essential for PPP arrangements:

- Contract/agreement between government and private players;
- Operates on commercial principles;
- Delivers services on payment of user charges;
- Payment by the public agency/government for bulk delivery of service;
- Full cost recovery, at least the O&M charges;

**Figure 4.1: PPP Continuum: Degree of public sector responsibility**

New Projects



Existing Services and Facilities

Source: The National Council for Public Private Partnerships (Canada)

- Responsibility for providing services rests with the government;
- Division of risks, roles and responsibilities between the public and private; and
- Need complex regulatory mechanisms.

As can be seen above, various models of PPPs can be explored for the development and management of infrastructure in Darfur, particularly in the transport, water and power sectors. However, the prospects for successful PPPs may vary from one sector to another. While discussing the state of infrastructure in Sudan as a whole, it was observed that AICD report for Sudan (2011) suggested that the largest infrastructure funding gaps existed in transport and water because these two sectors are less amenable to private finance, in comparison with the power sector. This, however, does not mean PPPs in these two sectors should not be encouraged. The sections below look at PPP prospects in each of the three sectors under consideration (transport, water, power).

**PPPs in the Transport Sector**

With regard to the road sub-sector, PPPs are possible; and one workable model would be for the Sudan Government to continue to mobilize resources from the Arab and Chinese partners for the construction of the national roads in Darfur. Thereafter, private sectors entities could assume the management of road asset through either management contracts or concessions. In the case of a concession, it has already been pointed out that the public sector (government) would have to concede market power associated with the road asset; such as road tolls and other forms of road user charges. Therefore, for a concession arrangement to succeed, the concessionaire would have to recoup whatever investments made on the road asset by charging user fees. Hence, for a particular road section to qualify for concession, the traffic levels would have to be high enough to enable the concessionaire to recoup their investments. While empirical data was not available on which to base a good inference, it is very unlikely that the concession model in the road sector would be viable in the short to medium term. This is because traffic volumes in the

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Darfur region may not be adequate to support a concession arrangement. On the other hand, management contracts would be very useful for road maintenance.

In the case of rail transport, PPP arrangements are possible for track rehabilitation and maintenance; either on management contract basis or concession. In the former case government would contract track maintenance to a private entity for an agreed fee. In the latter case, a private concessionaire could take over track maintenance and collect access fees from the different rail operators. As there are already private rail operators in Sudan, this is a real possibility, provided that the appropriate legal framework is put in place. Meanwhile, the proposed rail extensions from Nyala to El Geneina and from Nyala to El Fasher could be undertaken through PPP arrangements.

with regards to civil aviation infrastructure, major projects entail expansion of terminal capacities at major airports; and the development of two regional airports at Ed Daein and Zalingei. PPP is possible whereby a private operator could be responsible for providing ground handling services at major airports, while also investing in the expansion of terminal facilities and other services. Indeed UNAMID civil aviation operations in Darfur provide useful lessons; UNAMID developed terminal facilities, and in some cases extended runway lengths, in order to support its operations in the Darfur region. As peace returns to Darfur and UNAMID operations recede, a private operator (s) can take over the management and maintenance of the facilities under some form of PPP arrangement.

### **PPPs in the Water and Sanitation Sector**

In the developed world, early entrants into various types of PPPs included the Netherlands, a number of Canadian municipal governments and Ireland<sup>15</sup>:

- In the Netherlands, a 30-year concession with a total contract value of €1.58 billion was awarded by the Water Board of Delft land in 2002 for the design, construction, and operation of a new wastewater treatment plant, and the refurbishment and operation of an existing wastewater treatment plant;
- In Canada, ageing water and wastewater systems requiring renewal expenditure of more than \$28 billion, prompted the municipalities of Moncton, Hamilton & Dartmouth to consider and develop PPP financing mechanisms to deliver water services; and
- In Ireland more than 100 water and wastewater PPP projects - most of them 'design-build' (DB) were undertaken.

Roger Black points out that in the developing world private participation in the water sector began to be hailed as a solution to chronic failures of coverage and services during the 1990s; and that between 1990 and 2005 private investors committed over USD 50 billion to more than 380 water infrastructure projects in developing countries.

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<sup>15</sup> Roger Black (Deloitte Infrastructure Projects and Finance) in the paper entitled: "PPP and water sector: Plugging the Infrastructure Hole." what year???

What this implies is that PPP arrangements are possible in the water and sanitation sector in Sudan as a whole and in Darfur in particular; albeit with some challenges. The main challenge stems from the fact that PPPs are based on commercial principles and as such frequent rises in the price of water should be expected; either to offset rising operational costs or inflation or rise in government taxes. In the case of a failed water project in Buenos Aires (Argentina), the following reasons were cited: frequent price increases; poor service quality; failure to honor contractual commitments; and financial problems. Similarly, in the case of Manila West (The Philippines), the following reasons were cited for the failure of the project: price hikes; failure to extend water connections to poor areas; no investments; increase in tariffs; and non-fulfillment of other contractual obligations.

In spite of the challenges cited above, the potential for PPPs in water and sanitation sector is enormous, given the demand for water and sanitation services, which were highlighted under *water infrastructure*. Major water projects in Darfur range from US\$20 million to US\$102 million, with the total estimated requirement of the next six years exceeding US\$1 billion. It is, therefore, an imperative that measures be undertaken to encourage and support PPPs in water and sanitation in Darfur. Water harvesting and distribution, for example, should be able to attract private sector participants, provided the requisite PPP policies, regulations and guidelines are put in place.

### **PPPs in the Power Sector**

AICD Report (2011) on Sudan indicates that there has been relatively high level of spending in the power sector in recent years with the private sector playing a significant role. This could be attributed to the enactment of the Investment Encouragement Act of 2000 and Electricity Act 2001, which offer various incentives to investors including tax exemptions. This has enabled the private sector to participate in power generation and distribution.

As discussed earlier, available power supply in Darfur is only 42.5 MW, which is approximately 20 per cent of the desired capacity of about 220MW in order to meet current demand. The strategy to increase power supply entails increasing generation capacity from various sources that include thermal, geothermal, solar and wind energy. In all these areas, the prospects of involving private sector entities through PPP schemes is good. Similarly, the Government of Sudan should promote PPPs in power distribution in the Darfur region.

## **4.4 Possible Niche Areas for the Bank's Intervention**

With regard to infrastructure development in particular, the Bank has made significant contributions to infrastructure development in Africa, and tens of millions of Africans are now better off thanks to Bank investments in transport, energy and water. However, Africa still has massive infrastructure needs as it currently invests only 4% of its GDP in infrastructure, compared with 14% in China. The Bank estimates that bridging the infrastructure gap could increase GDP growth by an estimated 2 percentage a year. Bridging the infrastructure gap will require African countries to invest approximately

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7% of GDP in infrastructure development. In this regard, the Bank intends to scale up infrastructure financing to the continent significantly not just through its own lending but also by leveraging its financial resources.

In this regard, the Bank's intervention in support of the social and economic development of Sudan as a whole and Darfur in particular is crucial. At the time of preparing this report, the Bank had already committed €3 million for water projects in Darfur mainly for the development of master plans for urban water infrastructure, sanitation, drainage and waste management for 20 rural towns in all the five states of Darfur. A lot more will be required for projects in all the three infrastructure sectors as outlined below.

In the area of water and sanitation the Bank is to consider financing a technical assistance project whose activities cut across all the Darfur States:

- Capacity building for improved water governance in Darfur;
- Ground water management in fractured aquifers in Darfur;
- A plan for monitoring water information system (WIS) for Darfur;
- Training and human resources development in Water Resources Management and Water Harvesting;
- Identification and design of potential water harvesting projects in Darfur using RS, GIS; and
- Capacity development for Improved Water Management Systems in Darfur.

The total cost of the above activities is estimated at US\$7.6 million to be implemented over a period of 3 to 4 years.

In the transport sector, the Bank should consider supporting the development of sub-sector strategies, institutional reforms and training. This should include: the elaboration of a **Transport Sector Development Strategy** for the Darfur Region; updating the National Transport Master Plan (2010-2030); development of policy and regulatory framework for promotion of PPPs in the transport sector; and human capacity development in the road, rail and civil aviation sub-sectors. The estimated cost of the above interventions is US\$10 million.

As concerns transport infrastructure projects, the Bank should consider the following:

- Funding some of the road projects linking five Darfur States and road projects linking with main municipalities of the districts;
- Feasibility and design studies for a rail extension from Ed Daein through Sheriya to El Fasher in North Darfur, estimated to cost US\$2 million;
- Reforming the rail subsector and promotion of public private partnerships in track maintenance and development of new rail links; and
- Support the improvement of civil aviation infrastructure relating to safe navigation and operation of aircraft.

In the power sector, the Bank should consider supporting the following activities, whose estimated cost is US\$4.5 million:

- Development of a comprehensive policy, strategy and master plan to guide further development of the sector, including policy framework to promote PPPs in power generation and distribution;
- Development of appropriate legal and regulatory frameworks covering licensing, safety, standards, setting of tariffs and tariff differentiation, private sector relations;
- Support the development of solar energy sources to provide access to cleaner energy and power in very remote locations, in the short to medium term;
- Exploration of wind and geothermal energy options in the Jebel Mara area in the medium and long term; and
- Human capacity building in the energy sector.

Regarding the development of power infrastructure in Darfur, the Bank should consider participating in projects relating to the extension of the national power grid into Darfur, such as the Nyala-Kass-Zalingei-El Geneina grid link.

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## 5. CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Conclusion

The report has revealed that the state of infrastructure in Darfur is generally very poor and grossly inadequate, due to underdevelopment and the legacy of a protracted civil conflict. The consequence of this dilapidated state of infrastructure development is low level of economic activity and limited employment opportunities and increasing poverty. In total, Darfur's reconstruction and recovery needs stand at US\$7.25 billion for the period 2013 to 2019 as estimated in the Darfur Development Strategy (DDS).

Donors including the Bank have done a commendable job in doing the preliminary assessment, which creates an opportunity for operationalizing the Doha Document for Peace in Darfur (DDPD), critical for bringing a permanent end to the Darfur conflict. The Government's creation of the Darfur Regional Authority (DRA) to consolidate peace and oversee early recovery and development process, which made the organization of the Doha Conference possible, is another opportunity that needs to be exploited. In particular, the pledges made at the Doha Conference in 2013 serve as a solid foundation on which donors can now build to ensure implementation, and complement the efforts with capacity building and modest targeted operations given the Sudan's external debt situation and the lack of access to concessional financing.

### 5.2 Recommendations

To address Darfur's infrastructure gap, there is need to undertake policy, institutional and regulatory reforms in all the sectors under consideration. Appropriate incentive schemes are necessary in order to stem migration of skilled personnel out of the country. In the meantime, institutional capacities can be enhanced through technical assistance support, provision of equipment and training of trainers, so as to ensure that there is adequate capacity to manage and maintain the infrastructure that would be developed. Capacity building activities should include:

- i. Undertaking a manpower survey in order to determine priorities for manpower development in the medium to long term for all the three sectors;
- ii. Prepare and execute training programs in all the sectors;
- iii. Development of institutional capacities at regional/state/local/community level for integrated water resource management; and,
- iv. Establish vocational training institutes in Darfur for technicians in water and power sectors.

Regarding financing, various models of PPPs can be explored for the development and management of infrastructure in Darfur, particularly in the transport, water and power sectors, using the scenarios and options presented in the report. However, the prospects

for successful PPPs may vary from one sector to another, and would depend on the consolidation of peace and the granting of unhindered access to regions of Darfur.

In the transport sector, there is need to elaborate a Transport Sector Development Strategy for the Darfur Region which will enhance policy formulation; ranking of priority projects and adoption of funding strategies.

In the water sector, there is need to protect existing water resources and develop potential ones. This will require strengthening institutions which are currently fragmented and too ill equipped to tackle water related challenges.

In the energy sector, medium to long-term strategic options would include the following elements: rehabilitation and maintenance of the existing networks and plants; exploiting the potential of solar energy to provide access to cleaner energy and power in very remote locations; exploring wind and geothermal energy options in the Jebel Mara area; adopting strategies for promoting Public Private Partnerships in power generation and distribution; putting in place policies to encourage research and promote investments in alternative sources of energy and technologies in the medium to long-term; and linking of Darfur to the National Grid or regional grids through power trade.

## ANNEXES

### Annex 1: Roads and Bridges

Objective	Outputs	Road Project	Length (km)	Estimates Cost US\$ Million		
				2013-2016	2017-2019	Total
Improved physical access to goods, markets, administrative and social services	National Roads linking State capitals and Locality capitals are rehabilitated or upgraded	Rehabilitation/Reconstruction of sections of El Fasher – Nyala Road	195	65.0	-	65.0
		Asphalting En Nuhud – Ed Daein – Nyala Road in two phases:				
		▪ Phase I, El Rahud- Ed Daein	272	176.8	-	176.8
		▪ Phase II, Ed Daein – Nyala	154	-	100.1	100.1
		Upgrading to asphalt road, Nyala - Ed El Fursan - Rahad El Berdi - Um Dafok <sup>20</sup>	268	-	71.5	71.5
		Rehabilitation of the tarmac road Nyala - Kass – Nertiti – Zalingei road (remaining section Kass-Nertiti- Zalingei,112km)	198	67.2	-	67.2
		Construction of NertitiGeldo-Golo– Rokero	99	-	69.3	69.3
		Rehabilitation of gravel road Zalingei–Garsila–Foro Baranga	150	22.5	-	22.5
		Rehabilitation of gravel road El Fasher–Kutum -El Tina	360	27.0	27.0	54.0
		Rehabilitation of El Fasher – Kabkabiya – El Geneinagravel road	328	24.0	25.2	49.2
		Rehabilitation of the gravel road, Nyala – Gaida - Buram – Radoom	303	22.0	23.5	45.5
		Rehabilitation of the gravel road, Buram–Tulus–Ed El Fursan	127	19.1	-	19.1
		<b>Sub-Total</b>		<b>423.6</b>	<b>316.6</b>	<b>740.2</b>
	State roads linking urban centers with markets and agricultural productions areas are rehabilitated	North Darfur Road Projects				
		(i) Re-gravelling of Roads				
		o Roads inside El Fasher	25	6.0	-	6.0
		o El Fasher–Mellit-Malha	65	7.8	7.8	15.6
		o El Fasher–Sag El Naam– Wada’ah – El Taweisha – Ailliet	268	30.0	34.32	64.32
		o El Fasher – Korma	95	-	22.8	22.8
		o Roads in State District	80	19.2	-	19.2
		(ii) Construction of 4 Bridges (Hallof, El Nasser, Abu Shook)	-	6.0	-	6.0
		(iii) Construction of 15 water-way (Wadi) crossings	-	3.0	-	3.0
		(iv) Paving roads in El Fasher City	40	-	24.0	24.00
		<b>Sub-Total</b>		<b>72.0</b>	<b>88.9</b>	<b>160.9</b>
		South Darfur Road Projects				
		Nyala – Kofygany	144	17.28	17.28	34.56
		Monwashy –Sony	80	19.20	-	19.20
		Nyala- Abu Ajura-Tulus	129	20.0	10.96	30.96
		Nyala – Kubum – Rahad El Berdi	180	21.6	21.6	43.20
		<b>Sub-Total</b>		<b>78.08</b>	<b>49.84</b>	<b>127.92</b>
West Darfur Road Projects						
• El Geneina –Sirba – Seleah-Kulbus	107	-	25.68	25.68		

20 Funding is available for the first158km is funded leaving a funding gap of US\$71.5 million

		• El Geneina – Habila- ForoBaranga	166	39.84	-	39.84
		• El Geneina –Masteri- KangoHaraza-Arara	152	18.0	18.46	36.46
		<b>Sub-Total</b>		<b>57.84</b>	<b>44.14</b>	<b>101.98</b>
		Central Darfur Road Projects				
		Um Dhukun– Rahad El Berdi	110	13.2	13.2	26.4
		Bindisi–Mukjar–Saraf-MaginArtala–Kubum	80	9.6	9.6	19.2
		Garsila-Bindisi–Kabar–Sillili- Um Dhukun	240	28.8	28.8	57.6
		Zalingei – SarafOmra	70	16.8	-	16.8
		Zalingei Road network (Upgrading to Bitumen)	30	18.0	-	18.0
		<b>Sub-Total</b>		<b>86.4</b>	<b>51.6</b>	<b>138.0</b>
		East Darfur Road Projects				
		Road Networks in Ed Daein	30	7.2	-	7.20
		Ed Daein – Abu Jabra	126	20.0	10.24	30.24
		Ed Daein – Mahajería – Sheariya	137	16.0	16.88	32.88
		Mahajería–Labado–Um Kurdous	147	15.0	20.28	35.28
		Ed Daein–Abu Matariq- Saimaha-Bahar El Arab	300	36.0	36.0	72.00
		Ed Daein–El Ferdous–Abu Ud-Kubbi	132	15.0	16.68	31.68
		<b>Sub-Total</b>		<b>109.2</b>	<b>100.08</b>	<b>209.28</b>
		<b>TOTAL</b>		<b>827.12</b>	<b>651.16</b>	<b>1,478.28</b>
	Institutional and human capacity development	Development of sub-sector strategies, institutional reforms and training		2.0	2.0	4.0
		<b>GRAND TOTAL</b>		<b>829.12</b>	<b>653.16</b>	<b>1482.28</b>

Source: Ministry of Transport, Roads and Bridges, Darfur State Governments and Consultant's Estimates

## Annex 2: Civil Aviation Infrastructure Investments for the three Major Airports in Darfur (USD Dollars)

Item	2013-2016			2017-2019			2020-2030		
	Nyala	El Fasher	El Geneina	Nyala	El Fasher	El Geneina	Nyala	El Fasher	El Geneina
Runway Strip and RESA									
Clearing and Grading	1,425,275								
Re-Pavement	4,778,000								
Passenger Terminal Building									
New Terminal		1,800,000							
Terminal Expansion	960,000	-	585,000	1,875,000	1,350,000	487,500	7,350,000	3,150,000	750,000
Aircraft Rescue and fire fighting	630,860	-	630,680	-	-	-	1,200,000	1,200,000	1,230,680
Perimeter Fencing		694,590	-						
Navigational Aids									
Airfield lighting system			2,860,000						
PAPI's			80,000						
Contingency	1,558,827	498,918	831,136	375,000	270,000	97,500	1,716,172	870,000	396,136
Sub-Total	9,352,962	2,993,508	4,986,816	2,250,000	1,620,000	585,000	10,266,172	5,220,000	2,376,816
Professional Fees	935,296	299,351	498,682	225,000	162,000	58,500	1,019,703	522,000	237,682
<b>GRAND TOTAL</b>	<b>10,288,258</b>	<b>3,292,859</b>	<b>5,485,498</b>	<b>2,475,000</b>	<b>1,782,000</b>	<b>643,500</b>	<b>11,285,875</b>	<b>5,742,000</b>	<b>2,614,498</b>

Source: Amalgamation of Tables 4.3, 4.4 and 4.5

### Annex 3: Civil Aviation Infrastructure Investments for all Airports and Airstrips

Objective	Outputs	Project Activities	Estimated cost US\$ Million			
			2013-2016	2017-2019	2020-2013	Total
Airstrips rehabilitated/upgraded/ or constructed	Facilities at Regional Airports at Nyala, El Fasher and El Geneina Airport Upgraded	Runway Strip & RESA				
		▪ Clearing and grading	1,425	-	-	1,425
		▪ Re-pavement	4,778	-	-	4,778
		Passenger Terminal				
		▪ New Terminal	1,800	-	-	1,800
		▪ Terminal Expansion	1,545	3,713	11,250	16,508
		Aircraft Rescue & Fire Fighting	1,262	-	-	1,262
		Perimeter Fencing	0,695	-	-	0,695
		Navigational Aids				
		▪ Airfield lighting system	2,860	-	-	2,860
		▪ PAPIs	0,080	-	-	0,080
		Professional Fees	1,733	0,446	1,779	3,958
		Contingency	2,889	0,743	2,982	6,614
		Sub-Total	19,067	4,902	16,011	39,980
Construction of new Airports at Zalingei and Ed Daein <sup>21</sup>		Pavement	38,462	0,200	0,200	38,862
		Buildings	9,704	6,520	0,320	16,544
		Electrical Works	3,000	14,000	3,000	20,000
		Navigational Aids	3,000	3,000	5,000	11,000
		Communication Equipment	2,400	-	-	2,400
		Airport Equipment	5,400	1,040	0,240	7,040
		Sub-Total	61,966	24,760	8,760	95,486
		Aircraft Maneuvering area (runway, taxiway, apron) 150,000sq. meters per airport for 3 airports	-	11,250	15,000	26,250
		Perimeter Fencing	-	2,4	3,2	5,6
		Sub-Total	-	13,65	18,2	31,85
		Aircraft maneuvering area				
		Improvement of aircraft maneuvering areas at 8 air strips and construction of perimeter fencing		1,6	-	1,6

21 The two airports have been estimated to cost the same amount hence the cost of each can be obtained by dividing the amounts shown for each item by two.

### Annex 3: Civil Aviation Infrastructure Investments for all Airports and Airstrips(continued)

	Perimeter fencing		5.6	-	5.6
	Sub-Total	-	7.2	-	7.2
	TOTAL	81.0	50.5	43.0	174.5
Institutional human capacity development	Development of sub-sector strategies, institutional reforms and training	1.5	1.5	-	3.0
	<b>GRAND TOTAL</b>	<b>82.5</b>	<b>52.0</b>	<b>43.0</b>	<b>177.5</b>

Source: National Transport Master Plan and Sudan Civil Aviation Authority

## Annex 4: Railway Projects

Objective	Outputs	Project Activities	Estimated Costs (US\$ Million)		
			2013-2016	2017-2019	Total
Improved physical access to goods, markets, administrative and social services	Upgrading and Extending the Rail Network and system serving Darfur	Upgrading of the railway track from Abu Jabra to Nyala	150.0	50.0	200.0
		Feasibility and design study for rail extension from Ed Daein to El Fasher	-	2.0	2.0
		Rail Extension, Nyala to Kass (approx 90km)	90.0	90.0	180.0
	Increased stock of locomotive and upgraded workshop facilities	Purchase of new locomotive (7)	21.0	-	21.0
		Repair of locomotives and other rolling stock	4.0	-	4.0
		Re-equipping of workshops	5.0	-	5.0
		Sub-Total	272.0	142.0	414.0
	Capacity Building	Development of sub-sector strategies, institutional reforms and training	1.5	1.5	3.0
			273.5	143.5	417.0

Source: DJAM Reports, Sudan Railways Corporation and Consultant's Estimates

## Annex 5: Selected Priority Water Projects

Srl. No	Project Title	Prospective Implementing Agency	Project Location	Cost Estimate US Dollars
	Water Supply from Pipelines and Wells Projects			
1	Construction of Water Yards	DLC, DRDF	All 5 States	30,000,000
2	Increase & Sustain access to water services in South Darfur State	SWC, WES	SD	20,000,000
3	Urban sanitation and hygiene facilities	PWC, MIWR, UNICEF	All 5 States	7,000,000
4	Water supply networks in different areas/Mahalias in West Darfur	PWC, MIWR, UNICEF	WD	3,500,000
5	Drilling of five water wells along road of El Fasher and Eweenat/Libya , ND	DLC, DRDF	ND	560,000
6	Increase & Sustain access to WASH services in West Darfur State	UNICEF	WD	18,500,000
7	Increase & Sustain access to WASH services in South Darfur State	UNICEF	SD	17,500,000
8	Increase & Sustain access to WASH services in North Darfur State	UNICEF	ND	13,000,000
9	Mitigating resource-based conflicts in Northwest of North Darfur State	UNAMID	ND	890,000
10	Adequate and safe water for health care facilities and the population in Darfur	WHO	All 5 States	4,544,010
11	Water supply networks for small towns	DLC, DRDF	All 5 States	20,000,000
12	El Fasher water supply from Sag Elnam	North Darfur State Water Cooperation	ND	50,000,000
13	Water Treatment Facility for El Fasher Urban Water Supply Scheme	UNOPS	ND	10,000,000

14	Water Supply for Mellit, North Darfur	UNOPS	ND	10,000,000
15	Water Supply for Kebkabia in North Darfur	UNOPS	ND	10,000,000
16	Water Supply for Kass, South Darfur	UNOPS	SD	10,000,000
17	Water Supply for Zalingei, Central Darfur	UNOPS	CD	10,000,000
18	Nyala Pipeline from Bagara Basin	SWC South Darfur	SD	50,000,000
	Sub-Total			285,494,010
	Projects to supply water from dams and surface water sources			
1	Water for sustainable development and conflict prevention- Development and Management of Groundwater Sedimentary Basins	Govt	All 5 States	5,000,000
2	Water for sustainable development and conflict prevention- WadiAzom Watershed Management	Govt	SD, WD	8,000,000
3	Water for sustainable development and conflict prevention- Wadi El Ku Catchment Management	Govt	(ND,SD)	8,000,000
4	Water Harvesting	Govt	All 5 States	8,000,000
5	Water for sustainable development and conflict prevention- WadiNyala Watershed Management	Govt	SD	8,000,000
6	Water for sustainable development and conflict prevention- WadiIbra Watershed Management	Govt	SD, WD	8,000,000
7	Water for sustainable development, environment protection and conflict prevention- WadiKaja	Govt	WD	8,000,000
8	Water for sustainable development and conflict prevention- WadiTiwal Water shed Management.	Govt	SD, WD	8,000,000
9	Water Harvesting for Improving Food Security in South Darfur	FAO	SD	5,000,000
10	Water Harvesting for Improving Food Security in North Darfur	FAO	ND	5,000,000
11	Water Harvesting for Improving Food Security in West Darfur	FAO	WD	5,000,000
12	IWRM Policy Formulation, Institutional Strengthening, Capacity Building and Pilot Implementation	UNEP / MIWR	All 5 States	10,000,000
13	Training & Human Resources Development in Water Resources Management and Water Harvesting	UNESCO	All 5 States	2,000,000
14	Mitigating resource-based conflicts in South Darfur State	UNAMID	SD	2,680,000
15	Mitigating resource-based conflicts in Northwest of North Darfur State by building local capacities and rehabilitating existing resources	UNAMID	ND	2,430,000
16	Capacity Development for Improved Water Management Systems in Darfur	UNDP	All 5 States	1,000,000
	Sub-Total			94,110,000
	Climate Change Projects			
1	Prevention of River erosion in Geneina & Zalingei Towns	PWC, MIWR, UNICEF	WD	3,125,000
2	Enhancing resilience for climate change and climate variability impacts in Darfur region	MIWR-HRS, UNESCO	All 5 States	1,000,000
3	Climate change adaptation, IWRM, and sustainable natural resource management in Darfur	UNEP / HCENR	All 5 States	3,000,000
4	Reducing the vulnerability of communities to climate change in drought-prone areas of southern Darfur State through improved water harvesting practices	UNDP	SD	1,000,000
	Sub-Total			8,125,000
	GRAND TOTAL			387,729,010

Source: Darfur Water Conference Documents year??

## Annex 6: List of all 65 DIWC Projects (arranged in decreasing order of budget)

Sl. No.	Project Title	Coverage	Estimated Cost US Dollars	Duration in Years
1	Water for sustainable development and conflict prevention – Development and Monitoring of Groundwater Sedimentary Basins	ADS	102,000,000	6
2	Water supply networks for small towns	ADS	60,000,000	3
3	Construction of Water Yards	ADS	57,000,000	3
4	Increase and Sustain access to WASH services in West and Central Darfur States	WD/CD	55,500,000	6
5	Increase and sustain WASH services in East and South Darfur States	ED/SD	52,300,000	6
6	El Fasher water supply form Sag Elnam	ND	50,000,000	3
7	Water for sustainable development and conflict prevention – WadiAzoom Watershed Management	SD/ED,WD/ CD	47,000,000	6
8	Water for sustainable development and conflict prevention – Wadi El Ku Catchment Management	ND, SD, ED	40,000,000	6
9	Increase and sustain access to WASH services in North Darfur State	ND	38,200,000	6
10	Water Harvesting	ADS	37,000,000	3
11	Water Harvesting for conflict prevention in East and South Darfur States	ED, SD	35,400,000	6
12	Water for sustainable development and conflict prevention – WadiNyala Watershed Management	SD	35,000,000	6
13	Water for sustainable development and conflict prevention- WadiIbra Watershed Management	SD, CD,WD	33,000,000	6
14	Water for sustainable development, environment protection and conflict prevention- WadiKaja	CD, WD	32,000,000	6
15	Water Harvesting for conflict prevention in North Darfur State	ND	30,400,000	6
16	Water for sustainable development and conflict prevention- WadiTiwal Watershed Management.	SD, CD, WD	26,500,000	6
17	Water Harvesting for conflict prevention in 9 locations	CD,WD	26,400,000	6
18	Increase & Sustain access to water services in East and South Darfur States	ED, SD	25,813,500	6
19	Water Harvesting for conflict prevention in Central and West Darfur State	CD/WD	20,400,000	6
20	Performance Review and Institutional Strengthening in Operational and Technical Capacity of the Urban Water Administrations of 3 Darfur States Capital Cities.	ADS	20,000,000	5
21	Rehabilitation of Small Dams & Reservoirs in Darfur	ADS	20,000,000	3
22	Improved access to water, sanitation and hygiene services for the vulnerable population in East and South Darfur States	ED, SD	17,000,000	6
23	IWRM Policy Formulation, Institutional Strengthening, Capacity Building and Pilot Implementation	ADS	14,000,000	4
24	Humanitarian Support & Facilitation of Water-Sanitation to the vulnerable groups in Darfur.	ND	13,629,646	2

25	Rehabilitation of water yards, hafirs, water reservoirs and dams.	ADS	13,040,000	1
26	Climate change adaptation, IWRM, and sustainable natural resource management in Darfur	ADS	12,000,000	4
27	Water Harvesting for Improving Food Security in East and South Darfur	ED, SD	11,000,000	2
28	Water Treatment Facility for El Fasher Urban Water Supply Scheme	ND	10,000,000	4
29	Water Supply for Mellit, North Darfur	ND	10,000,000	4
30	Water Supply for Kebkabia in North Darfur	ND	10,000,000	4
31	Water Supply for Kass, South Darfur	SD	10,000,000	4
32	Water Harvesting for Improving Food Security in North Darfur	ND	10,000,000	2
33	Water Harvesting for Improving Food Security in Central and West Darfur	CD/WD	9,000,000	2
34	Water Supply for Zalingei, Central Darfur	WD	7,500,000	4
35	Urban sanitation and hygiene facilities	ADS	7,000,000	6
36	Management of Groundwater Resources- Kass District	SD	6,700,000	3
37	Prevention of River erosion in Geneina&Zalingei Towns	WD& CD	6,250,000	6
38	Humanitarian Support for Conflict Affected Persons and Communities in East and South Darfur	ED, SD	5,000,000	4
39	Water & Sanitation for Peace and Livelihoods	ND	5,000,000	5
40	Water supply and Sanitation support project in Krenek and Sirba districts in West Darfur	WD	4,840,792	4
41	Adequate and safe water for health care facilities and the population in Darfur	ADS	4,544,010	2
42	Management of Water Resources Information	ADS	4,500,000	2
43	Water supply networks in different areas/Mahalias in West Darfur	WD	3,500,000	6
44	Mitigating resource-based conflicts in South Darfur State	SD	2,680,000	2
45	Mitigating resource-based conflicts in Northwest of North Darfur State by building local capacities and rehabilitating existing resources	ND	2,430,000	3
46	Water and Sanitation Improvement for conflict affected people In West Darfur	WD	2,325,834	5
47	Improved access to and availability of sustainable WASH in West Darfur	WD	2,289,000	3
48	Life -saving through well drilling	WD	2,270,000	6
49	School Wash Project for rural and nomadic areas in West Darfur	WD	2,001,700	5
50	Training & Human Resources Development in Water Resources Management and Water Harvesting	ADS	2,000,000	4
51	Reducing the vulnerability of communities to climate change in drought-prone areas of southern Darfur State through improved water harvesting practices	SD	2,000,000	3
52	Life- saving WASH intervention for vulnerable IDPs and host communities in South Darfur	SD	2,000,000	2
53	Enhancing resilience for climate change and climate variability impacts in Darfur region	ADS	1,500,000	3
54	Capacity building for improved water governance in Darfur	ADS	1,200,000	3

55	Groundwater Management in Fractured Aquifers in Darfur.	ADS	1,200,000	3
56	A plan for Monitoring and Water Information System (WIS) for Darfur	ADS	1,200,000	2
57	Rufaida Sanitation and Hygiene Project in South Darfur	SD	1,120,600	2
58	Provision of Water and Sanitation in South Darfur	SD	1,110,000	2
59	Conjunctive use of water resources for agricultural production in North Darfur	ND	1,000,000	3
60	Identification and design of potential water harvesting projects in Darfur using RS, GIS	ADS	1,000,000	3
61	Capacity Development for Improved Water Management Systems in Darfur	ADS	1,000,000	2
62	Mitigating resource-based conflicts in Northwest of North Darfur State	ND	890,000	3
63	Integrated watershed management of WadiNyala	SD	800,000	3
64	Drilling of five water wells along road of ElFasher and Eweenat/Libya , ND	ND	560,000	1
65	Conflict mediation and Peace building in Darfur	ADS	325,000	1
	TOTAL		1,071,320,082	

Source: Darfur International Water Conference Document (June 2011)

### Annex 7: List of ‘Software Project’ out of the 65 Projects

Sl. No.	Project Title	State	Amount US\$	Duration (Years)
1	Management of Groundwater Resources- Kass District	SD	6,700,000	3
2	Management of Water Resources Information	ADS	4,500,000	2
3	Enhancing resilience for climate change and climate variability impacts in Darfur region	ADS	1,500,000	3
4	Capacity building for improved water governance in Darfur	ADS	1,200,000	3
5	Mitigating resource-based conflicts in South Darfur State	SD	2,680,000	2
6	Mitigating resource-based conflicts in Northwest of North Darfur State by building local capacities and rehabilitating existing resources	ND	2,430,000	3
7	Mitigating resource-based conflicts in Northwest of North Darfur State	ND	890,000	3
8	Conflict mediation and Peace building in Darfur	ADS	325,000	1
9	IWRM Policy Formulation, Institutional Strengthening, Capacity Building and Pilot Implementation	ADS	14,000,000	4
10	Climate change adaptation, IWRM and Sustainable Natural Resource Management in Darfur	ADS	12,000,000	4
11	Reducing the vulnerability of communities to climate change in drought-prone areas of southern Darfur State through improved water harvesting practices	SD	2,000,000	3
12	Capacity Development for Improved Water Management Systems in Darfur	ADS	1,000,000	2
13	Training & Human Resources Development in Water Resources Management and Water Harvesting	ADS	2,000,000	4
14	Groundwater Management in Fractured Aquifers in Darfur.	ADS	1,200,000	3
15	A plan for Monitoring and Water Information System (WIS) for Darfur	ADS	1,200,000	2

16	Conjunctive use of water resources for agricultural production in North Darfur	ND	1,000,000	3
17	Identification and design of potential water harvesting projects in Darfur using RS and GIS	ADS	1,000,000	3
18	Integrated watershed management of WadiNyala	SD, ED	800,000	3
19	Water Harvesting for Improving Food Security in South Darfur	SD	11,000,000	2
20	Water Harvesting for Improving Food Security in North Darfur	ND	10,000,000	2
21	Water Harvesting for Improving Food Security in West Darfur	WD	9,000,000	2
	TOTAL		86,425,000	

Source: Darfur International Water Conference Document (June 2011)

## Annex 8: Power Infrastructure Projects

Sr. No.	Project Title	Cost and Phasing (US\$ Million)		
		2013-2016	2017-2019	Total
1	Thermal Power Generation			
	• 5 MW Plant for Nyala	8.2	-	8.20
	• 20MW Plant for Nyala	35.1	-	35.10
	• Overhaul of 6 Generators in El Fasher	6.0	-	6.0
	• Upgrading electricity generation and connectivity in cities, towns and villages in Central Darfur	22.9	22.9	45.8
2	Solar Power Generation			
	• 5 MW for Nyala	13.4	-	13.4
	• 3 MW for El Fasher	8.5	-	8.5
	• 2 MW for El Geneina	6.0	-	6.0
	• 1.75 MW for Zalingei	5.3	-	5.3
3	Wind Power			
	• 20 MW for Nyala	-	46.2	46.2
4	Rural Solar House Systems, 16,500 units per year @ US\$750 per unit	37.2	37.3	74.5
5	Detailed study for geothermal power generation at Tegabo and Medop in North Darfur	1.0	-	1.0
6	Power Grid Extension Babanousa – Adila- Ed Daein- Nyala – El Fasher	140	100	240
7	Power Grid Extension Nyala – Kass-Zalingei- ElGeneina	100	105	205
8	Expansion of Power distribution networks for capital cities and locality towns and villages	120	180	300
9	Development of Electrification Master Plan	2.0	-	2.0
10	Capacity Building in the Energy Sector	1.5	1.5	3.0
	GRAND TOTAL	507.1	492.9	1,000.0

Source: Ministry of Water Resources and Electricity + Consultant's Estimates

### Annex 9: List South/East Darfur Projects

Sl. No.	Project Title	Amount US\$	Years
1	Improved access to water, sanitation and hygiene services for the vulnerable population in South Darfur	17,000,000	6
2	Increase & Sustain access to WASH services in South Darfur State	52,300,000	6
3	Water Harvesting for conflict prevention in South Darfur State	35,400,000	6
4	Water for sustainable development and conflict prevention- WadiNyala Watershed Management	35,000,000	6
5	Increase & Sustain access to water services in South Darfur State	25,813,500	6
6	Water Supply for Kass, South Darfur	10,000,000	4
7	Humanitarian Support for Conflict Affected Persons and Communities in South Darfur	5,000,000	4
8	Management of Groundwater Resources- Kass District	6,700,000	3
9	Reducing the vulnerability of communities to climate change in drought-prone areas of southern Darfur State through improved water harvesting practices	2,000,000	3
10	Integrated watershed management of WadiNyala	800,000	3
11	Water Harvesting for Improving Food Security in South Darfur	11,000,000	2
12	Mitigating resource-based conflicts in South Darfur State	2,680,000	2
13	Life- saving WASH intervention for vulnerable IDPs and host communities in South Darfur	2,000,000	2
14	Rufaida Sanitation and Hygiene Project in South Darfur	1,120,600	2
	TOTAL	207,924,100	

Source: Darfur International Water Conference Document (June 2011)

### Annex 10: List of North Darfur Projects

Sl. No.	Project Title	Amount US\$	Years
1	El Fasher water supply from Sag Elnam	50,000,000	3
2	Increase & Sustain access to WASH services in North Darfur State	38,200,000	6
3	Water Harvesting for conflict prevention in North Darfur State	30,400,000	6
4	Humanitarian Support & Facilitation of Water-Sanitation to the vulnerable groups in Darfur.	13,629,646	2
5	Water Treatment Facility for El Fasher Urban Water Supply Scheme	10,000,000	4
6	Water Supply for Mellit, North Darfur	10,000,000	4
7	Water Supply for Kebkabia in North Darfur	10,000,000	4
8	Water Harvesting for Improving Food Security in North Darfur	10,000,000	2
9	Water & Sanitation for Peace and Livelihoods	5,000,000	5
10	Mitigating resource-based conflicts in Northwest of North Darfur State by building local capacities and rehabilitating existing resources	2,430,000	3
11	Conjunctive use of water resources for agricultural production in North Darfur	1,000,000	3
12	Mitigating resource-based conflicts in Northwest of North Darfur State	890,000	3
13	Drilling of five water wells along road of ElFasher and Eweenat/Libya , ND	560,000	1
	TOTAL	182,109,646	

Source: Darfur International Water Conference Document (June 2011)

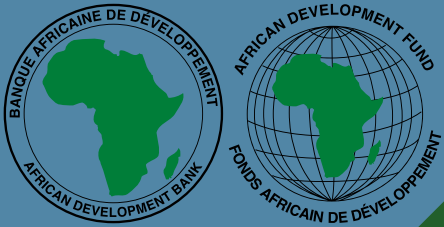
## Annex 11: List of West/Central Darfur Projects

Sl. No.	Project Title	Amount US\$	Years
1	Increase & Sustain access to WASH services in West Darfur State	55,500,000	6
2	Prevention of rain erosion in Geneina&Zalingei Towns	6,250,000	6
3	Water supply networks in different areas/Mahalias in West Darfur	3,500,000	6
4	Water for sustainable development, environment protection and conflict prevention- WadiKaja	32,000,000	6
5	Water Harvesting for conflict prevention in 9 locations	26,400,000	6
6	Water Harvesting for conflict prevention in West Darfur State	20,400,000	6
7	Life- saving through well drilling	2,270,000	6
8	School Wash Project for rural and nomadic areas in West Darfur	2,001,700	5
9	Water and Sanitation Improvement for conflict affected people In West Darfur	2,325,834	5
10	Water Supply for Zalingei, Central Darfur	7,500,000	4
11	Water supply and Sanitation support project in Krenek and Sirba districts in West Darfur	4,840,792	4
12	Improved access to and availability of sustainable WASH in West Darfur	2,289,000	3
13	Water Harvesting for Improving Food Security in West Darfur	9,000,000	2
	TOTAL	174,277,326	

Source: Darfur International Water Conference Document (June 2011)

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# African Development Bank Group

The African Development Bank Group is Africa's premier development institution, owned by both regional (African) and non-regional member countries. Since its establishment in 1964, the Bank Group has focused on the continent's economic and social development. Poverty reduction has been a key consideration, along with the elimination of its cause: limited human and institutional capacities, poor access to social and economic infrastructure and services, and inadequate capital. The Bank Group uses its mandate and convening power to champion and reinforce Africa's voice in international forums and to mobilize financial resources. Availing knowledge and advisory services to African countries has become a significant component of this process, especially since 2015 when the Bank laid strong emphasis on its five key priority areas or the **High 5s**. That is, *Light up and Power Africa, Feed Africa, Industrialize Africa, Integrate Africa, and Improve the Quality of Life for Africans*.